

The Permian-Triassic Impact Event caused Secondary-Craters & -Impact Structures in Europe, Africa & Australia

Part 2 of my study: “Global Impact Events are the cause for Plate Tectonics and the formation of Continents and Oceans” - see also: **Part 1**, and **Part 3** to **6**

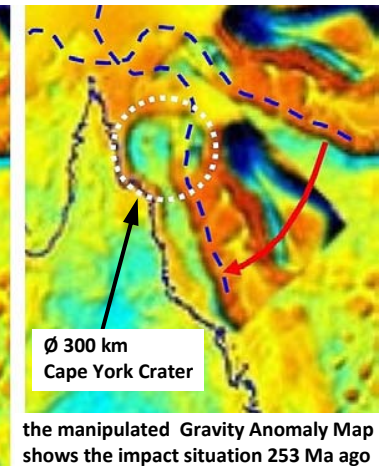
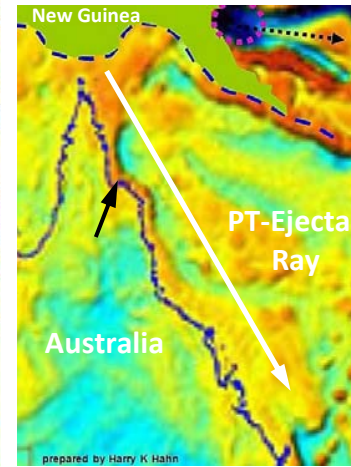
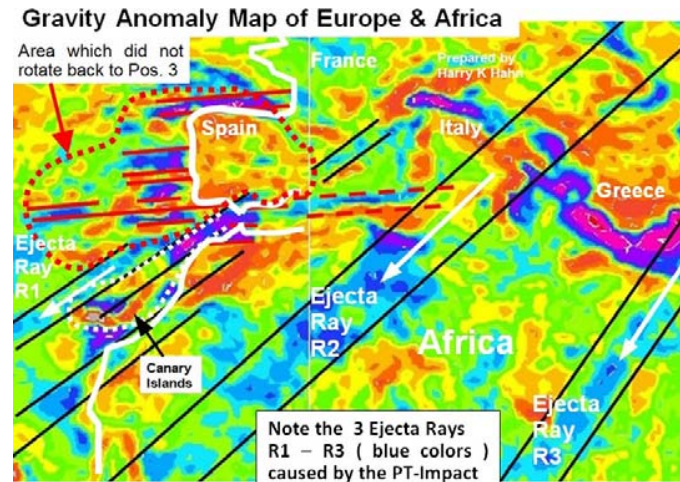
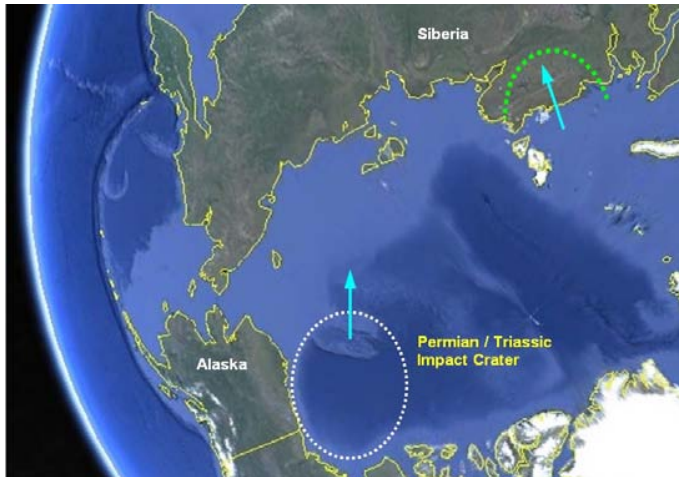
by Harry K. Hahn / Germany - **8. July 2017** - Note: Document not allowed for commercial use ! → Study-Docu here : www.permiantriassic.de or [here](#)
 (→ **higher resolution versions** of my studies are available here: www.archive.org > see **Part2_hr**)

Abstract :

First I will give an overview of the Permian Triassic (PT) Impact Event on the first pages before I describe the Secondary-Craters and -Impact Structures of the PT-Impact. The section which describes the assumed secondary craters and impact structures in Europe, Africa & Australia that were caused by the PT-Impact Event starts at page 12.

The large secondary- impact craters and –structures found in Australia, Europe and Africa were caused by Ejecta Material that was produced during the Permian Triassic (PT)-Impact Event in the Arctic Ocean area, which formed the **1270 x 950 km elliptical PT-Impact Crater**. The impactor which caused the PT-Impact, an asteroid or comet in the diameter range of probably 60 to 200 km, collided with our planet at a very shallow angle. Because of this very shallow impact angle of probably less than 8° and the estimated low impact velocity of around 8 km/s, large amounts of material was excavated from Earth’s crust during the impact. This excavated crust material, together with large fragments of the impactor, is the ejecta material that caused many large secondary craters & impact structures on Earth. It probably had a velocity of slightly less than 8 km/s.

Some large fragments of the impactor or of the ejected material caused a secondary impact crater chain along the NE-coast of Australia. An exceptional large impact crater of this crater-chain, the > 300 km Cape York Crater caused a number of large-scale magma eruptions over a long time period, which were partly responsible for the creation of the Pacific Plate as described in more detail in **Part 1** of my study. In Europe and Africa powerful Ejecta Rays from the PT-Impact Event caused further secondary impact crater chains with crater diameters of up to 200 km. The tracks of these crater chains are clearly visible on different gravity anomaly maps, which show the reduced thickness of Earth’s crust in these areas (blue areas). It is clearly visible that these tracks of the Ejecta Rays intersect at a certain point which was the impact location of the PT-Impact at the time of impact, in the North of Siberia. The outline of Italy is a direct result of these crater chains as my drawings indicate. Another large ejecta fragment caused a secondary crater (VLC) at the location where the Victoria Lake is located today. A part of the impacting material was ejected again and caused the VLC-ejecta rays, another part descended in Earth’s crust and caused the African LLSVP (see **Part 1** & **Part 6b**). The indicated Congo Crater isn’t a result of the PT-Impact. It probably caused the Triassic/Jurassic boundary.



Contents :

1	To the crater formation of the Ø 1270 x 950 km P/T-Impact Crater
2	To the evolution of the PT – Impact and its effects on Earth’s Crust
3	Earth at the time of the PT-Impact Event
4	A big secondary PT-Impact Crater with > Ø 320km on the NE-coast of Australia
5	The evolution of the Pacific Plate & Pacific Ocean caused by the P/T-Impact
6	Key-Maps for the further analysis of the Pacific Plate
7	Europe was formed by Ejecta of the Permian-Triassic –(PT) Impact Event
8	Gravity Anomaly Map of Africa showing the PT-Ejecta Rays R1 - R4
9	Epilogue / References

Page :	6	Mid of 2012 I informed ~ 10 geologists and impact researchers (e.g. Prof. C. Koeberl, Prof. T. Kenkmann and Prof. U. Reimold) about the discovered 300 km diameter Cape-York Crater and other possible impact structures on Australia’s East coast. In 2015 & 2017 I informed the above mentioned + geologists & the head office of the UNI Karlsruhe(KIT) about the discovered PT-Impact Crater. I even went to the 16th Symposium for “Tectonics” TSK2016 in Bonn in March 2016 and distributed copies of my study about the PT-Impact. But the only answer I got so far (KIT) was: My discoveries aren’t explainable with the current state of geophysics
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	37/42	

Geological evidence for the Permian-Triassic (PT) - Impact Crater :

A number of scientists specialized in impact research already proposed, that the Siberian Traps, the largest eruption of continental flood lavas on Earth, may be better explained by a large Impact than by a conventional mantle plume. Unfortunately the scientists haven't found the impact crater yet !

With my study I want to prove that **“Global Impact Events* are the primary cause for Plate-Tectonics (and Expansion-Tectonics) on Earth and on other planets and moons of our solar system, and that such a Global Impact Event caused the formation of Continents and Oceans on Earth !**

The hard evidence for the correctness of my hypothesis, will be the confirmation of the Permian-Triassic (PT) Impact Crater described in my study.

I have collected many Rock samples in order to proof my hypothesis : **Images of this rock samples can be found on the following websites :**

www.permiantriassic.de (or www.permiantriassic.at) → **This website should be active in March 2021** (please try it in the next months from time to time)

In the following I want to show now some extracts from a book written by the well-known impact researcher Prof. Dr. Christian Koeberl.

These extracts will provide further indication and evidence for the Permian-Triassic (PT) Impact Crater and its effects, which I describe in my study !

The title of the book : **“Impact Markers in the Stratigraphic Record” – Authors : C. Koeberl & F. Martinez-Ruiz (ISBN : 3-540-00630-3)**

Here the extracts from the book :

Page 29 : Siderophile element anomalies (e.g. enhanced Ir contents) were found at some P-Tr boundary locations (e.g., Holser et al. 1989). And recent research succeeded in demonstrating the P-Tr boundary event was a much shorter event than thought. At Meishan, China, a negative excursion in the carbon isotopic composition had a duration of less than about 160,000 years and suggested that it could be the result of the impact of an icy carbon-rich comet.

Page 29 : Kaiho et al. (2001) reported sulfur isotope and chemical data for samples from the Meishan (China) Permian-Triassic (P-Tr) boundary section. They interpreted S-isotope data, as well as the occurrence of Fe- and Ni-rich particles, as evidence for a large-scale impact event that penetrated the Earth's mantle and formed a crater approximately 1000 km in diameter.

A number of scientists pointed out that the Siberian Traps cannot be the result of a mantle plume (e.g. Czamanske et al. 1998, Sharma 1997, Elkins-Tanton and Hager 2000)

Page 109 : An impact event is also supported by evidence from extraterrestrial noble gases in fullerenes found in P-Tr boundary beds in China, Japan, Hungary.

Page 109 : Because there is a similar duality of signals between likely volcanic and impact sources at the P-Tr boundary, similar to the K-T boundary, the hypothesis of Impact Researchers should be tested, which claims that the Siberian Traps could have been caused by decompression melting at the impact site. And that impact volcanism can uniquely explain the dual signals in the geological record.

Page 110 : An indicative model of Impact Researchers shows that it is possible for the volume of decompressed mantle beneath a large ~ 200 km sized crater to greatly exceed the excavated volume of the impact crater itself, primarily due to reduction of lithostatic load. Under suitable conditions of geothermal gradient, this would lead to near instantaneous melting with volumes of the order of 10^6 km^3 , similar to the characteristic volumes of LIP's.

Page 110 : And the induced large-scale vertical and horizontal thermal gradients are expected to have a long-term effect on secondary mantle flow.

Page 111 : Decompression melting may contribute more melt than conventional shock melting.

Page 111 : We propose that the Siberian Traps, which are accessible and currently under considerable scrutiny, may be better explained by a large impact than by a conventional mantle plume. The closure of a former ocean between Siberia and Mongolia, as well as amalgamation with north and south China blocks may also have been occurring during Permian-Triassic times (→ and may be the result of a large impact event ! → comment from H.K.Hahn)

Page 97 : Decompression melting must be seriously considered whenever an impact is sufficiently large to cause the transient crater depth to excavate a substantial fraction of the local crustal thickness, and thereby cause a sudden drop in lithostatic pressure beneath the crater.

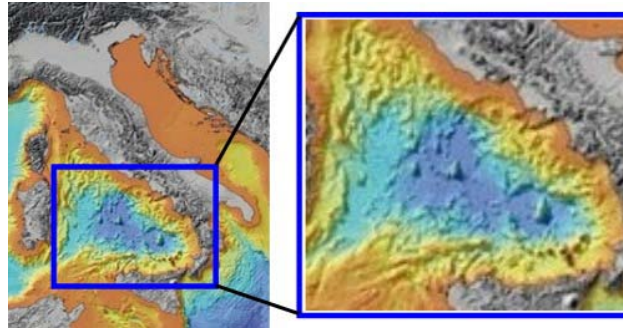
Summary

There is evidence for an elliptical impact crater with the enormous dimensions of **1270 x 950 km** on the ocean floor of the Beaufort Sea near the north-coast of Alaska. This impact crater seems to be responsible for the Permian-Triassic Boundary, which has caused the most severe mass extinction in Earth's history, ~253 million years ago. This Permian-Triassic (PT) Impact Crater was formed by an oblique impact. That means that the impactor (an asteroid or comet) collided with our planet a very shallow angle of probably less than 8°



The impactor, a carbon-rich comet or an asteroid with a diameter of 60 to 200 km, impacted in the Beaufort Sea close to the north-pole and caused a gigantic butter-fly shaped ejecta blanket with two large ejecta wings which covered the majority of the northern hemisphere. Within the boundaries of this ejecta blanket many large secondary impact craters were formed by the ejecta, with crater diameters of up to 450 km. (see [Part 2](#) & [3](#) of my study). In Europe (Mediterranean area) at least 8, but probably up to 20 such large secondary craters were formed by the impacting ejecta, that was thrown out of the PT-Crater. These impact craters and the resulting large-scale lithospheric-flow is responsible for the tectonic development of

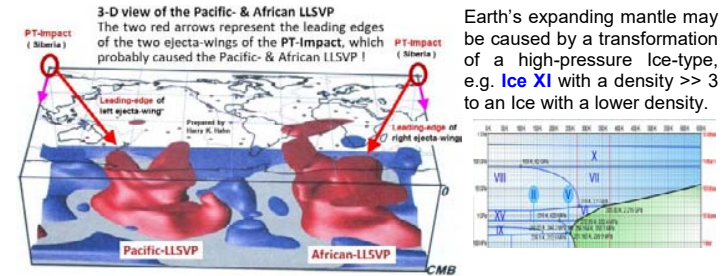
Europe during the last ~250 Ma. Two of these secondary craters (≈ Ø160 & Ø220 km), which formed the Tyrrhenian Sea north of Sicily (Italy) and which are still noticeable on topographic- & geological maps (see below), should provide evidence to confirm the described impact scenario



The main impulse of the PT-impact, together with the impulses and secondary craters, produced by the ejecta material, caused a global fracture pattern on Earth's crust, which was the trigger for the break-up of "Pangea" and a global expansion tectonic process. This expansion tectonic process caused the dichotomy on Earth → the formation of continents and ocean basins. And it is responsible for the transport of large amounts of volatiles, especially H₂O, from Earth's mantle to Earth's surface. Earth's diameter increased from an estimated diameter of 6500-7500 km ~250 million years ago to a diameter of 12756 km today, with an average expansion rate of ~ 20mm / year.

The expansion of Earth's mantle probably was caused by ≥ two effects : By abrupt decompression of Earth's mantle, which led to the large-scale expansion of volatiles, especially H₂O (ice/water), in Earth's mantle. And by phase changes (transformation) of minerals and high-pressure Ice e.g. **Ice XI & X** caused by the thermal energy (heat) that was induced in Earth's mantle by the molten

PTI-ejecta which descended in Earth's mantle and formed the African-LLSVP and the Pacific-LLSVP :



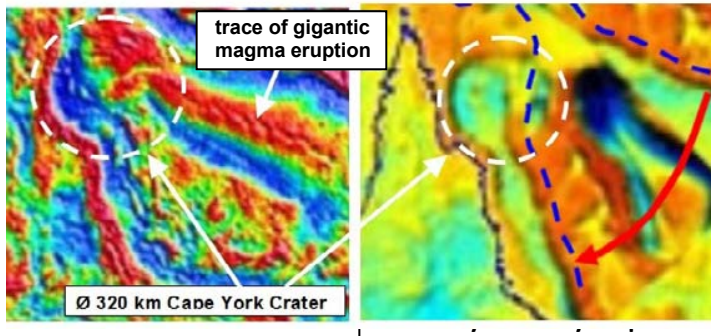
The ocean basins, which represent new surface area of our planet and which formed between the old crust fragments (the continents), continuously filled up with water (H₂O) over the last ≈ 250 Ma. This water was, and still is, transported from Earth's mantle to Earth's surface through fractures caused by the PT-impact, and through the Mid-Ocean Ridges were new surface areas of planet Earth (→ the ocean floors) are continuously created

In the same way as the water was transported to the surface of our planet Earth, and in the same way the expansion tectonic process was initiated on Earth it happened on other planets and moons of our Solar System. There is evidence for other powerful global impact events which occurred on the planets Venus, Mars and Pluto, on Jupiter's moon Ganymede, on Saturn's moons Enceladus & Iapetus, on Pluto's moon Charon and on our moon. These global impact events, which are described in more detail in [Part 5 \(P5\)](#) of my study in all probability took place in the last 300 million years !

But back to the Permian -Triassic (PT)-Impact ! : The main impulse of the Permian-Triassic (PT)-impact on Earth initially caused a break-off of the Angara Craton from the Russian Craton and it caused a strong acceleration of the Angara Craton towards South, where China and Australia were located at that time. The following powerful southward movement of the Angara Craton then caused the HP- and UHP-orogens in China, through the

extreme compression which it produced in the crust fragments caught between the North China Craton & the Angara Craton. This dynamic process led to the formation of the Altaid magmatic fronts.

In the NE & NW of Australia, off the coast, two exceptional large craters with ~ 350-400 km diameter can be identified, which both seem to be secondary craters caused by ejecta from the PT-impact event. Here especially the Cape York impact crater located off the NE-coast of Australia must be mentioned, because it strongly influenced the tectonic development of the Pacific Plate through a number of gigantic magma eruptions.



The stratigraphic record of the NE-coast of Australia (e.g. "Moreton Geology") indicates the probable connection of the Cape York crater, and its secondary impact structures, with the PT-impact event. At least eight (8) gigantic magma eruptions can be assigned to the Cape York Crater, which took place within the last ~200 million years. The fifth eruption of this series of magma eruptions, which was very powerful, not only left clear visible traces on the Pacific Plate. The magma front of this eruption also moved a small cratonic block (the Colorado Plateau) deep into the north-american continent. This has caused the formation of the Rocky Mountains and the Basin & Range Province. Further, a second magma front resulting from this eruption strongly influenced the

geology of Antarctica, and it separated Antarctica from Australia & South-America. This eruption No.5 may have been triggered by extreme earthquakes, of magnitude >12 (on the Richter Scale), which were caused by the Chicxulub Impact Event ~65 Ma ago, and could therefore be partly responsible for the extinction of the dinosaurs.

The magma eruption No.6 of the Cape York crater left further distinct traces on the Pacific plate and it strongly influenced the geology of Mexico and of the Gulf of Mexico, when the magma front crossed this area. This magma front was also responsible for the formation of the Appalachians, which were created by a crust-fragment that was relocated (bended) towards the East by the magma front.

The 7th magma eruption of the Cape York Crater again left clear traces on the Pacific Plate. It strongly influenced the geology of Middle America when its magma front impacted there.

The magma eruptions No.6 & 7 may have been triggered by strong impact-related earthquakes too (→ probably caused by the 62 Ma Impact-Cycle).

A key map for the further analysis of these magma eruptions is the NOAA ocean floor map, which shows the topography of the Pacific Plate in fine detail. This map shows all the fine traces which will lead to the confirmation of these magma eruptions, and it will help to understand the dynamic geological processes caused by these magma eruptions, e.g. the separation of New Guinea & New Zealand from Australia, and the separation of Japan from New Guinea, the formation of Indonesia, French Polynesia etc.

Another key map is a global ocean-floor-age map (e.g. from Google). This map clearly shows the 1200-1600 km wide ocean-floor stripes (between 60°N and 30°S latitude) along which the magma fronts moved mainly from west to east. In the eastern half of the Pacific Plate these stripes are clearly visible because of the strong east-ward

shift of their ocean-floor ages on the map, which was caused by an eastward acceleration of these stripes, resulting from the massive eastward directed magma outflows. The distinct bend in the Hawaiian-Emperor-Chain (starting at 43 Ma) is, at least partly, a result of the faster east-ward motion of 2 or 3 of these ocean-floor stripes over the Hawaiian hotspot, because these ocean-floor stripes were accelerated (& stretched) in eastward direction by the magma eruptions (-outflows).

Along the NE coast of Australia there are many other secondary impact structures noticeable, which all were caused by the Cape York impact.

Other possible secondary impact craters, caused by the PT-impact event, were found in India, in Arabia and in South-America.

Here the 450 x 380 km elliptical crater identified in India, which formed the Bay of Bengal, seems to be related (identical) to the large secondary crater off the NW-coast of Australia with the estimated dimension of 400 x 350 km, that is responsible for the ejection of large amounts of ejecta, rich in Platinum Group elements, in a ray-like pattern over the Yilgarn Craton.

A large elliptical crater with the dimensions of 840 x 630 km , found in South-America, which can be identified on topographic maps and on satellite images, may also be related to the PT-impact event.

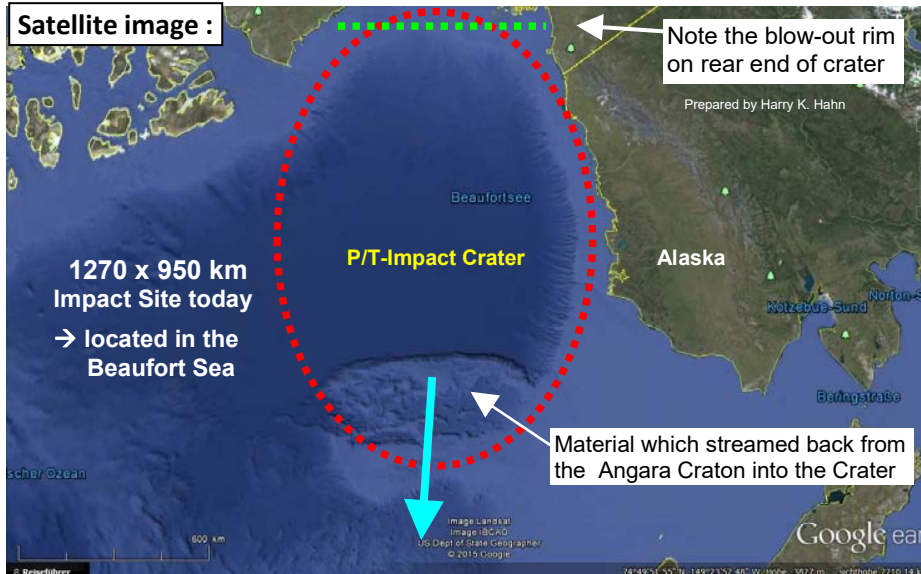
Another largescale impact event in Africa, which must be mentioned here, are four chains of impact craters (probably > 10 craters per chain), with craters in the Ø150 to Ø250 km range, which represent ejecta rays which cross the whole continent in different angle direction !

These impact craters are also secondary craters, which were caused by ejecta originating in the PT-Impact Crater !

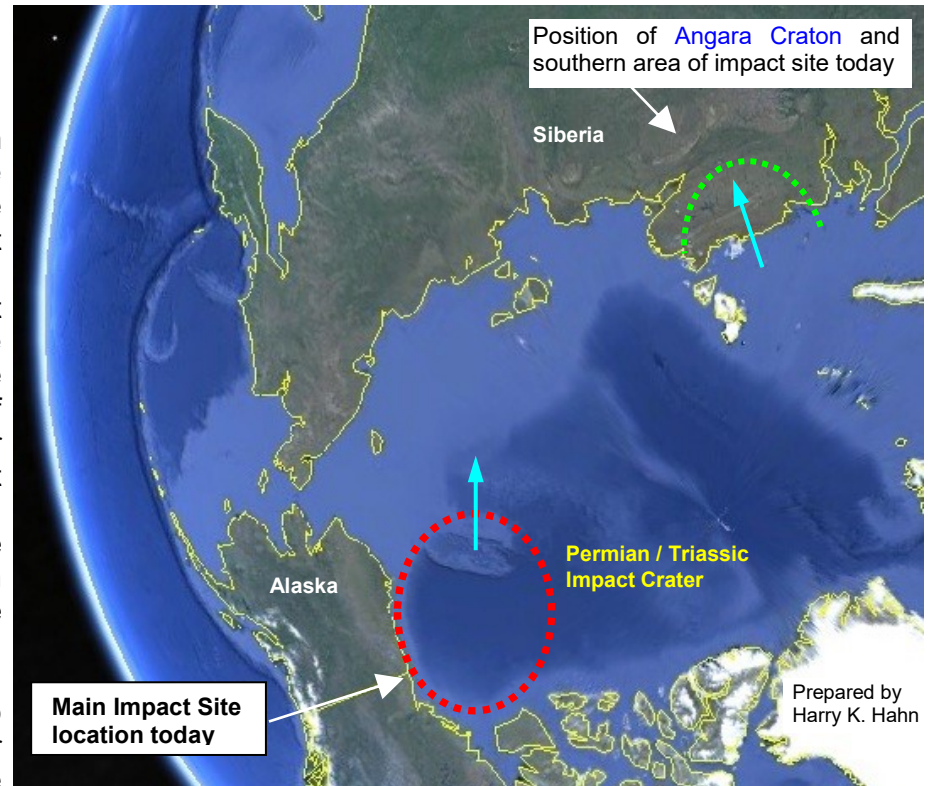
1 253 Million years ago a big Asteroid or Comet collided with Earth and caused a 1270 x 950 km elliptical Impact Crater

The asteroid or comet had a diameter in the range of ≥ 60 to 200 km, and it caused the most severe impact event and mass extinction known in Earth history. → This caused the **Permian-Triassic boundary**, which is associated with the most extensive **mass extinction** of marine species and terrestrial vertebrates & plants. And it caused the largest eruption of “continental” **flood lavas**, the **Siberian Traps**.

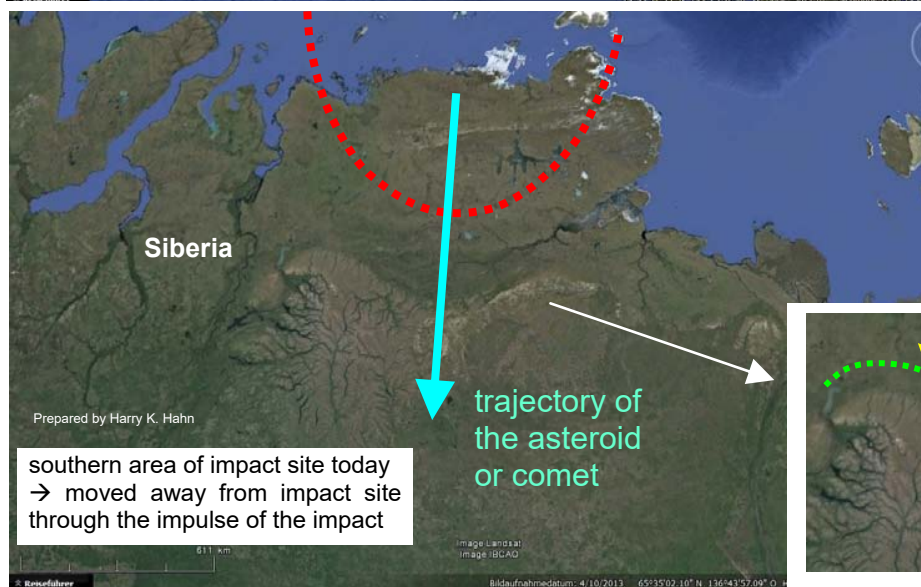
The following images and explanations describe the impact event and its effects on our planet Earth during the ~ 253 million years from this event. As everyone can imagine, this powerful impact event completely reshaped our Earth's appearance !



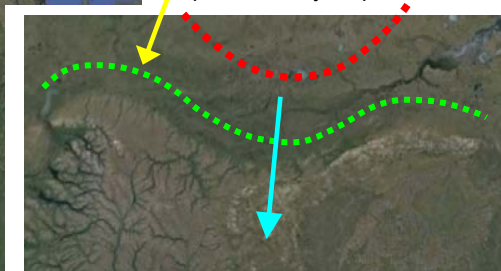
The two images on the left show the remains of the impact site as it appears today. The main impact site is located in the Beaufort Sea close to the coast of Alaska. Another part of the impact crater which moved away from the impact site through the impulse of the impacting asteroid is located in **Siberia**. By moving the two locations together the impact scene becomes evident.



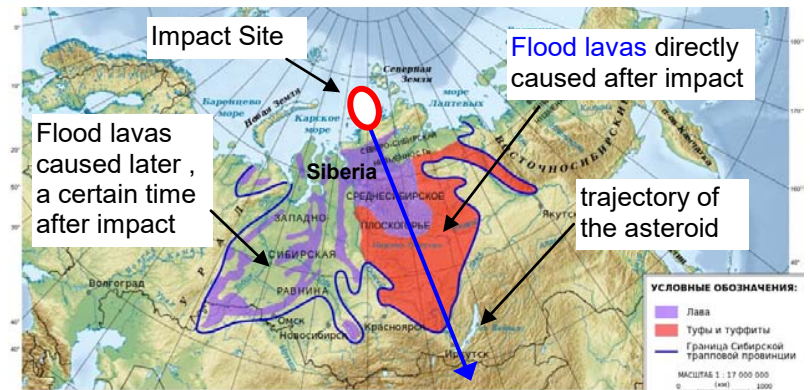
→ Here 3 informative movies about the P/T-Event : [PT_Movie 1](#) ; [PT_Movie 2](#) ; [PT_Movie 3](#)



Note the **bow-shape** of the northern edge of the flood-lava formation
→ similar to bow-waves produced by ships !



The flood lavas caused by the impact : The Siberian Traps

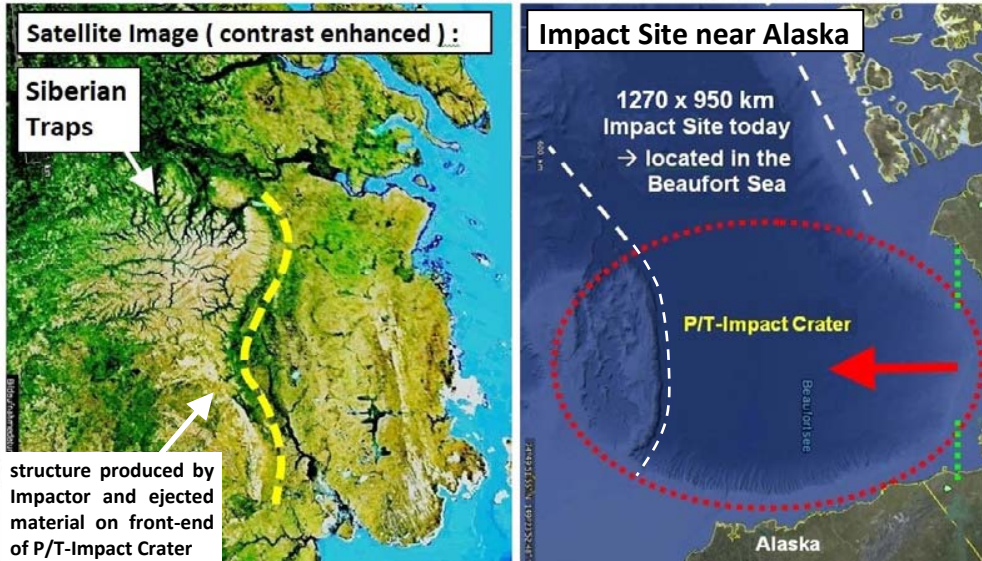


To the crater formation of the Ø1270 x 950 km P/T-Impact Crater

There is **close correlation** between the topography of the real P/T-impact crater and the topography of a simulated elliptical impact crater with similar properties (ellipticity, impact angle, impact velocity, target surface etc.). The PT- impactor probably had an impact velocity of around 8 km/sec. And the impact angle probably was in the range of around 5 to 7 degrees.

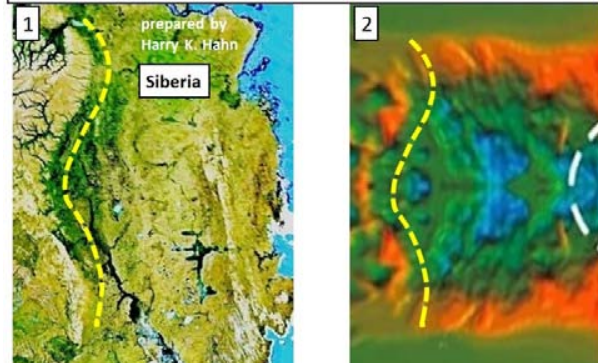
Therefore the PT-impact was a “**low-velocity impact**” of a large asteroid or comet in the diameter range of 60 to 200 km, at a very shallow angle. During impact the lower part of the impactor was decelerated by shearing along the surface, while the fragmented upper part of the impactor continued its motion nearly unaffected. The fragmented upper part of the impactor, together with a very large volume of partly molten excavated rock material was ejected in a very large butterfly-shaped ejecta blanket. This ejecta blanket which included many large secondary impactors (→ fragments of the P/T-impactor + ejecta), produced a number of secondary crater chains with crater diameters of 100-250 km, and a number of very large secondary craters with diameters of >300 km (e.g. Bengal Bay Crater, Cape York Crater, Pantanal Crater, etc.). There is strong indication that these impact crater chains are responsible for the major fractures in Earth’s crust, which led to the break-up of Pangea. (→ e.g. the **crater chains R1 to R4** → see **Part 2 of Study**)

The real structure of the Permian Triassic Impact crater area



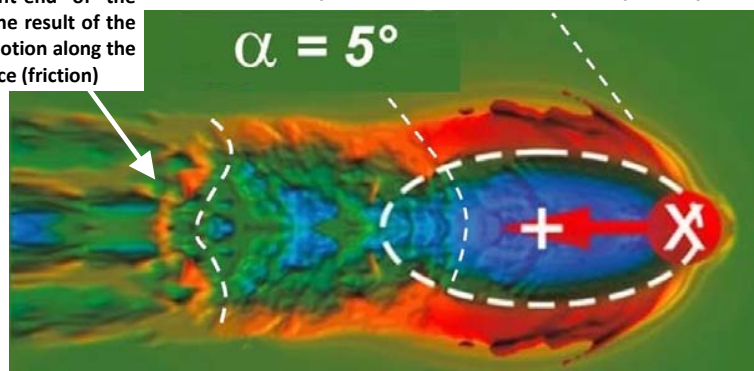
structure produced by impactor and ejected material on front-end of P/T-Impact Crater

Compare → impact structures on front-end of crater :
 1.) Reality : Satellite image Siberia (contrast enhanced)
 2.) Simulation : front-end structure at ~ 5 - 7° impact angle



The secondary structures at the front-end of the crater are the result of the projectile motion along the target surface (friction)

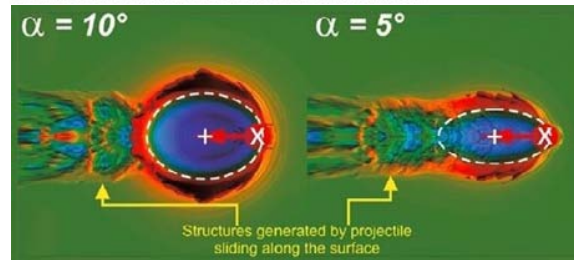
Simulated Impact Structure of a 5° oblique Impact :



Early reflections of shock and rarefaction waves in the projectile prevent plastic deformation in the upper part of the body. The strong pressure gradient in the projectile suggests fragmentation of the projectile would likely occur.

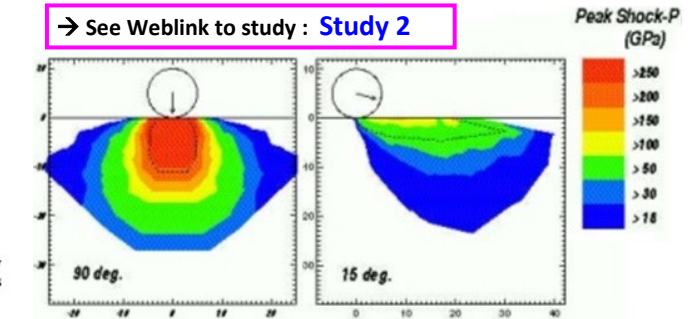
In this case, the lower part of the projectile is decelerated by shearing along the surface while the upper part continues its motion nearly unaffected.

Figure 2. Influence of the impact angle on crater shape. Impact of a 5 km sized projectile at 8 km/s and low impact angles α (friction coefficient $f=0.3$; no cohesion). The dashed white line marks the inner boundary of the crater cavity just before the onset of crater modification (measured at the preimpact surface). The cross (X) indicates the contact point of the projectile with the target, the “+” marks the geometric center of the crater. The secondary structures close to the left crater rim are the result of the projectile motion along the target surface (friction) and indicate a very oblique impact angle. The color contours denote the elevation where green represents the initial level of the target, blue represents topography below, and red above the target level.



The diagrams below show that the maximum shock pressure is drastically reduced in an oblique impact at 15° impact angle compared to the vertical impact case. The reduction in volume of melt is ≥ 90% for a 15° impact ! (This estimate does not include possible melting due to shear heating). That means the PT-Impact has ejected large volumes of unmelted rock !

→ See Weblink to study : **Study 2**



The transition from circular to elliptical impact craters

Dirk Elbeshausen,¹ Kai Wünnemann,¹ and Gareth S. Collins²

2. Model Setup → Weblink to Study : **Study 1**

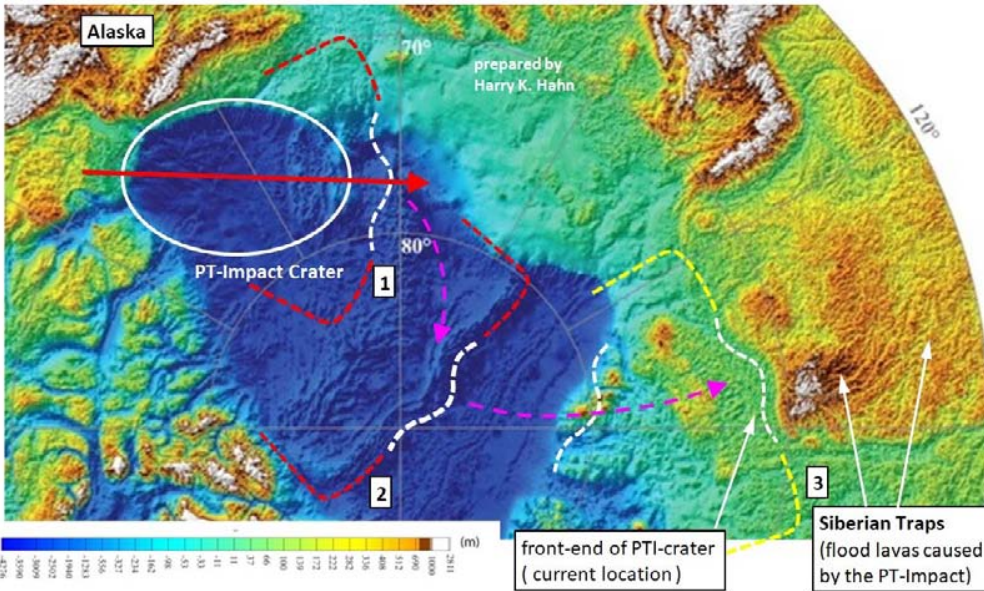
[5] To investigate crater formation for shallow-angle impacts, we have carried out a series of 3-D simulations with the hydrocode iSALE-3D [Elbeshausen and Wünnemann, 2011; Elbeshausen et al., 2009]. This code uses finite difference and finite volume techniques on a Cartesian staggered mesh. It follows an Implicit Continuous-fluid Eulerian and Arbitrary Lagrangian-Eulerian (ICE’d ALE) approach, as described in Harlow and Amsden [1971] and Hirt et al. [1974], to solve the Navier-Stokes equations in a compressible manner. Hence, the kinematic description of motion can be either Lagrangian (where the mesh deforms according to the nodal velocities) or Eulerian (where mesh is fixed in space) or a mixture of both. Due to large deformations and shearing of matter that occur in particular during oblique impacts, the Eulerian approach is more appropriate for the given study [e.g., Collins et al., 2013]. The Eulerian kinematic description requires the reconstruction of interfaces between matter and the free surface (or different types of materials which was not considered in this study as target and projectile were assumed to consist of the same material) to enable a precise calculation of material flows. For the interface reconstruction, it is beneficial to use an adaptive approach coupled with a volume-of-fluid technique [Benson, 2002; Hirt and Nichols, 1981; Gueyffier et al., 1999] as described in Elbeshausen and Wünnemann [2011]. The code has been successfully validated against laboratory experiments and benchmarked against other numerical impact models [e.g., Davison et al., 2011; Pierazzo et al., 2008].

[6] In all simulations, we assume terrestrial gravity conditions ($g=9.81 \text{ m/s}^2$) and resolve the projectile by 16–24 cells per projectile radius. We varied the impact angle α in a range between 90° (vertical impact) and 5°. The primary focus of this study was on low impact angles ($\alpha < 30^\circ$), since we expected the transition from circular to elliptical craters in this range. We used impact velocities of $U=8 \text{ km/s}$, 12 km/s .

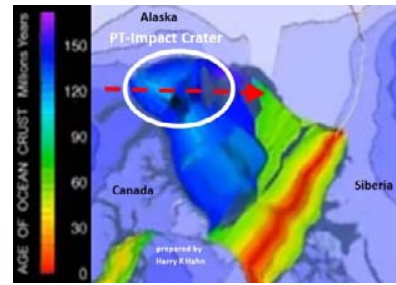
Large-scale structures caused by the PT – Impact , visible on different Maps

Polar-Projection of PT-Impact Area – Topographic Map

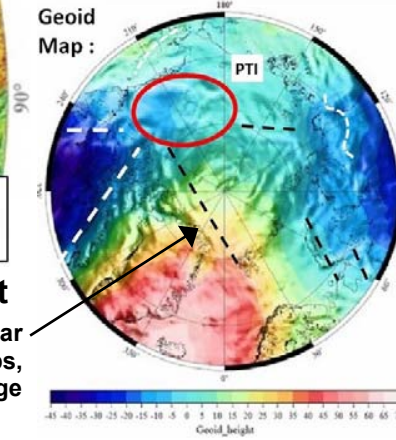
→ the motion of the front-end of the PTI-crater over time is indicated



Ocean-Floor Age Map of PT-Impact Area

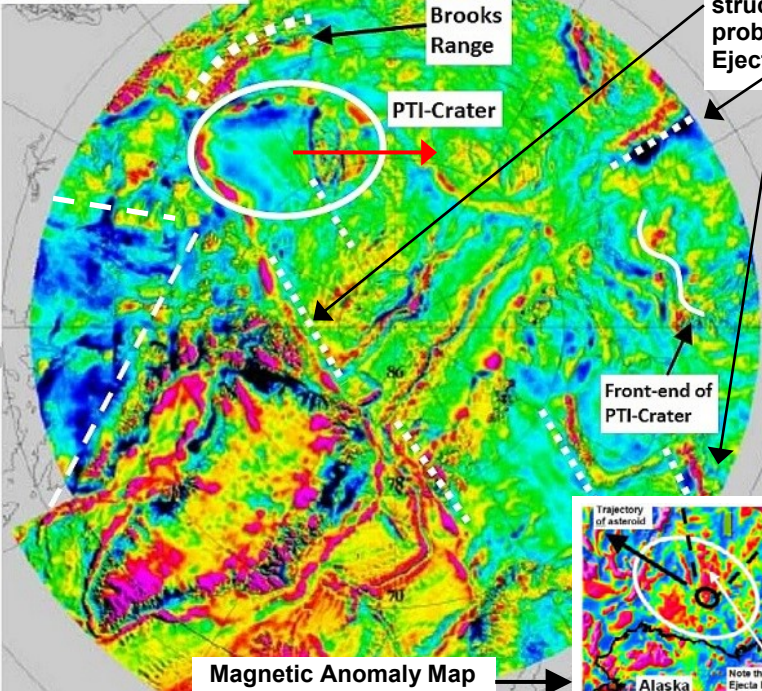


Geoid Map :



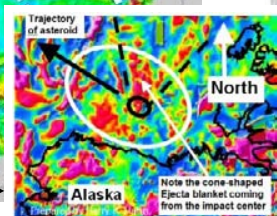
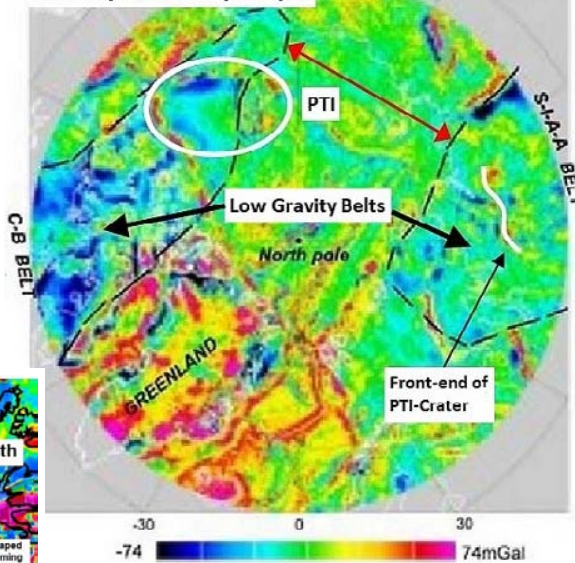
Gravity Anomaly- and Geoid Maps also indicate the PT- Impact

Gravity Anomaly Map :



Note the indicated linear structures on the maps, probably caused by large Ejecta-rays & -blankets

Gravity Anomaly Map :



There is an interesting example of an elliptical Crater on Mars with the dimensions of 10 x 7.5 km, which in all probability was caused by a small Mars-orbiting moonlet whose orbit tidally decayed, because it came to close to the marsian atmosphere. It probably impacted in a very shallow angle $\leq 5^\circ$ (see trajectory-d at the image below) with a relative slow velocity of less than 5 km/s .

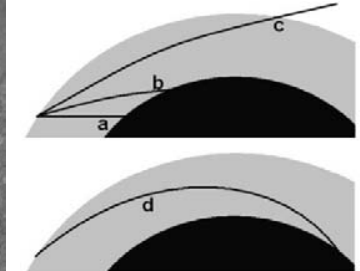
The impactor which caused the P/T-Impact Crater on Earth probably also was a small moonlet, which was caught by Earth's gravity and was orbiting around Earth, before its orbit tidally decayed in Earth's atmosphere, and it finally impacted at a shallow angle of $\leq 7^\circ$ with an impact velocity of probably less than 8 km/s. This would explain the elliptical Crater, the visible ejecta-ray structures the Siberian Traps and the triggered Expansion Tectonics.

On the origin of a double, oblique impact on Mars

J.E. Chappelow^{a,b,*}, R.R. Herrick^b

A double, oblique impact feature north of Olympus Mons provides a unique opportunity to investigate the event that formed it. The sizes of the craters, their ellipticity, shapes of ejecta blankets, separation from each other, and positions relative to each other, all give us information about the event. Coupling this information with an existing model of meteoritic flight through an atmosphere allows us to test several possible scenarios for the event (object type and origin, pre-entry trajectory, atmospheric trajectory, prevailing atmospheric density). We find it highly improbable that the impactor was simply an extra-martian asteroid or comet. We also find that it is unlikely to have been a double-asteroid or a tidally fractured one, but is more likely to have been a Mars-orbiting moonlet whose orbit tidally decayed, and that denser atmospheric conditions than today's may have prevailed when it impacted.

→ Study : [Weblink1](#), [Weblink2](#)



The trajectory (d) of the asteroid that caused the elliptical impact on Mars and the trajectory of the impactor that caused the PT-Impact were similar !

Fig. 1. A large (7.5 × 10.0 km) elliptical crater with a smaller elliptical crater (2.0 × 3.0 km) lying 12.5 km directly uprange (to the left). 'Butterfly'-pattern ejecta occur around both craters. (Mosaic of THEMIS daytime IR images.) North is up.

Fig. 2. Atmospheric flight trajectories for asteroids (top) and a moonlet (bottom) in the martian atmosphere, as discussed in the text. Both are radially exaggerated.

To the evolution of the PT – Impact Event, and the effects of the impact on Earth’s crust

The PT₃-Impact was an **oblique impact**. This means the impactor, a large asteroid or a comet, with ~ 60 to 200 km diameter, impacted on our planet in a very shallow angle. The impact angle was probably < 8°. Therefore the impact, which took place close to the north-pole, produced a large butterfly-shaped ejecta blanket, originating at the impact site and spreading over the majority of Earth’s surface area. →

→ The butterfly-shaped outline of the **ejecta blanket** (marked in **red**) is shown on the map in FIG. 1

The tectonic map on the left (FIG 3), a polar projection shows the present situation. The two maps on the right side show the situation directly at the time of the **PT-impact**, and at ~ 150 Ma after the PT-impact.

Because of the immense size of the impactor, the ejecta blanket which resulted from the impact, covered nearly Earth’s complete surface, and it produced very large secondary impacts. Most of these secondary impacts were distributed within this butterfly-shaped ejecta pattern, and many secondary impact craters formed along distinct ejecta rays (e.g. ejecta rays R1 to R4), which have their starting point at the PT-impact Crater.

TECTONIC MAP OF THE NORTHERN HEMISPHERE

Don L. Anderson, Dave T. Sandwell, and Paul Wesel

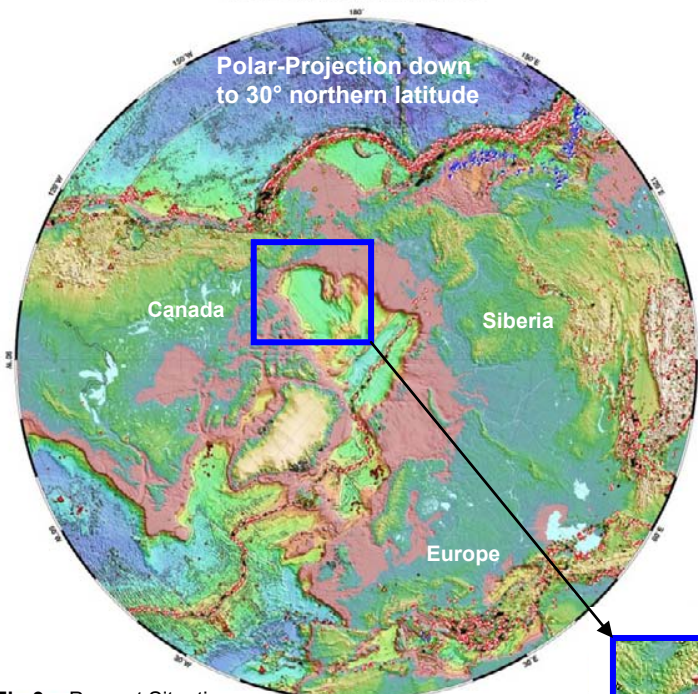
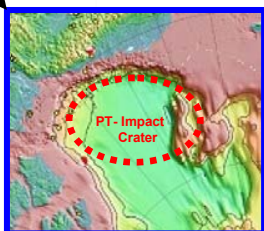
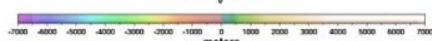


Fig 3 : Present Situation



Detail of Impact Site

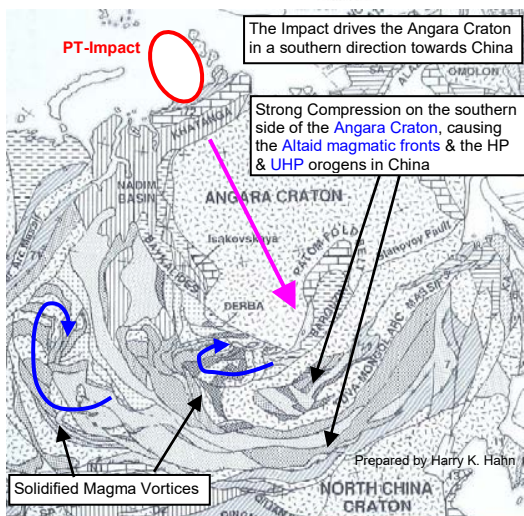


Figure 21.6. Paleotectonic map of Asia showing the primary orogenic-collage components mentioned in the text. Precambrian consolidated

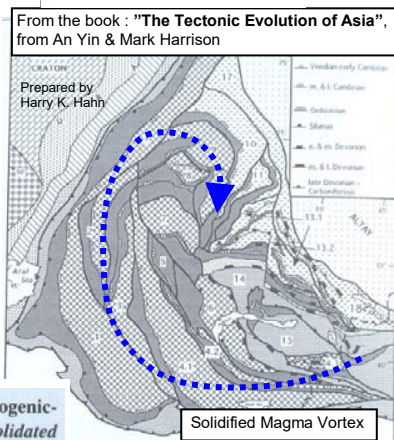


Fig 1 : A Polar-Projection centred on the PT-impact Site (→ center point corresponds approx. to the North-Pole too). The map shows Earth’s complete surface area and the positions of Earth’s continents as they probably were located at the time of impact.

The area which was most effected by the PT-impact is located within the butterfly-shaped ejecta blanket (red) Most secondary impacts (marked in pink & orange) and ejecta rays are also located within this area.

Fig 2 : A Polar-Projection of the North-Pole area down to approx. 30° northern latitude , showing the scene at a time between the PT-impact and today. All following considerations in this study are based on a smaller Earth before the impact and on strong **Expansion Tectonics** after the impact, because all maps used for the analysis indicate Expansion Tectonics !!

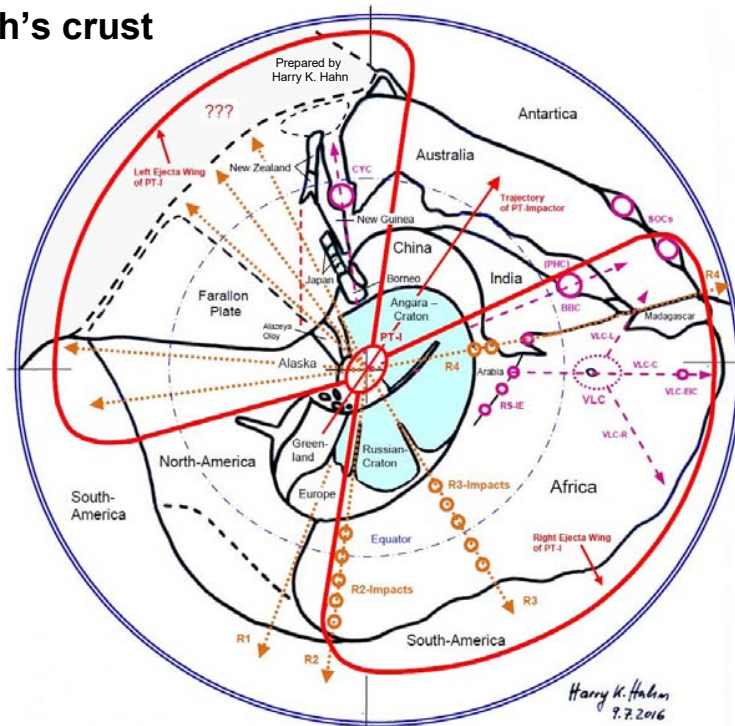


Fig 1 : Polar-Projection of Earth’s complete surface area **at the time of Impact** centred on the PT-impact Crater. **Earth diameter : ~6500-7500 km**

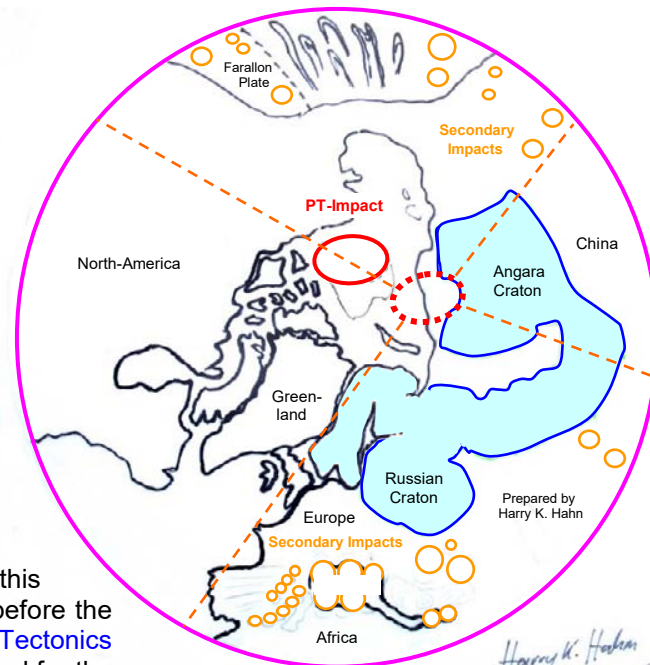
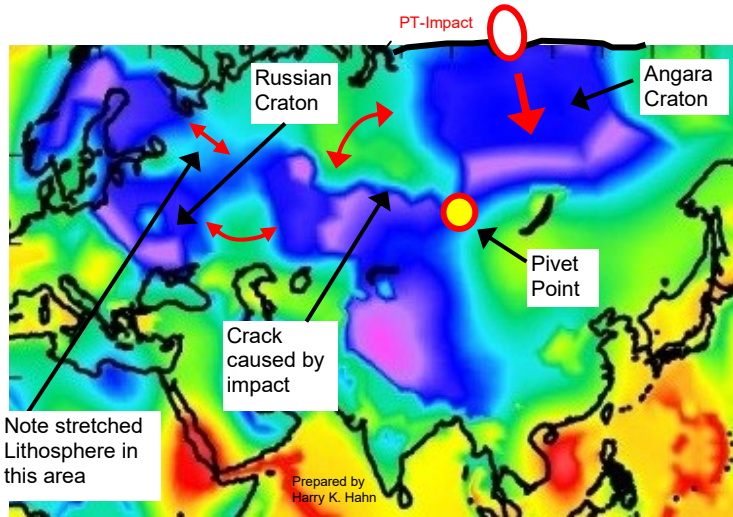


Fig 2 : Polar-Projection down to 30° N ~100 Ma ago, Ø Earth : ~ 10000 km

The tectonic evolution after the PT – Impact Event

Prepared by Harry K. Hahn

As already mentioned on the previous page, all the following considerations are based on a smaller Earth with ~Ø 6500-7500 km before the impact, and on strong **Expansion Tectonics** after the impact. Because all maps used for the analysis indicate that the **PT₂-Impact** triggered strong Expansion tectonics on Earth which is probably still going on today. (→ There is certainly much more expansion than subduction going on today !)



An important key-map for the analysis :

On the lefthand side a composite of continental thicknesses scaled from **vertical-S-wave** upper-mantle travel-time-anomalies combined with an age-dependent model of ocean basins is shown.

The map shows that there was originally a complete Eurasian Craton. However this large Eurasian Craton was hit by the asteroid ~253 Ma ago and broke apart through the immense shear- & bending stress which was induced into the Craton by the Impact Impulse.

The physical description of the impact event :

The **PT₃-Impact** event can roughly be divided into three phases which I will describe in the following :

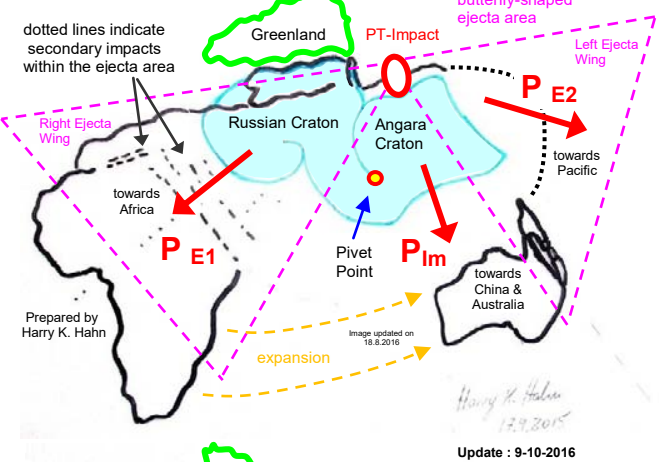
Phase 1 : The impact produced three main **impulses** which were induced into the surrounding Lithosphere. The impulse **P_{IM}** from the Impactor itself and the two Ejecta-Impulses **P_{E1}** and **P_{E2}** which all accelerated different areas of Earth's crust (lithosphere). The following formula can be applied :

$$P_{Total} = P_{IM} + P_{E1} + P_{E2}$$

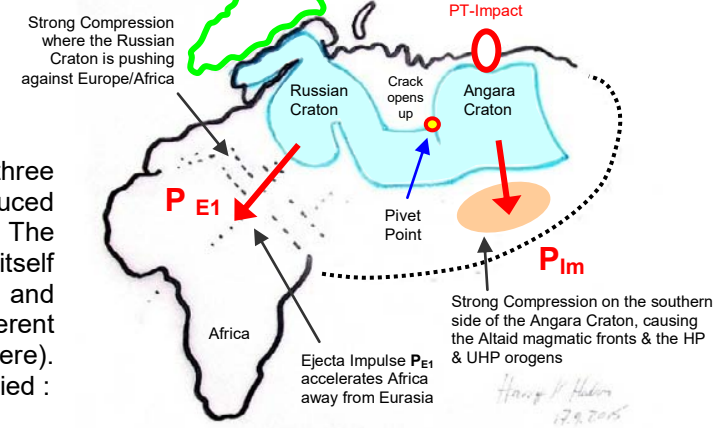
Phase 2 : The accelerated sections of Earth's Crust (e.g. the Angara & Russian Cratons, which rotated around a common pivot point) then later produced immense compression stress further away, where they collided with other thick crust areas.

Phase 3 : The further tectonics is more complex , because of complex interaction between different areas of Earth's crust. The begin of phase 3 is roughly described in the image on the right-hand side.

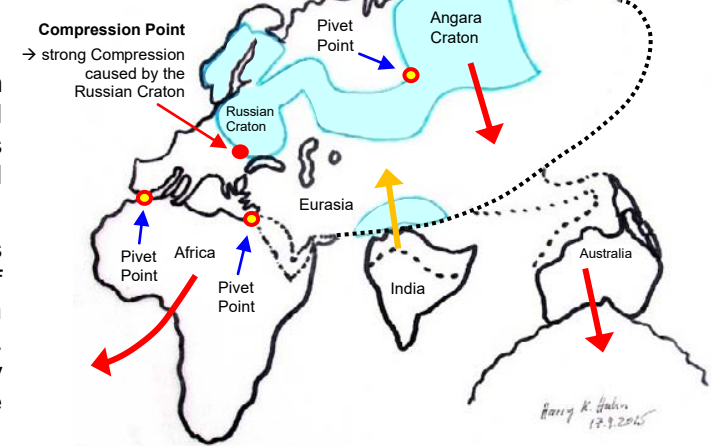
Phase 1 :



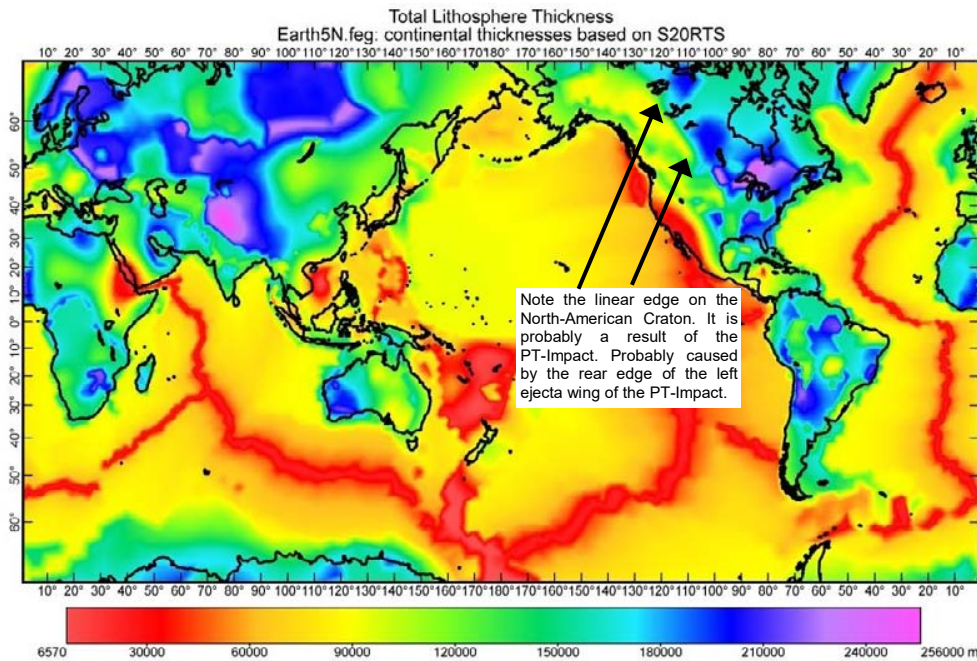
Phase 2 :



Phase 3 :

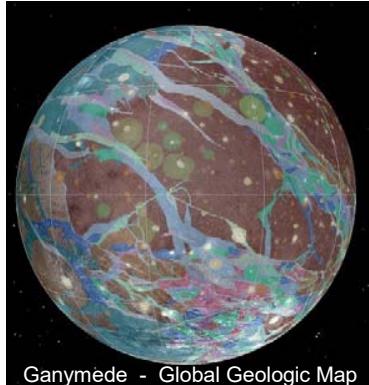


Model of total lithosphere thickness. A composite of continental thicknesses scaled from vertical-S-wave upper-mantle travel-time-anomalies and an age-dependent model in the ocean basins. See following Weblink : http://peterbird.name/publications/2008_torque_balances/012_total_lithosphere-Earth5N.jpg



Overview and probable cause of Expansion Tectonics : A global impact event combined with a mantle super-saturated in volatiles

High concentrations of volatiles in the mantle of certain planets & moons may be the driving force for their rapid expansion, after a global impact event has caused extensive fractures in their crust. → The global impact event and the fractures in the crust are the trigger, which initiate the expansion of the planet or moon through abrupt decompression of the mantle. Then the **volatiles** in their **mantle** e.g. **CO₂, H₂, SO₂, H₂S** etc. → **but especially H₂O**, which may be in a super-saturated state, cause the rapid expansion of the mantle, and the formation of ice-crusts, oceans & atmospheres on their surfaces → as seen on **Earth, Mars, Ganymede, Enceladus & Pluto** etc. (→ see this study !)



Jupiter moon Ganymede is definitely one of the most obvious examples of global expansion tectonics. **It is easy noticeable that the (old) brown colored areas represent fragments of a sphere which drifted away from each other !** The fragments of these shattered (older & smaller) sphere seem to get pulled apart from each other by an expanding sphere (→ the expanding mantle) underneath. The cause of the fractures in the old (brown-colored) crust and the trigger of the expansion tectonics was a global impact event ! (see chapter 6 in this study !) And the substance which is driving the obvious expansion of the moon must be **H₂O** ! Because the mantle of Ganymede pretty much only consists of water in different aggregate states ! → See diagram on the righthand side ! This expansion only slightly increases the moon's moment of inertia

Figure 3.15 Idealized interiors of selected icy bodies (depths in kilometres). Comparatively minor differences in history, composition, and location have produced a wide range of internal structures and geological processes in the larger satellites and dwarf planets. (Various sources.)

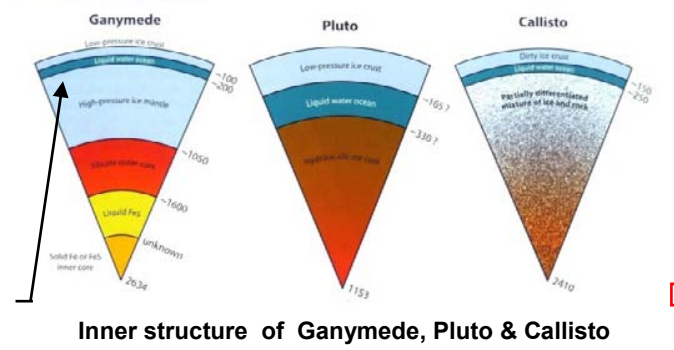
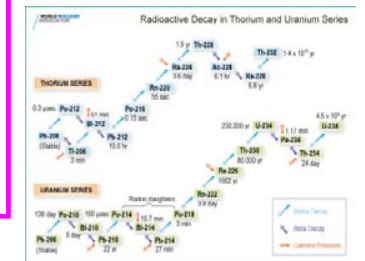


Table 2.5 : Average Chemical Composition in % of Continental and Oceanic Crust

	Continental Crust			Oceanic Crust
	Upper	Middle	Lower	
SiO ₂	66.3	63.5	53.4	60.6
TiO ₂	0.64	0.69	0.82	0.72
Al ₂ O ₃	15.4	15.0	16.9	15.9
FeO*	5.04	6.02	8.57	6.71
MgO	2.48	3.59	7.24	4.66
MnO	0.10	0.10	0.10	0.10
CaO	3.59	5.25	9.59	6.41
Na ₂ O	3.27	3.39	2.65	3.07
K ₂ O	2.80	2.30	0.61	1.81
P ₂ O ₅	0.15	0.15	0.10	0.13

Composition of Earth's mantle in weight percent			
Element	Amount	Compound	Amount
O	44.8		
Mg	22.8	SiO ₂	46
Si	21.5	MgO	37.8
Fe	5.8	FeO	7.5
Ca	2.3	Al ₂ O ₃	4.2
Al	2.2	CaO	3.2



Important indicators which support the Expansion Tectonics Hypothesis (→ see description below) :

- 1) Earth's mantle contains **0,5 – 2 wt% H₂O** . But because the mass of water (H₂O) in the mantle is poorly constraint, the real value could be much higher !
- 2) A comparison of Earth's **mantle** with the mantle of other planetary bodies with high concentrations of H₂O on their surfaces (see diagram), indicates that the **wt% of H₂O in Earth's mantle** maybe considerably under-estimated !
- 3) Different analyses indicate that Earth's radius is expanding with 4 to 15 mm/yr This means Earths diameter increased by **2000-7500 km** in the last **250 Ma** !
- 4) The 12 km "Kola super-deep Borehole" showed that at depths >7 km the **rock is extremely fractured** and **saturated with H₂O & Hydrogen** from deeper sources !
- 5) The **H₂O** in Earth's mantle is **super-critical** & behaves like a gas (Study1, [http://](#))
- 6) **Helium-3** and **Tritium** detected on Mauna Loa / Hawaii indicate the production of **Hydrogen-3 (Tritium)** by **ternary fission** in **Earths core**. See : <https://books.google>

Other interesting information: [Study1](#), [Study2](#), [Study3](#), [Study4](#), [Study5](#), [Study6](#), [Study8](#), [Study9](#)

Hypothesis : → Process for the expansion of the mantle which is causing expansion tectonics :

- 1.) First we consider a crust of a planet or moon which is stable (→ undamaged by big impacts) for a long time period (> 200 Ma). Underneath this stable crust, which is acting like the wall of a pressure vessel, **volatiles** accumulate within the **mantle** material over a long time. These volatiles are produced by different processes inside the mantle. At the beginning the mantle material of the planet or moon contains these volatile components in a dissolved state. However pressure and temperature in the mantle increase over time, because more and more volatiles accumulate within the mantle material, and because **radioactive decay** is constantly adding heat. The solubilities of the volatiles depend on pressure, temperature and the composition of the mantle material. When solubility decreases below volatile concentration, the volatiles will exsolve and start to form small gas bubbles in the mantle material
- 2.) At this point the mantle material is super-saturated with these volatiles. And with further increasing pressure within the mantle material, finally the point will be reached where the pressure in the mantle exceeds the pressure caused by the **lithostatic load** (weight) of the crust. This is the point when tensile stress will start to build up inside the crust material of the planet or moon, which allows the pressure within the mantle to increase even further ! (→ like in a pressure vessel). This build-up of stress in the crust can go so far, that the crust is close to fracturing through tensile stress ! In this state the crust will be very vulnerable to impact events !! The **extremely fractured rock** found at **depths >7 km** maybe proof of this !! (Note that Earth's mantle contains at least 0,5 - 2 % H₂O !)
- 3.) If one or more large impactors are hitting the crust of the planet or moon in this state, the fracturing of the crust will be particularly extensive because it was already close to fracturing through increased tensile stress. And as soon as the crust is fractured by the impact(s) the mantle material will start to expand rapidly. Because volatile solubility in the mantle material (**magma**) decreases through the rapid pressure drop in the mantle, caused by the fracturing of the crust, more and more gas will exsolve !! And the mantle expands faster and faster because of growing gas-bubbles within the mantle material. Heat from the impact event is contributing to this process !
- 4.) A self-accelerating process is initiated which only stops when a new equilibrium is reached between the decreased pressure in the mantle and the pressure produced by the new (thinner) overlying crust, which is caused mainly by gravity and not by the constraint of a closed spherical shell (a pressure vessel wall) anymore. Because of the grown gas-bubbles the mantle-density dropped considerably

Expansion Tectonic Earth models :

From **James Maxlow** & other geologists and geo-physicists which support this Theory :

Web-Links : [L1](#), [L2+L3](#), [L4](#), [L5](#), [L6](#), [L7+L8](#), [L9](#), [L10](#)

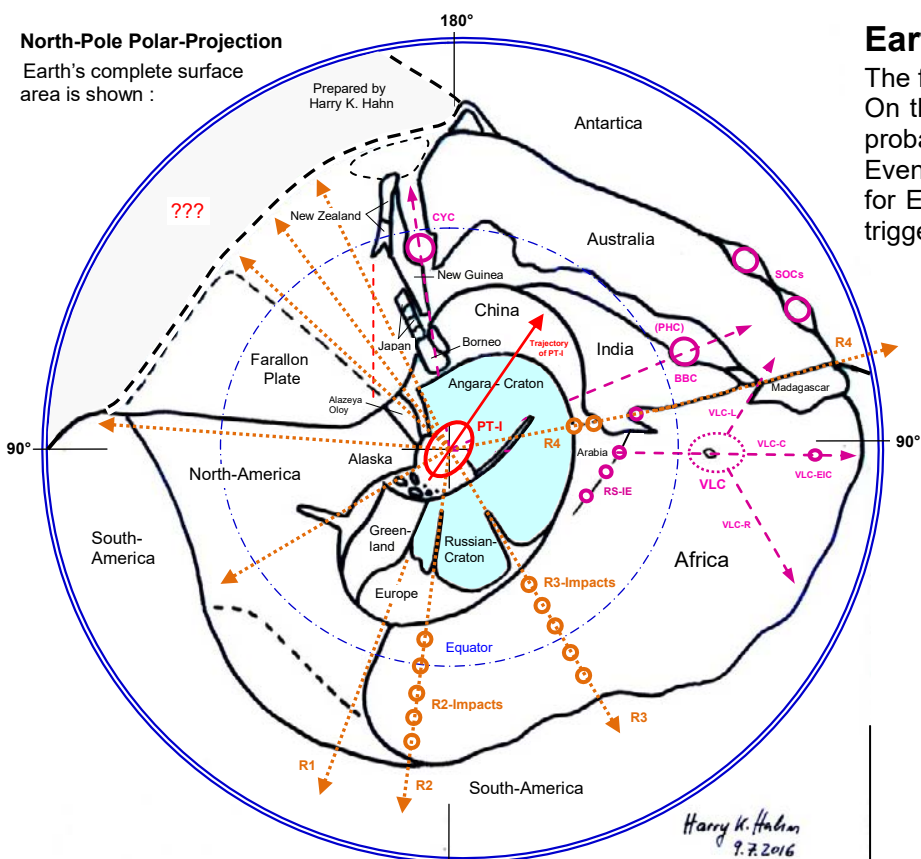
Isotope	Heat release [W/kg isotope]	Half-life [years]	Mean mantle concentration [µg isotope/kg mantle]	Heat release [W/kg mantle]
²³⁸ U	9.46 × 10 ⁻⁷	4.47 × 10 ⁹	30.8 × 10 ³	2.91 × 10 ⁻³
²³⁵ U	9.69 × 10 ⁻⁷	7.04 × 10 ⁸	0.22 × 10 ³	1.26 × 10 ⁻³
²³² Th	2.64 × 10 ⁻⁷	1.40 × 10 ¹⁰	124 × 10 ³	3.27 × 10 ⁻³
⁴⁰ K	2.92 × 10 ⁻⁷	1.25 × 10 ¹⁰	36.9 × 10 ³	1.08 × 10 ⁻³



North-Pole Polar-Projection

Earth's complete surface area is shown :

Prepared by Harry K. Hahn

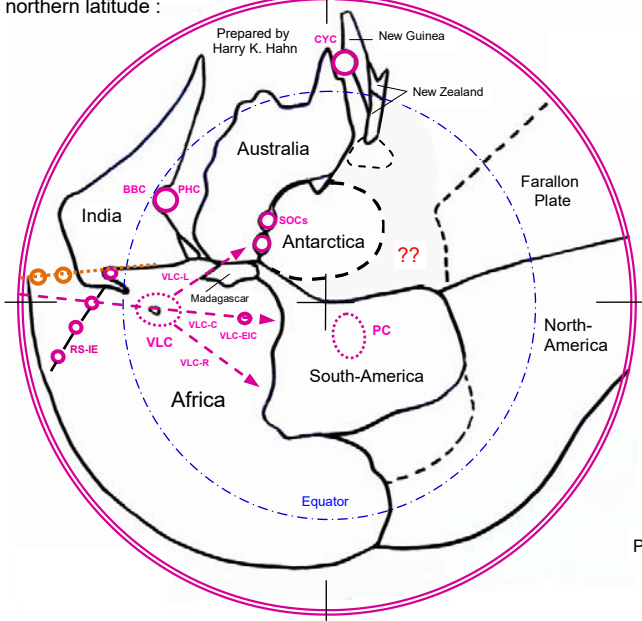


Harry K. Hahn
9.7.2016

Polar-Projection of South-Pole area

up to ~ 45° northern latitude :

Prepared by Harry K. Hahn



Prepared by Harry K. Hahn

Update : 9-10-2016

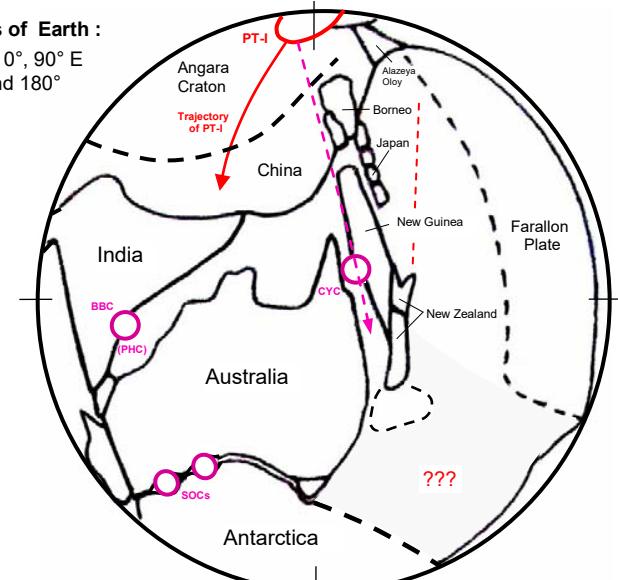
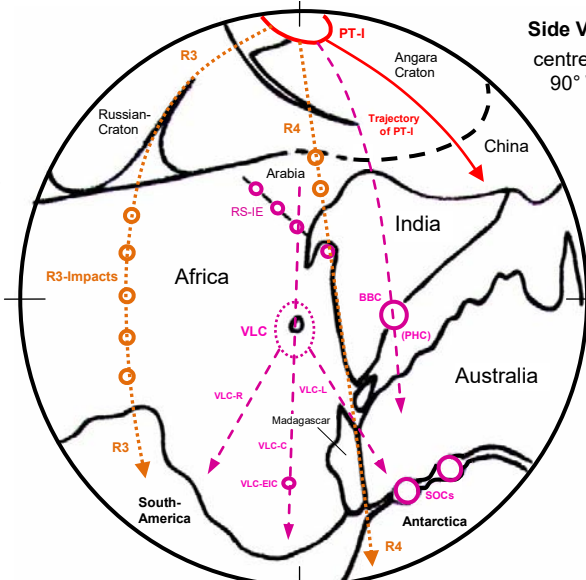
Earth at the time of the PT-Impact Event

Prepared by Harry K. Hahn

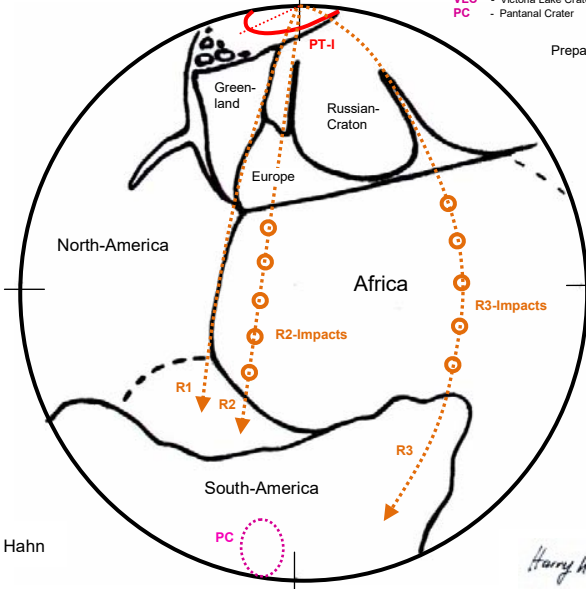
The following maps show how our planet Earth probably looked at the time of the Permian-Triassic (PT)-Impact. On these maps, the arrangement of Earth's continents at PTI-time is based on impact structures which in all probability were caused by the PT-Impact Event (especially the CYC-, the BBC/PHC- and the VLC-Impact Event & the Ejecta Rays (crater chains) R1-R4 were used as a reference). And an **Expansion Tectonics** model for Earth was used as base for these maps. The PT-Impact Event caused the shown fracture pattern, which triggered an expansion tectonics process on Earth. → **Earth's Ø** at the time of the PT-Impact : ~ **6500-7500 km**

Side Views of Earth :

centred on 0°, 90° E
90° W and 180°

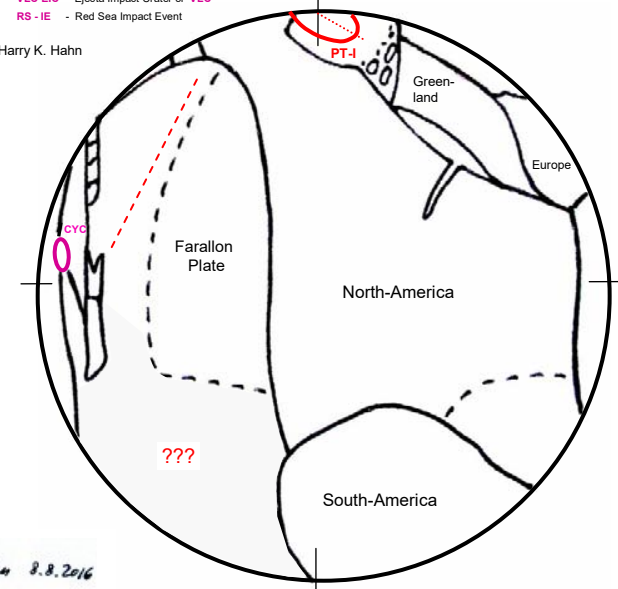


- PT-I - Permian Triassic Impact
- CYC - Cape York Crater
- BBC - Bengal Bay Crater
- PHC - (Port Hedland Crater)
- SOCs - Southern Ocean Craters
- VLC - Victoria Lake Crater
- PC - Pantanal Crater
- R1 to R4 - Ejecta Rays R1 to R4 (caused by PT-Impact)
- VLC-C - Central Ejecta Ray of VLC
- VLC-R - Right Ejecta Ray
- VLC-L - Left Ejecta Ray
- VLC-EIC - Ejecta Impact Crater of VLC
- RS-IE - Red Sea Impact Event



Prepared by Harry K. Hahn

Harry K. Hahn 9.8.2016



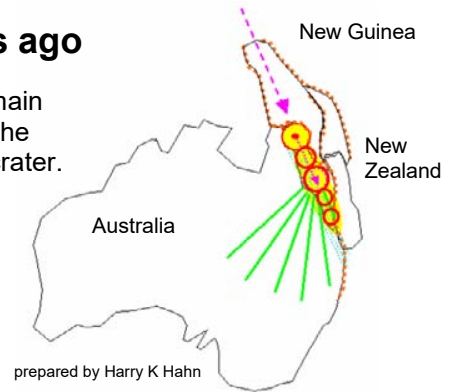
A big secondary PT-Impact Crater with $\geq \varnothing$ 320km on the NE-coast of Australia ~ 253 Million years ago

The geological map of the NE-coast of Australia indicates that this enormous impact event occurred at the **PT-boundary** and that it had two main chapters. The first chapter was written by the impact itself, which produced an ejecta blanket which covered the east of Australia, especially the coastal areas. The second chapter probably was initiated by a flood event, starting ~200Ma ago, caused by a magma eruption from the CY-crater.

The Cape York Impact Event :

The following images show, that there was either one (red), or a chain of successive large impacts (blue) which have caused the break-off of New Zealand and New Guinea from the Australian Plate. (see an example of a chain of impact craters on the left image below)

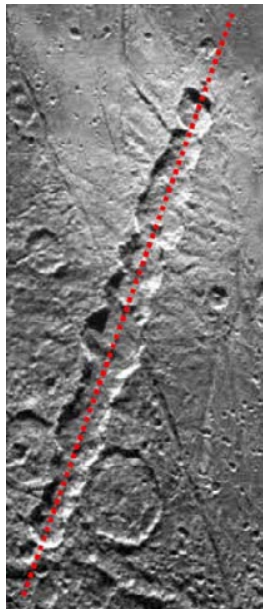
An impactor chain would provide an explanation for the cause of the large crack in Earth's crust required for such a break-off of big crust fragments ! Further it would also explain the cause of the different ray systems visible on the **gravity anomaly** map. The impactor or the chain of impactors were either ejecta of the **PT-Impact** or part(s) of the PT-impactor, which broke apart before impact.



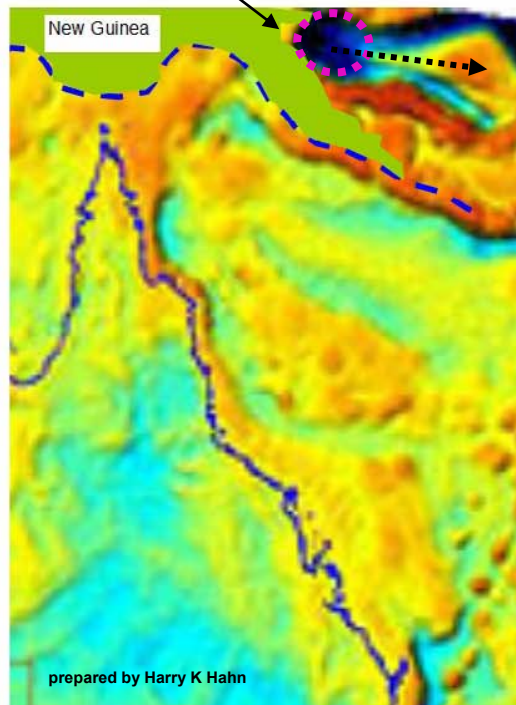
Modification of a Gravity Anomaly Map of Australia's East Coast to show the original impact structure

The image on the left shows the unchanged gravity anomaly map, with New Guinea marked in green on the map. (→ New Guinea's coast line is marked in blue) In the right image, the section in the top right area of the map was rotated by a 45° angle towards the north-east coast of Australia. The result of this "reconstruction" shows the original state of the impact structure shortly after the impact event took place ! The circular crater structure with a diameter of around 320 km is clearly visible ! And the border structures with high gravity intensity indicate that the impact structure may have been caused by a chain of impactors. (probably by a number of secondary impactors from the PT-Impact) Each of the further 3 to 4 big impacts having a diameter of 200 to 300 km !!

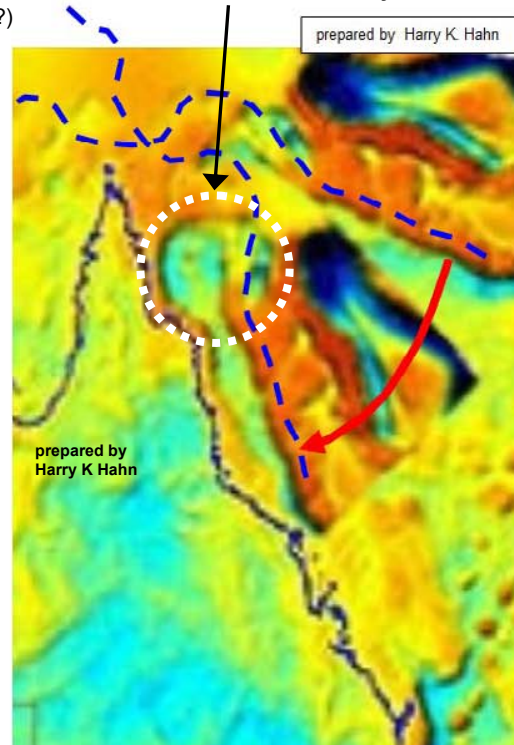
Example of a chain of craters on the Jupiter moon Ganymede caused by an impactor which broke apart before impact :



Also note the magma flow (yellow) which obviously came from the dark blue area (an outflow channel in the crust ?)

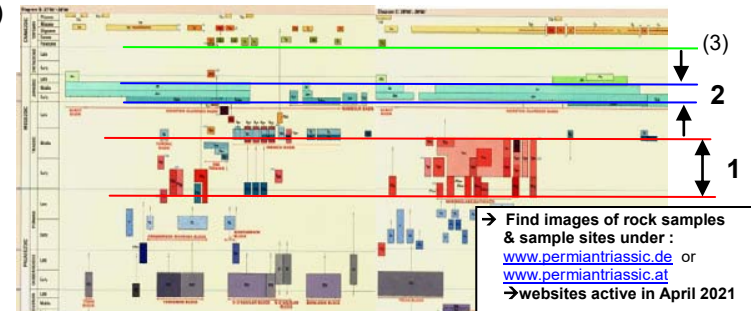


Note the circular crater structure of a large 300 km crater which is clearly visible now !



The geological map of the SE-coast of Queensland indicates two main chapters associated with the large impact event :

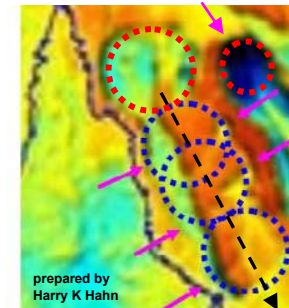
- 1.) Ejection of the red-colored rock types along the East Coast of QLD at ~253 Ma. → Crystallization of this "ejecta ranges" until ~ 225 Ma
- 2.) A gigantic flood event triggered by magma eruption 1, ~200 Ma ago and effecting the low-lying sedimentary areas until around 160 Ma
- (3.) Volcanic activity initiated at around 65 Ma and lasting until ~25 Ma → probably related to magma eruptions No.5 to 8 of Cape York Crater



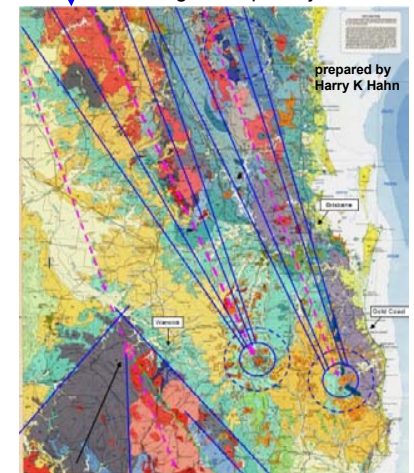
→ Find images of rock samples & sample sites under : www.permiantriasic.de or www.permiantriasic.at →websites active in April 2021

Map : -Moreton (Warwick) Geology-Geology Maps → type in : **WARWICK**

the lines on the geological map indicating the impact ejecta areas



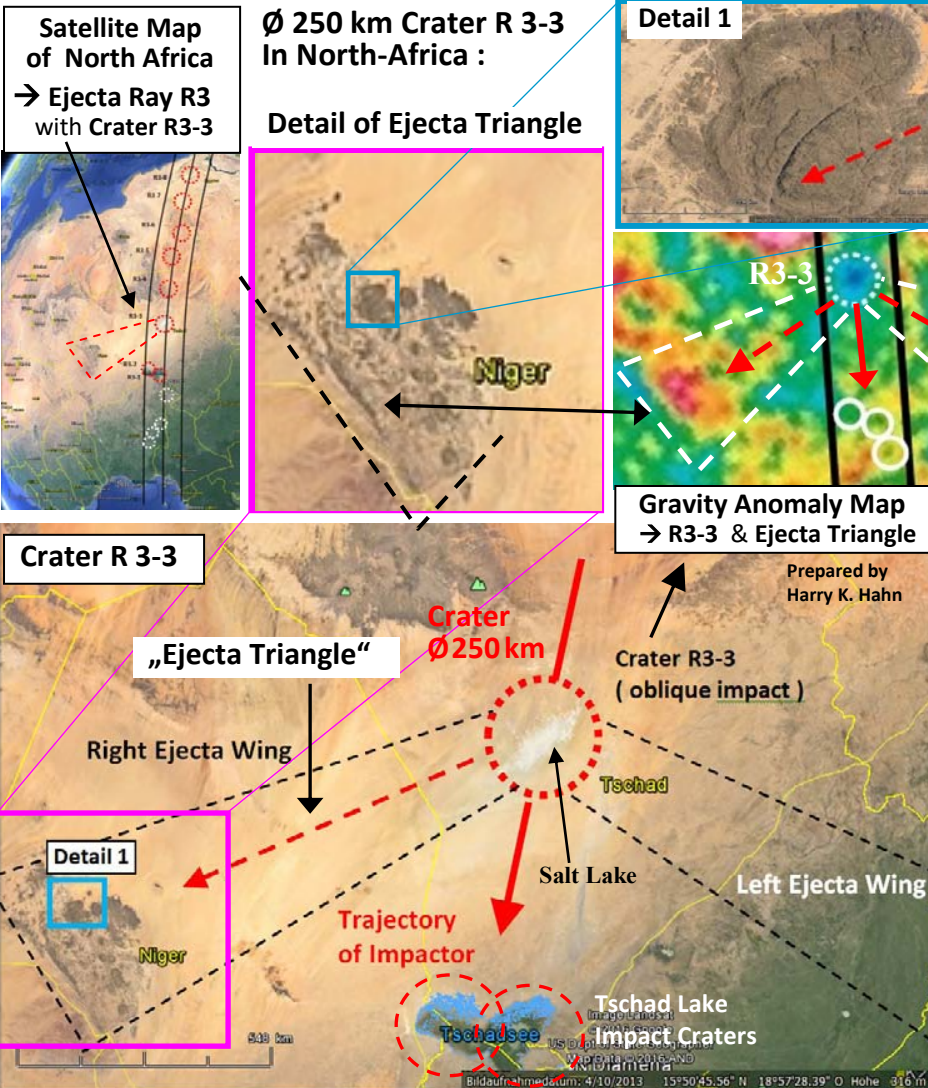
The bow-shaped border structures with a high gravity intensity could indicate that the impact event was indeed caused by a chain of impacts.



The Gulf of Carpentaria in the North of Australia was formed by Ejecta from a ≥ 300 km Crater of the Cape York Impact Event

I have found more evidence for a secondary Impact-Crater-Chain, caused by the PT – Impact, which has formed the North-East-outline of the Australian Continent. The New-Horizons space probe made an image of a crater on Pluto in 2015, which has formed a triangular ejecta-impact-structure very similar in shape as the **Gulf of Carpentaria in the North of Australia**. This is proof for another $\geq \varnothing 300$ km Crater that belongs to the already described Cape York Impact Event. A gravity anomaly map already provides evidence for at least two big craters which formed the NE-outline of Australia. The images shown here provide evidence for another Crater belonging to the same Impact Event! A similar triangular ejecta-impact-structures is visible near **Crater R3-3** from **Ejecta Ray R3** (Africa) and near the **Ajuy Crater** on Fuerteventura (Canary Islands) see **Page 29** of study.

A big $\approx \varnothing 250$ km Crater in Ejecta Ray R3 shows an „Ejecta Triangle“
The gravity anomaly map and the satellite images show a similar “Ejecta-Impact-structure” as on Pluto and in N-Australia, caused by the **Crater R3-3**

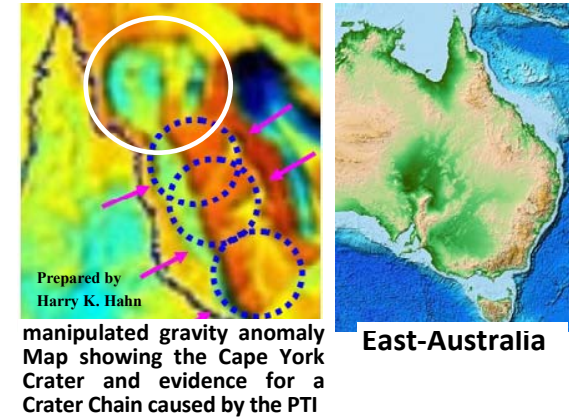
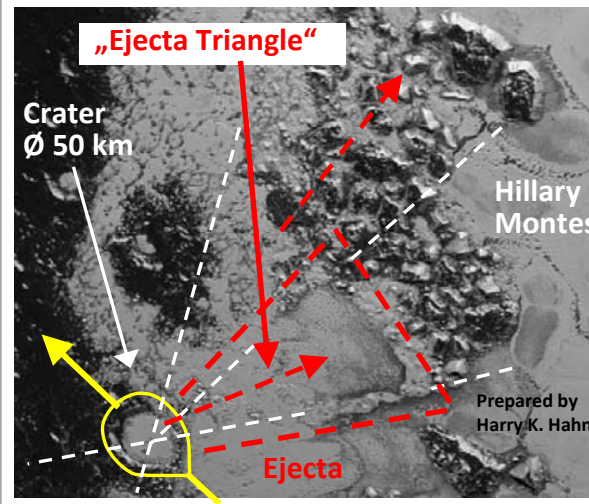
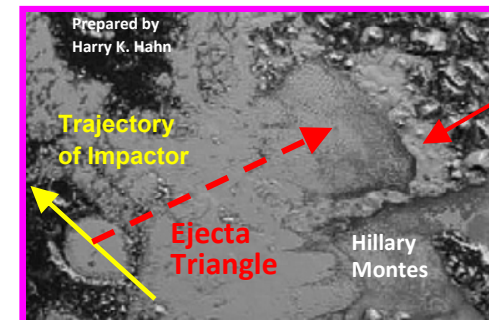


A $\varnothing 50$ km Crater on planet Pluto caused a large „Triangular Ejecta Impact Structure“

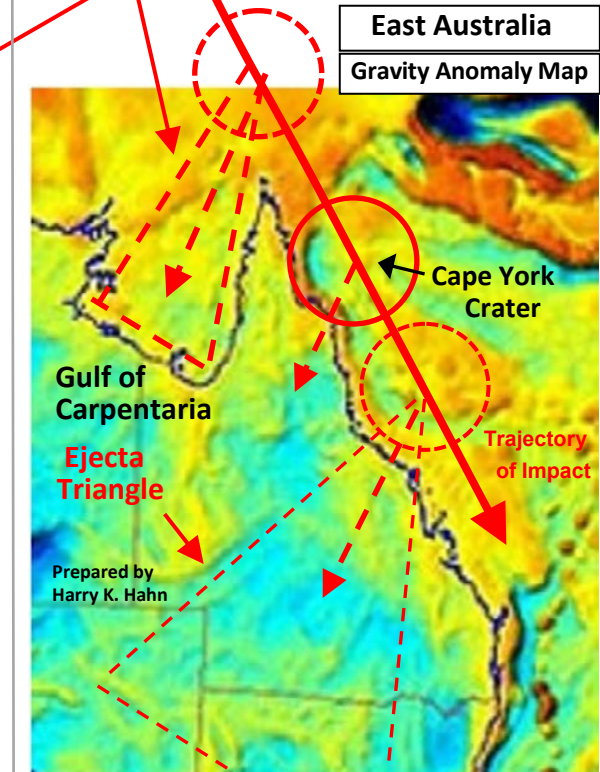
An oblique impact event on Pluto, less than 100 million years ago, formed Hillary Montes at the border line of Sputnik Planum.

An ejecta-lobe from this crater produced a precise triangular Ejecta Impact Structure !!
(\rightarrow see : [Pluto Images](#))

A $\varnothing 50$ km Crater on Pluto caused a Triangular Ejecta Impact Structure



„Ejecta Triangle“



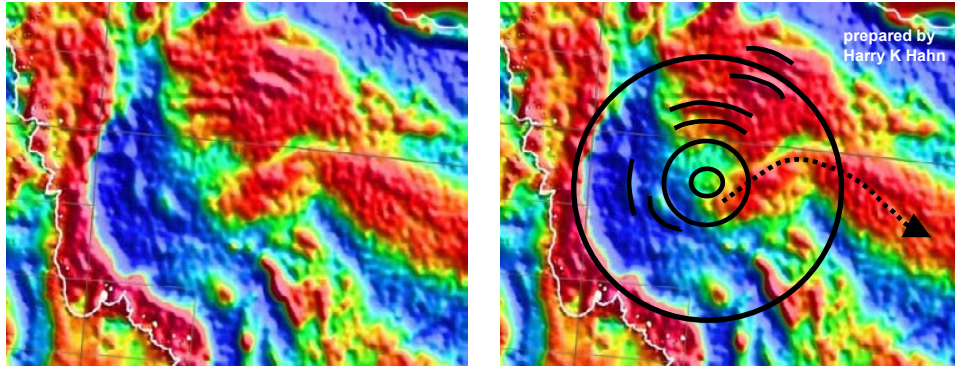
Cape York Crater \varnothing 320 km (NE-Queensland / Australia)

Detail view of the large Impact Crater near Cape York :

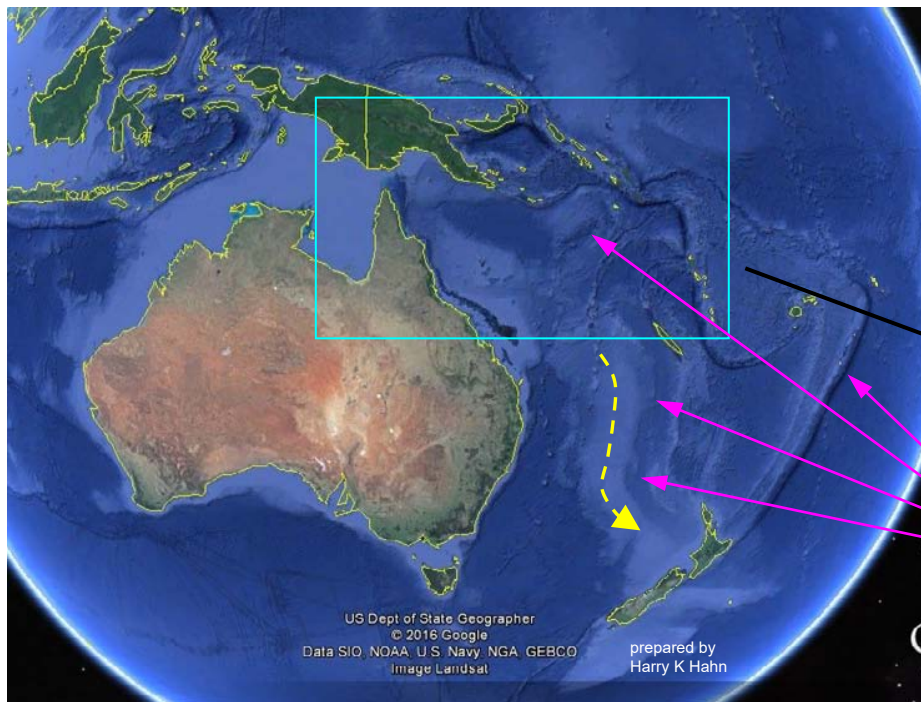
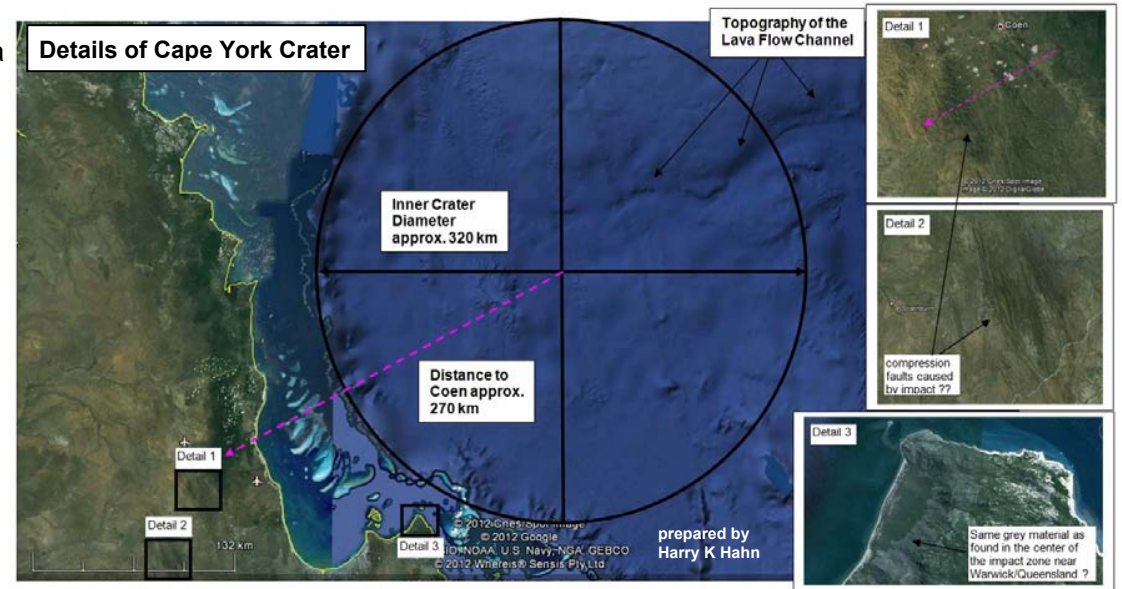
This crater which is clearly visible on different [gravity anomaly](#) maps of Australia initiated the break-off of New Guinea & New Zealand from the Australian Plate !

(And if there was a chain of craters, then this was probably the biggest one !)

Gravity Anomaly Map :



Cape York Crater on a Topographic Map : (→ Detail from the image below

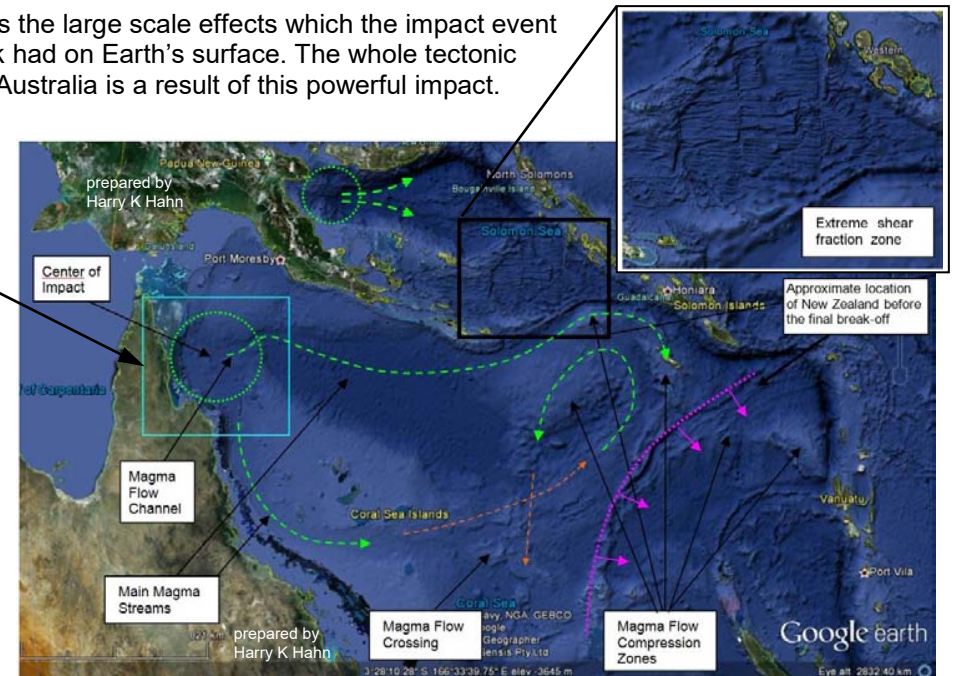


Detail of Magma Flow Traces visible on a topographic map :

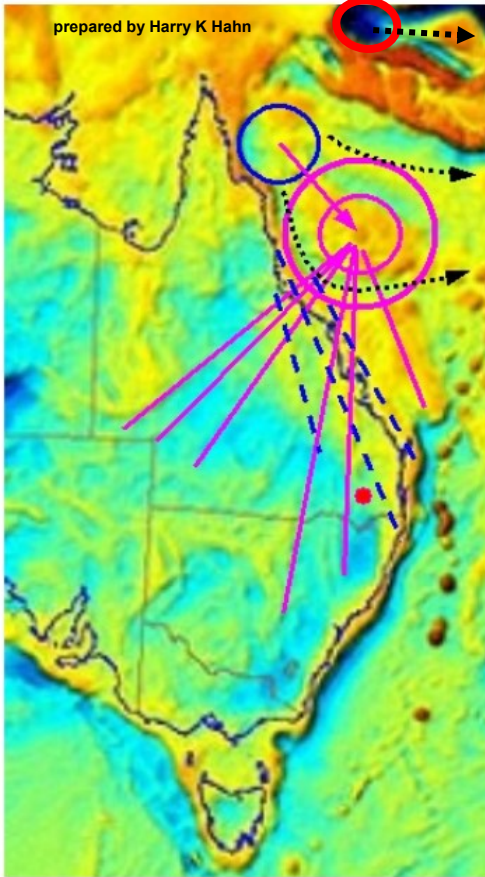
This map shows the large scale effects which the impact event near Cape York had on Earth's surface. The whole tectonic activity east of Australia is a result of this powerful impact.

Details of Crater see above

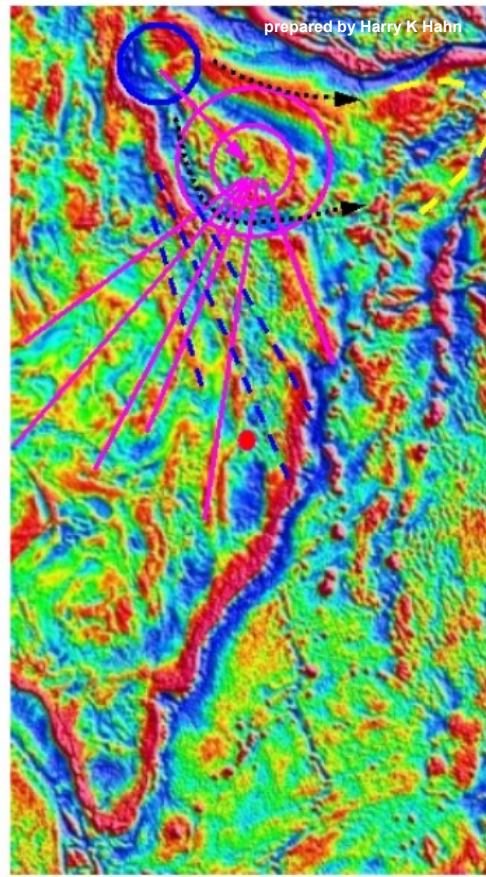
large scale magma flow traces



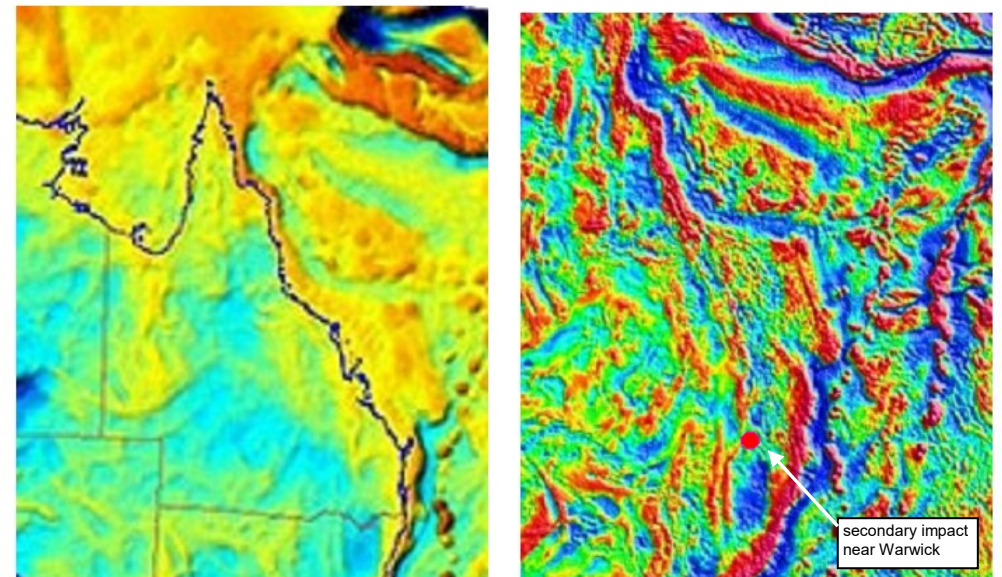
Gravity Anomaly Map 1



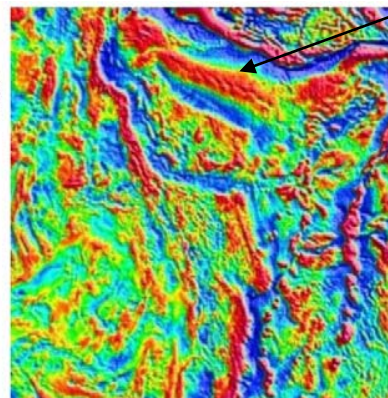
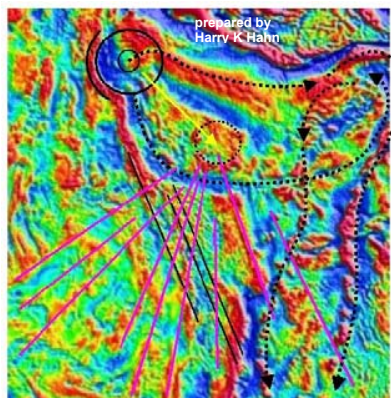
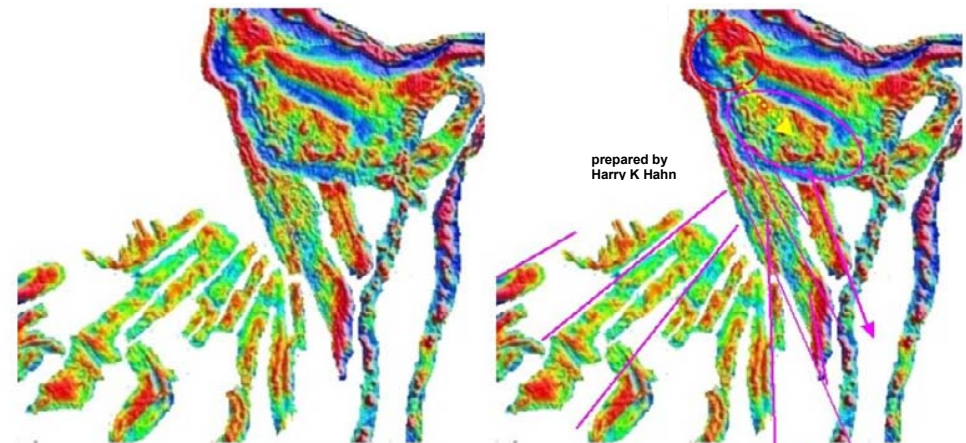
Gravity Anomaly Map 2



Maps without markings (for comparison) :



Main structures of the large Impact Event near Cape York / in NE-Australia



Note the traces of a massive & powerful magma flow, which came from the center of the crater.

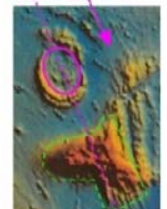
→ for comparison of the orientation also the small elliptical structure in SE-Queensland is shown (approx. 50 times enlarged !)

→ secondary impact near Warwick

→ see also the Chapters describing the Warwick Impact & Mt Warning Impact

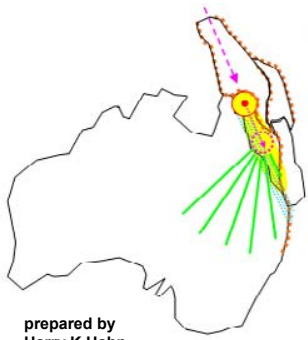


The two pink colored arrows shown in the smaller rectangular image indicate the interdependence between the assumed large impact in the North of Queensland and the assumed smaller elliptical Impact Structure in South-East Queensland. The main impact direction of the smaller elliptical structure is identical to the direction of the thin ray structure of the larger impact structure.



Impact Chronology of Cape York Impact

1



prepared by Harry K Hahn

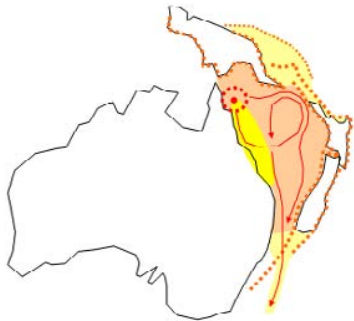
- yellow – main ejecta area ;
- green – ejecta rays
- orange – magma flow areas
- (dark orange → thicker or more compressed magma flows, light orange → thinner or less compressed magma flows)

→ Find further information and images of rock samples & sample sites under : www.permiantriassic.de or www.permiantriassic.at (→ websites should be active in April 2021)

2

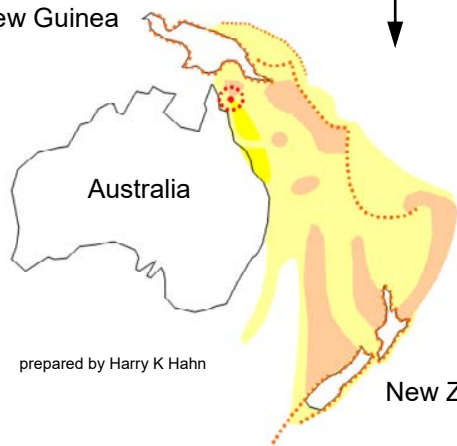


3



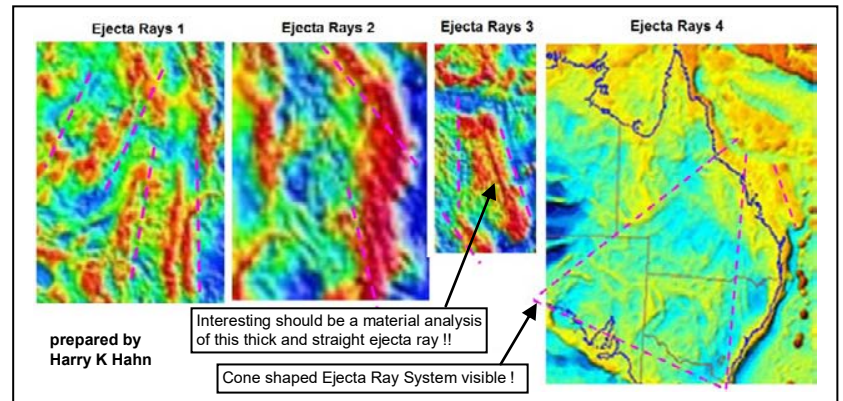
New Guinea

4



prepared by Harry K Hahn

New Zealand

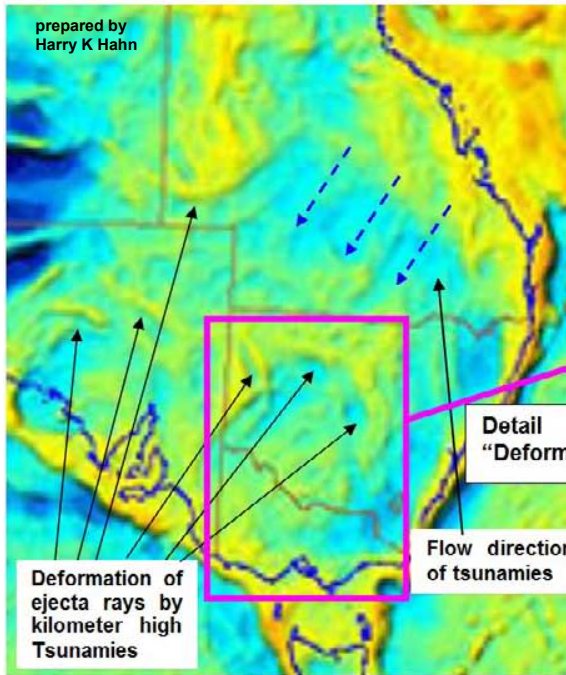


prepared by Harry K Hahn

Interesting should be a material analysis of this thick and straight ejecta ray !!

Cone shaped Ejecta Ray System visible !

Possible Deformation of Ejecta Rays by Tsunami Waves → probably caused by the collapse of a magma enclosure

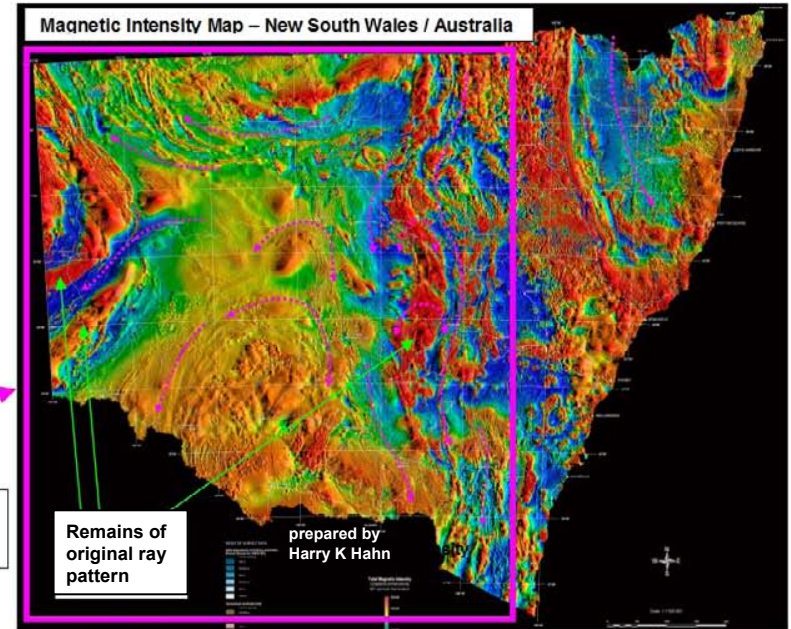


prepared by Harry K Hahn

Deformation of ejecta rays by kilometer high Tsunamies

Detail "Deformed Ejecta Rays"

Flow direction of tsunamies



Magnetic Intensity Map – New South Wales / Australia

Remains of original ray pattern

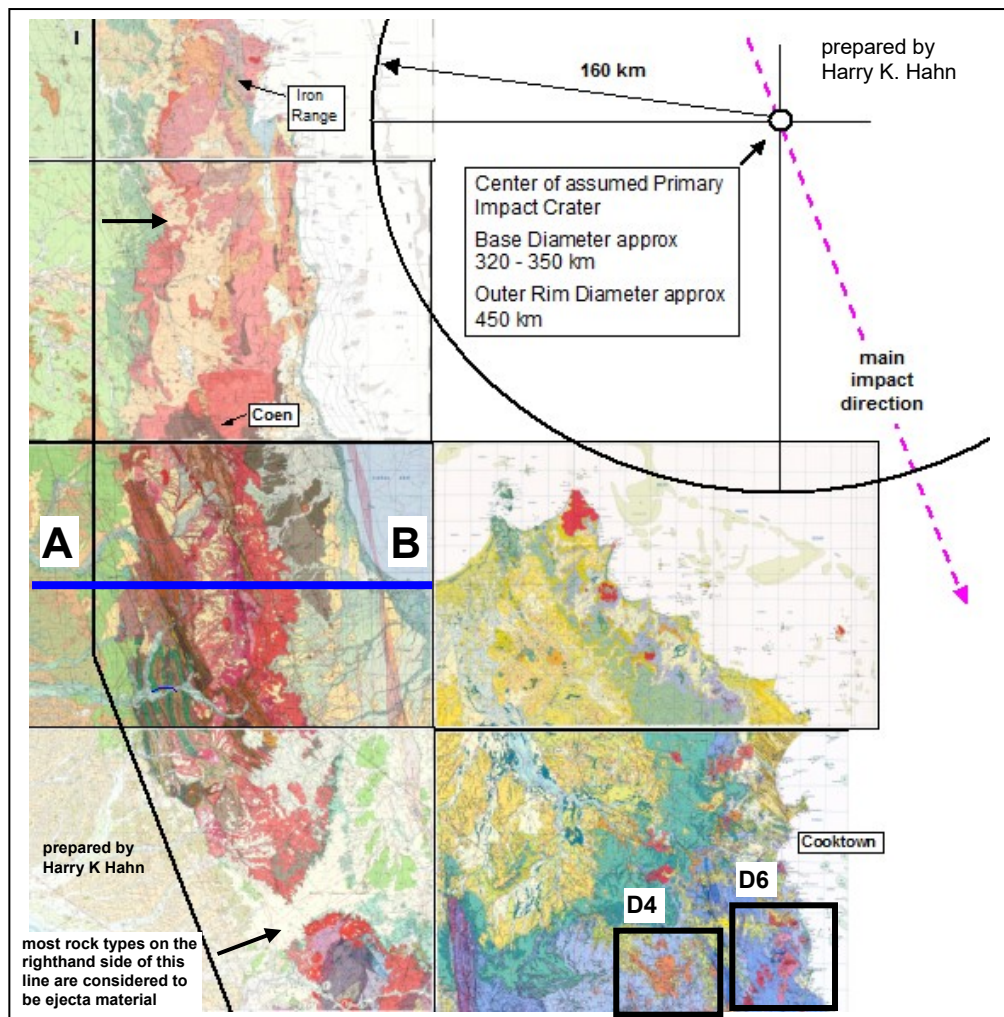
prepared by Harry K Hahn

The Magnetic Intensity Map of New South Wales clearly shows that the surface of the whole state was altered by one gigantic flood event. The distribution of all magnetic material, which probably came from the same Impact Event, and which originally had a precise ray-like distribution pattern, was defined by this flood event.

It seems that directly after the impact, ejecta rays were thrown out of the impact crater in the main ejecta area in precise straight lines. Then in Phase 3 of the assumed Impact Chronology, when the crust fragments (now called New Zealand) broke free and the enclosed "magma ocean" spread out quickly over the "Pacific Plate", gigantic amounts of ocean water flew back into the collapsed "magma enclosure" because its floor was at a lower level than the sea level of the Pacific ocean

This probably caused gigantic Tsunamies which flew in the indicated direction over the Australian Continent (see above). These Tsunamies probably reached heights of several hundred meters and they were strong enough to deform (bend) the thrown-out ejecta rays (→ which didn't have a rigid connection to the bed rock), as visible in the above shown maps.

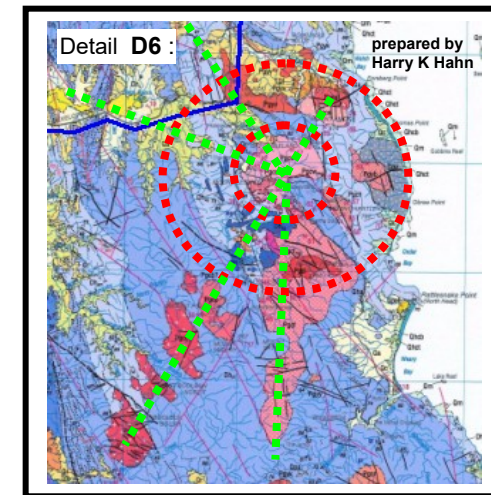
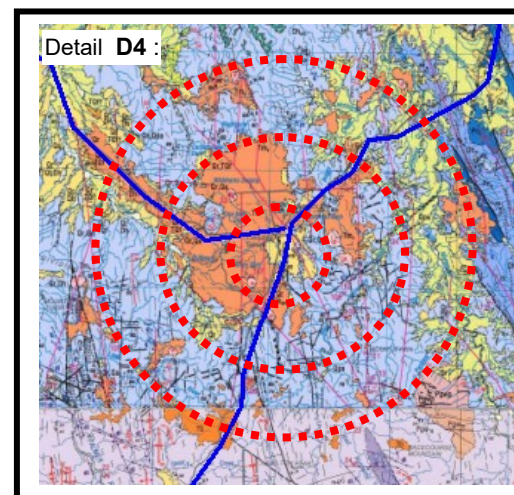
Geological map showing the position of the Cape York Crater and part of the Cape York Peninsula & Cooktown area



The map on the left is a map-combination of 6 geological maps, which shows the area south & west of the Cape York Impact Crater

Weblink to the geological Maps : → [Geological Maps](#)

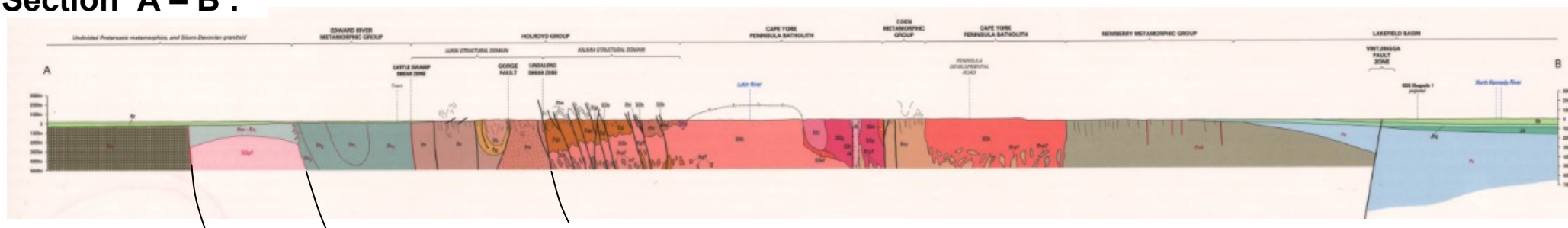
Note the indicated ejecta-like distribution-pattern of different rock types in **Details D4 & D6** (→ patterns indicate secondary impact structures !)



Section A – B going through the assumed impact-affected area, indicates that an extremely large impact event has taken place.

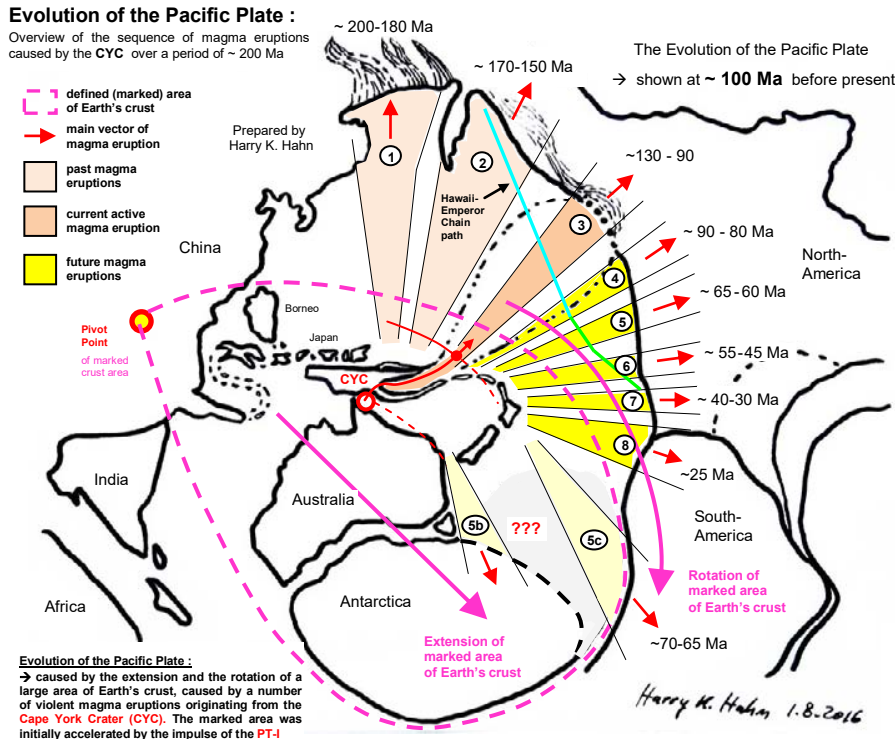
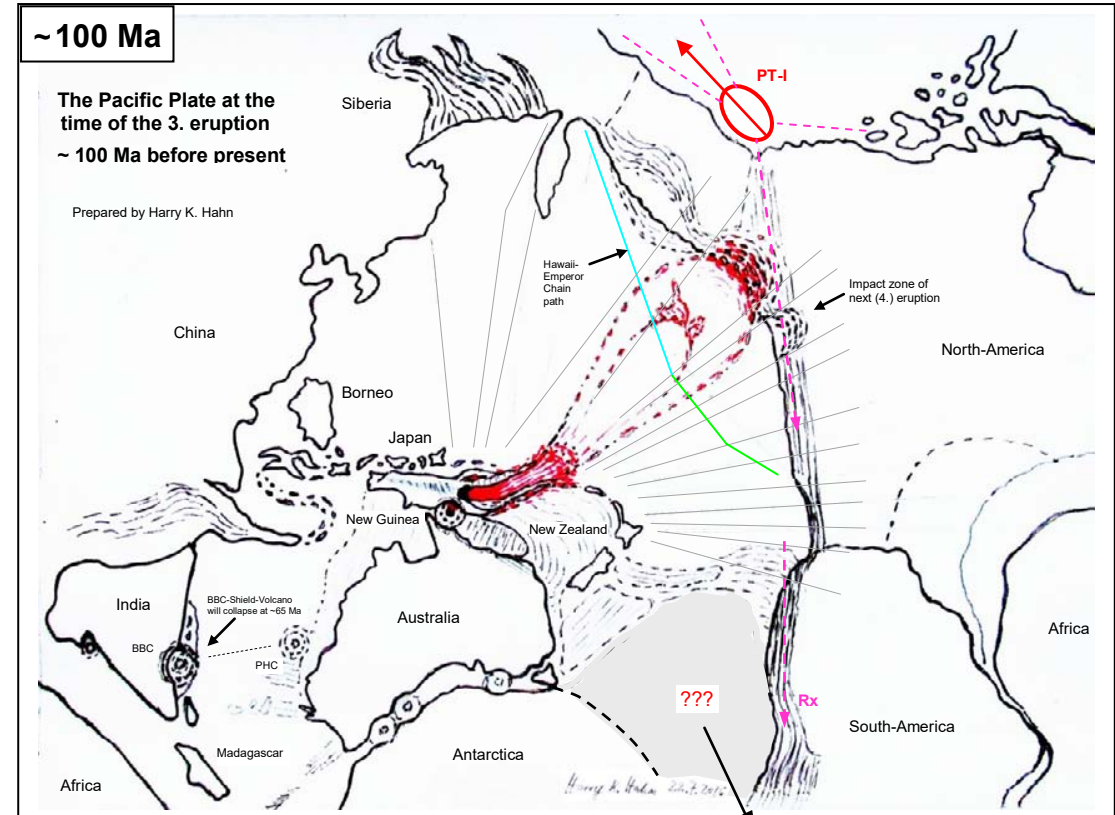
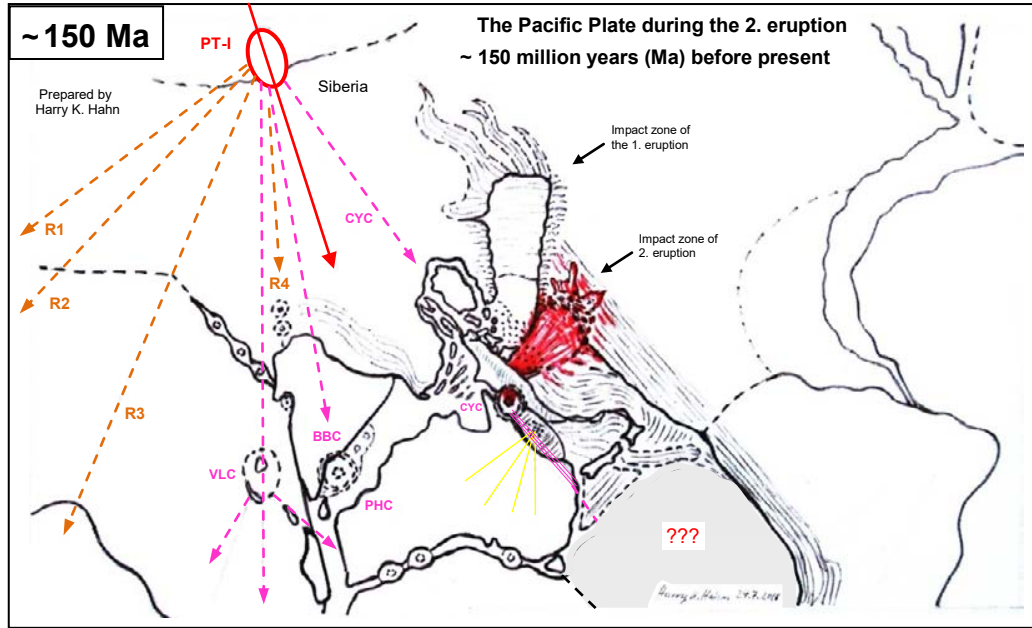


Section A – B :



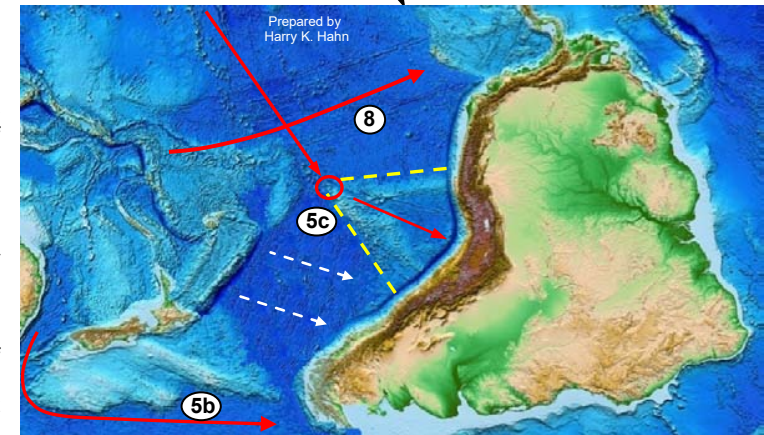
The evolution of the Pacific Plate & Pacific Ocean, in the aftermath of the PT-Impact Event, caused partly by the Cape York Crater :

The Impact impulse of the **PT-Impact Event** caused an acceleration of Australia & Antarctica towards SE. Together with many fractures in Earth's crust, caused by very large secondary impacts (e.g. by BBC, CYC & VLC), and together with powerful temporary magma eruptions of the Cape York Crater, the dynamic process of this evolution began.



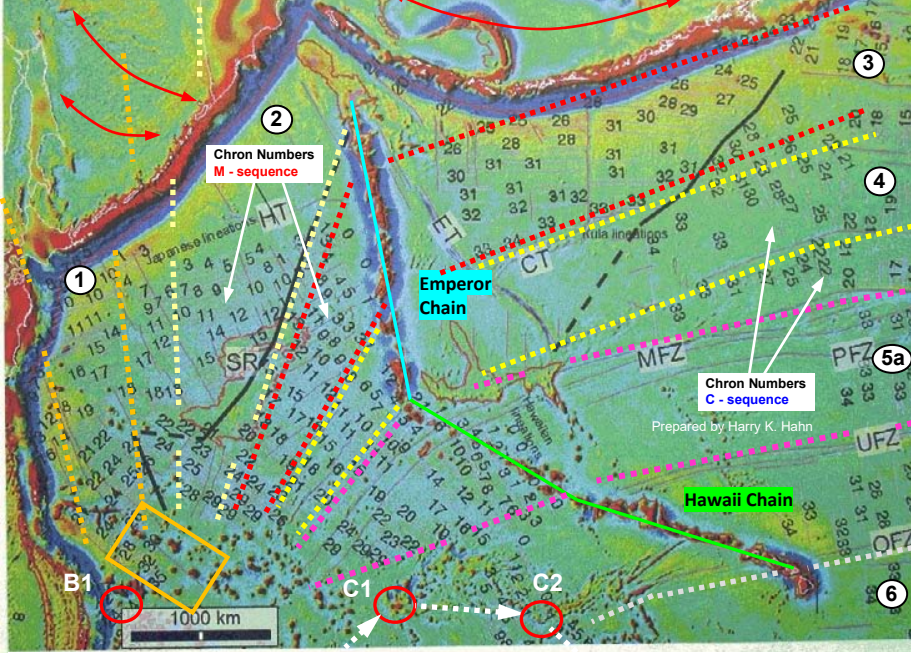
To the Evolution of the Pacific Plate

The Pacific Plate (→ new ocean floor !) was caused by an **Expansion Tectonics** process. This expansion tectonics process was triggered by the Permian-Triassic Impact Event (PT-I), and by a number of very large magma eruptions coming from a big secondary crater, caused by the PT-I event. This impact crater is the Cape York Crater (CYC) located just east of the Cape York Peninsula in the NE of Australia. This 300-350 km diameter crater must have been caused by a particular large and dense secondary impactor, because it penetrated deep into Earth's mantle and formed a channel which connected to the Pacific-LLSVP (caused by ejecta of the PT-I), which produced at least 8 but maybe up to 10 extremely large magma eruptions over the last 200 Ma, which initially erupted in a north- and north-eastward direction, and later mainly in an eastward direction. The Impact Impulse of the PT-I together with the described magma eruptions of the CYC caused the expansion and rotation of a large area of Earth's crust (→ Australia, Antarctica, New-Guinea, Indonesia, Japan etc.). The eruption which happened around 65-60 Ma ago (→ which may have been triggered by the **Chicxulub Impact**) was a particular violent eruption. This eruption seems to have initiated the final separation of Asia, Australia, Antarctica & South-America. The expansion tectonics process accelerated fast at this time, which was caused by a faster expanding Earth-Mantle.



Key-Maps for the further analysis of the Pacific Plate :

Gravity Anomaly Map



Free air gravity map of northern Pacific (Sandwell 2005). Identified magnetic lineations in the north Pacific, labeled with Chron-Numbers. The heavy black lines track triple junctions, dashed where inferred. The Japanese and Hawaiian lineations of the M-Sequence are of the Molokai fracture zone mostly west of Hawaii-Emperor chain; they are numbered with the M-prefix. Thin magenta lines represent fracture zones: HT-Hokkaido Trough; SR-Shatsky Ridge; ET-Emperor Trough; CT-Chinook Trough; MFZ-Mendocino fracture zone; PFZ-Pioneer fracture zone; UFZ-Murray fracture zone; OFZ-Oregon fracture zone.

The Gravity Anomaly Map above, shows the NW-Pacific Plate with Chron Numbers of magnetic lineations (→ see Table !).

The paths of different Magma Eruption Fronts (No. 1 - 8) from the Cape York Crater (CYC), over a period of ~200 Ma (≥ 8 eruptions), are indicated by different colored lines on the shown maps.

The lines indicate the approximate paths (directions) of the different magma fronts relative to their source areas, and relative to their final locations on the continental plates (→ final locations = collision zones with the continental plate, starting points = CYC magma chamber at time of event)

Between the different magma eruptions of the CYC there were quiet time periods (breaks) of ~ 20 to 50 Ma. Each of these magma eruptions left distinct marks = evidence (→ LIP'S, volcanic areas, cracks etc.) on the Pacific Plate. See further explanations on the following pages !

See Study :

Origin of the Pacific Jurassic quiet zone :

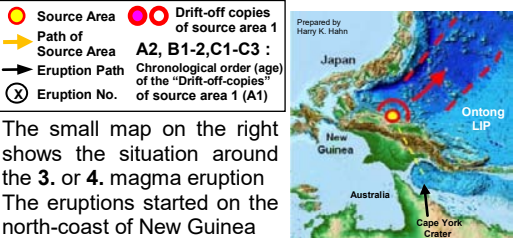
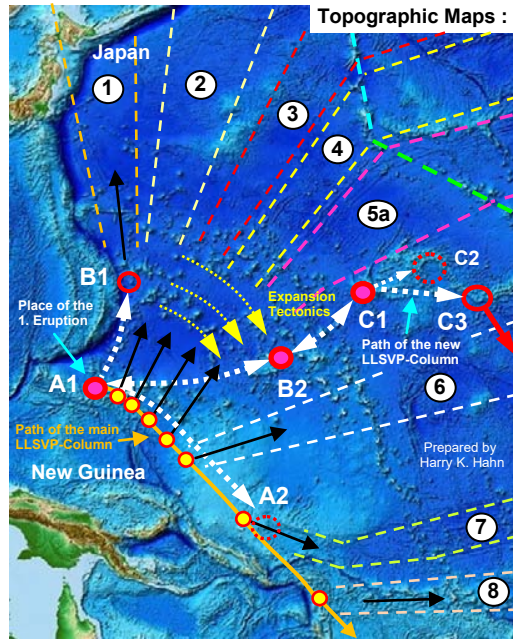
Magnetic Lineations M 35 - M 44



Chron Numbers of Magnetic Lineations in North-Pacific

West of Hawaii-Emperor Chain		East of Hawaii-Emperor Chain	
M-sequence	Age (Ma)	C-sequence	Age (Ma)
M 0	118	C 4	20
M 1	122	C 6	23
M 3	125	C 8	27
M 5	128	C 10	30
M 10	130	C 12	33
M 14	138	C 14	36
M 16	142	C 16	39
M 18	145	C 18	42
M 20	147	C 20	46
M 22	150	C 22	52
M 25	155	C 24	56
M 29	158	C 26	61
M 33	160	C 28	66
M 35	163	C 31	70
M 38	165	C 32	72
M 44	170	C 33-C34	74-84

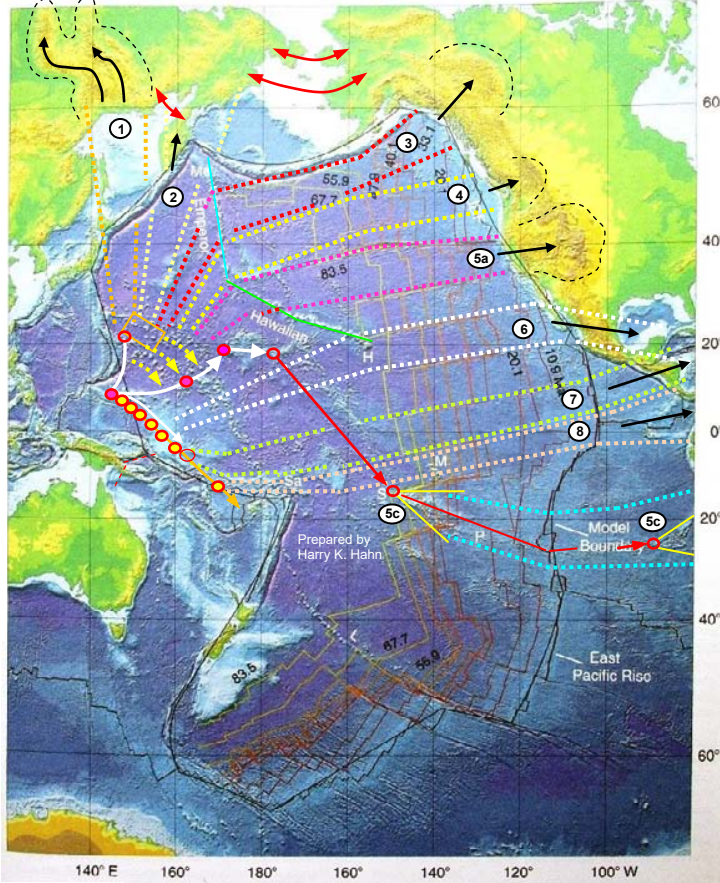
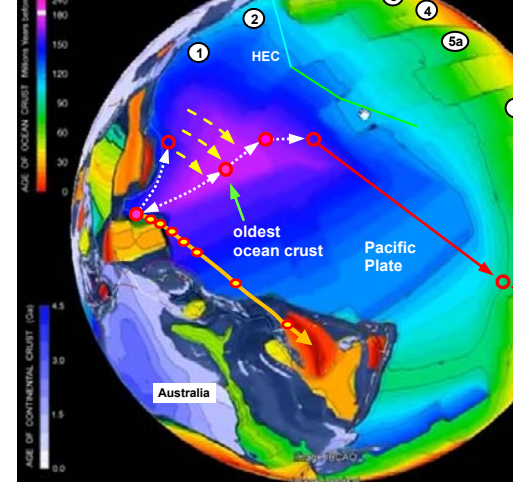
Topographic Maps :



The small map on the right shows the situation around the 3. or 4. magma eruption. The eruptions started on the north-coast of New Guinea.

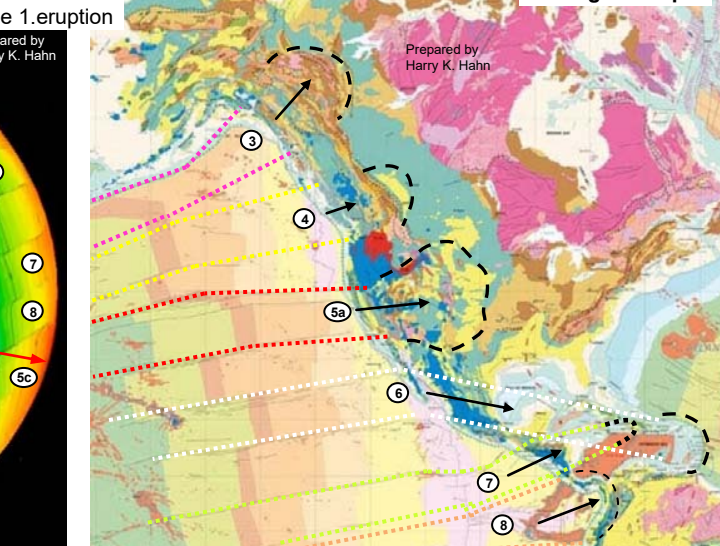
The larger map above shows the path of the source of the magma eruptions (yellow dots on orange arrow). Today it is located near the Fiji-islands. The source, a LLSVP resulting from the PTI- & CYC-Impact, has formed another LLSVP-column (B2) after the 1. eruption.

Ocean Crust Age Map :



The maps on the right show the paths of all magma eruptions

Geological Map :



The evolution of the Pacific Plate a short time after the fifth magma eruption coming from the Cape York Crater :

The following drawing shows the Pacific Plate at around 65 Million Years ago during the fifth magma eruption of the Cape York Crater.

This sketchy drawing isn't precisely to scale. But it is illustrating this violent magma eruption for the first time !

And so it gives some insight in this distant event which is important for the understanding of the evolution of the Pacific Plate.

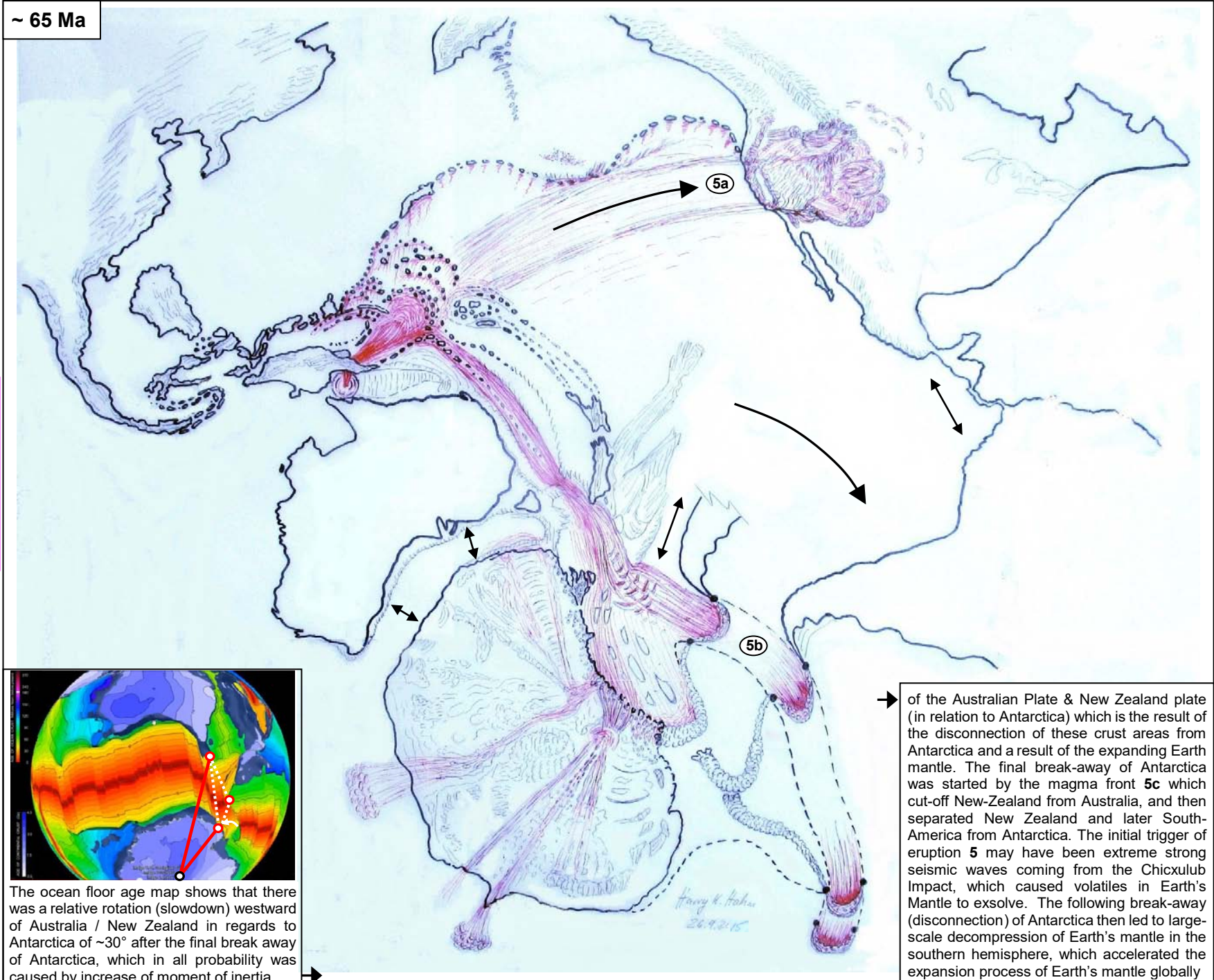
It also shows how Antarctica was involved in the event

The trigger for this violent magma eruption may have been the **Chicxulub Impact 65 Ma ago** which caused extreme earthquakes with values **>12 RS**. This magma eruption surely contributed to the extinction of the dinosaurs

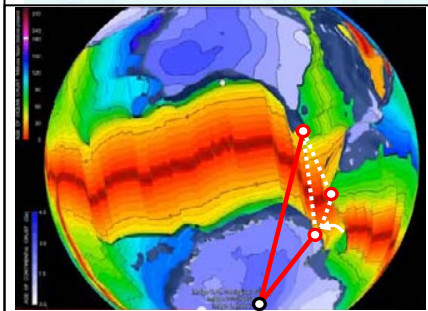
Beside the main magma front **5a** this eruption caused another magma front **5b** which moved south towards Antarctica, where it triggered the final breaking away of Australia/NZ & South-America from the continent Antarctica

It probably caused (indirectly) another large "secondary eruption" **5c** near French Polynesia (not shown).

The eruption **No. 5** at first has triggered the final break away of Australia / New Zealand & South-America (& Africa) from Antarctica, which then led to a faster expanding Earth Mantle



~ 65 Ma



The ocean floor age map shows that there was a relative rotation (slowdown) westward of Australia / New Zealand in regards to Antarctica of ~30° after the final break away of Antarctica, which in all probability was caused by increase of moment of inertia

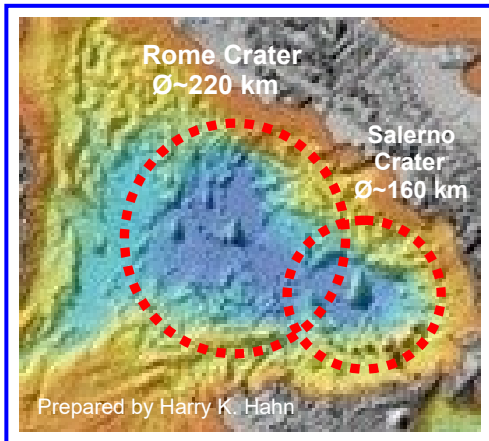
→ of the Australian Plate & New Zealand plate (in relation to Antarctica) which is the result of the disconnection of these crust areas from Antarctica and a result of the expanding Earth mantle. The final break-away of Antarctica was started by the magma front **5c** which cut-off New-Zealand from Australia, and then separated New Zealand and later South-America from Antarctica. The initial trigger of eruption **5** may have been extreme strong seismic waves coming from the Chicxulub Impact, which caused volatiles in Earth's Mantle to exsolve. The following break-away (disconnection) of Antarctica then led to large-scale decompression of Earth's mantle in the southern hemisphere, which accelerated the expansion process of Earth's mantle globally

Europe was formed by ejecta of the **Permian-Triassic - Impact**, which impacted in the Mediterranean-area ~253 Ma ago

The following maps and information shall provide first evidence of the impact scenario which took place in the Mediterranean-area at the P/T-boundary. The shown maps describe the whole impact-related process which formed **Europe** over the last 253 Ma.

The hard evidence for the impact hypothesis are two Impact Craters in **Italy**, which are already noticeable as such on the Tectonic Map of Europe. The estimated diameter of the two craters is ~ 220 km for the western crater (**Rome Crater**) and ~ 160 km for the eastern crater (**Salerno Crater**). → See the following explanation below :

Tectonic Map showing the two impact craters

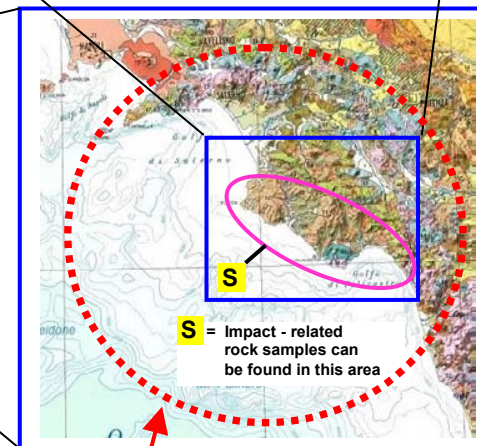
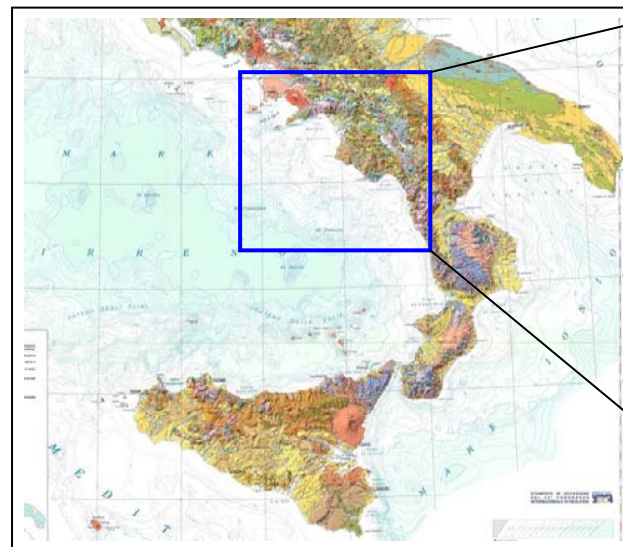
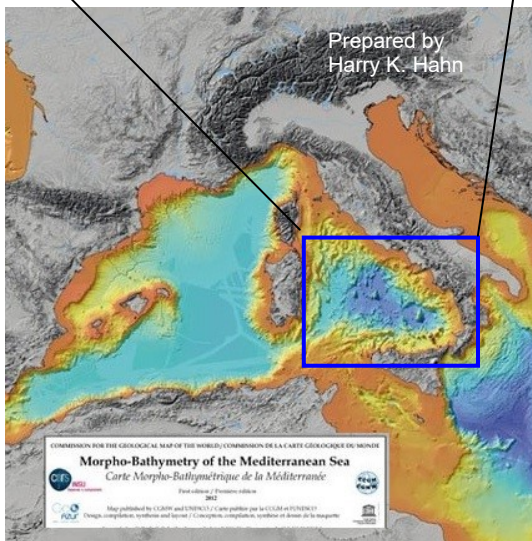


Some first rock samples which were collected close to the assumed impact center of the smaller 160 km crater provide further indication for an impact event !

Especially the samples collected on the sample sites 14 & 16 to 22 show various types of breccia, probably all impact breccia, partly with mineral glass inclusions (diaplectic glass). Sample site 21-B near Ascea shows breccia which contains mineral glass. This may be the hard evidence to confirm the described impact-crater and the impact-hypothesis !

The **geological map of Italy** is also providing first indication of a ring structure in the south-western part of Italy

The rock formations on sample site 21-B near Ascea close to the center of the Ø 160 km Salerno Crater show breccia which contains mineral glass (diaplectic glass)



Salerno Crater
estimated crater diameter approx. Ø 160-170 km.



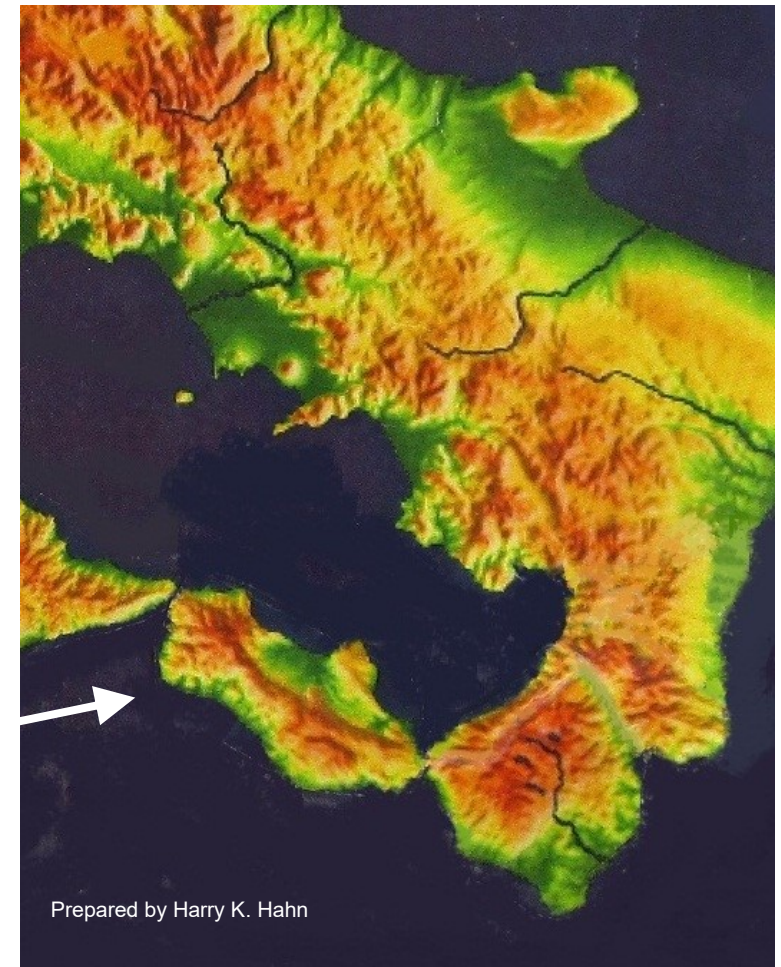
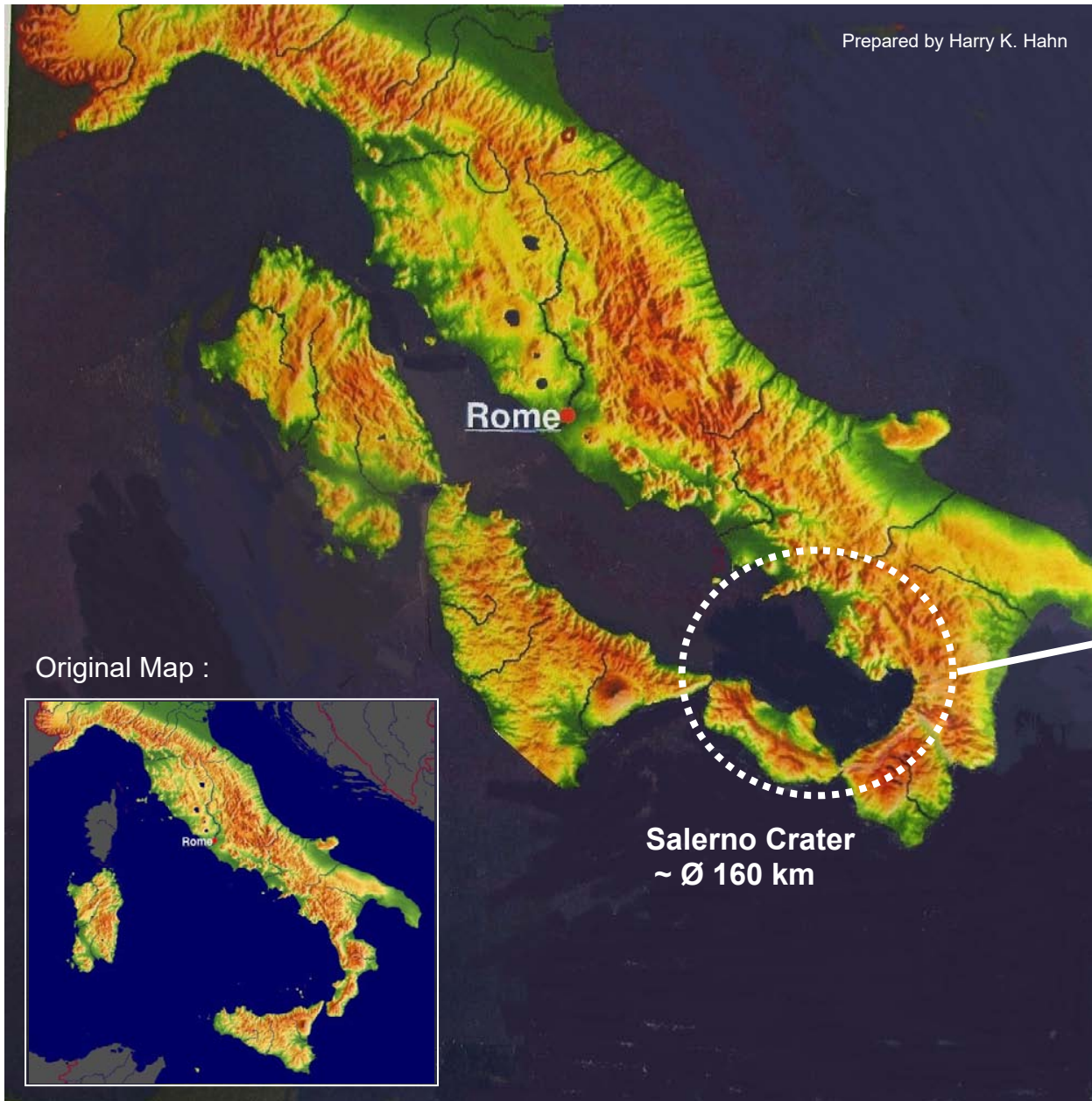
Breccia from sample site 21-B

→ Find images of all rock samples & sample sites on the websites : www.permiantriassic.at or www.permiantriassic.de

Note: These websites should be activated in April 2021

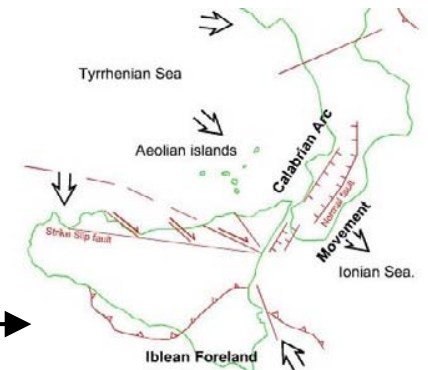
The topographic map of Italy also provides evidence for the two described impact craters

By re-arranging the different crust fragments which form Italy today, the original impact scene comes to light :



The manipulation of a topographic map of Italy and a re-arrangement of the crust fragments of Italy brings to light the original Impact Crater !

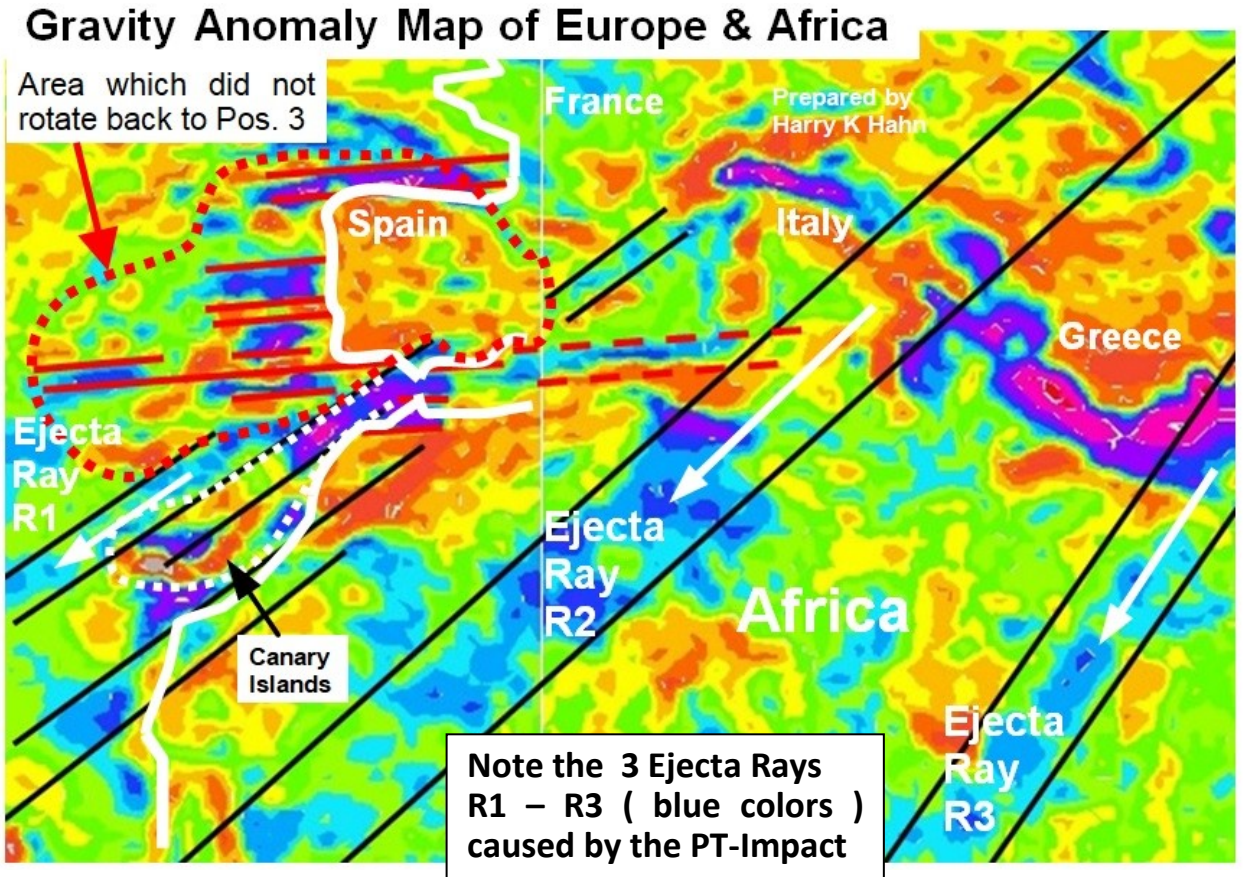
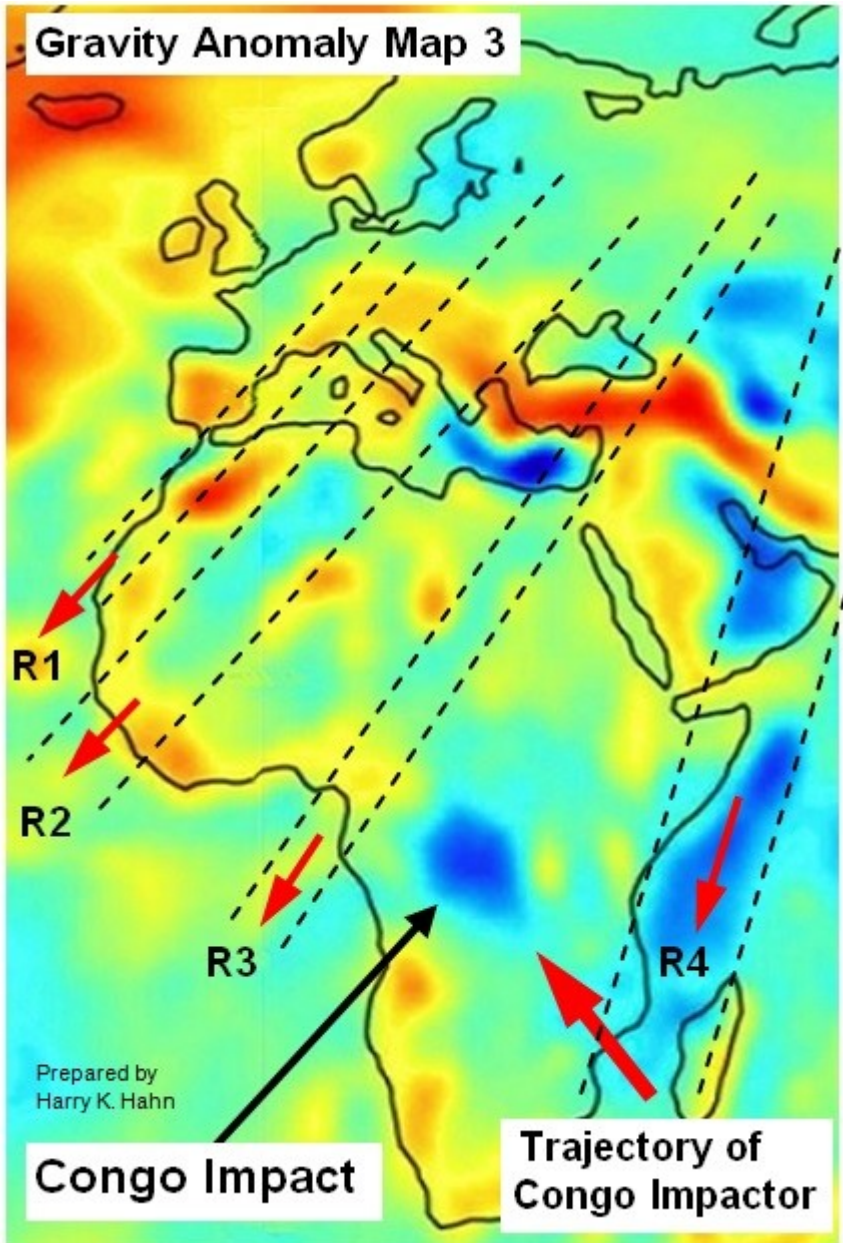
The tectonic situation near Sicily :



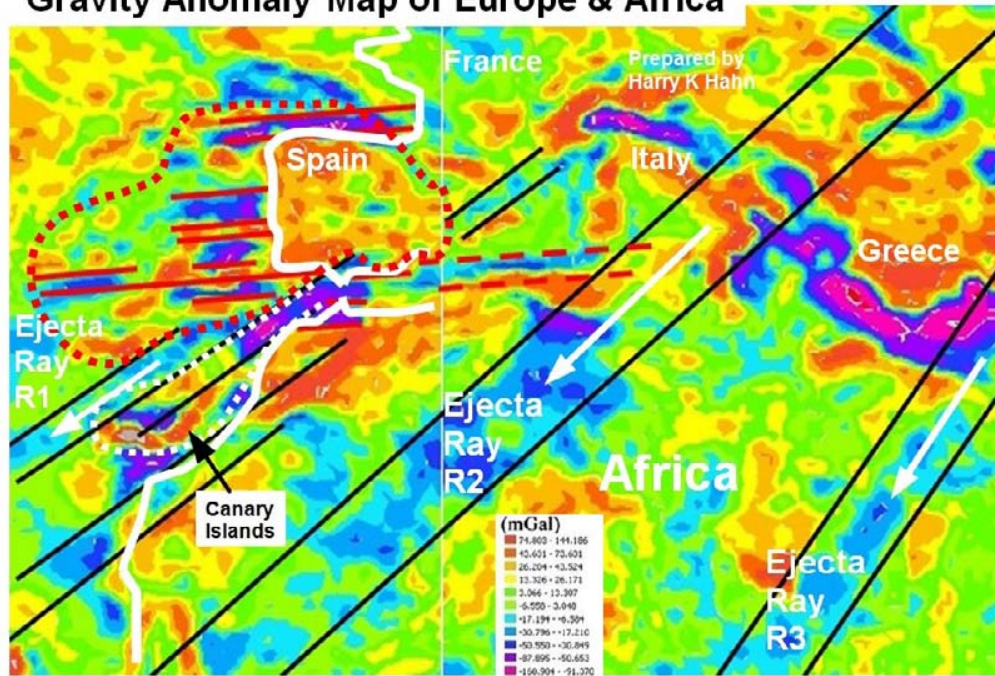
Gravity Anomaly Maps of Europe & Africa indicate Ejecta Rays from the PT-Impact Event

→ blue and green areas are negative anomalies → red and orange areas are positive anomalies

There are sets of linear structures (negative anomalies) visible which represent ejecta ray structures from the P/T-Impact

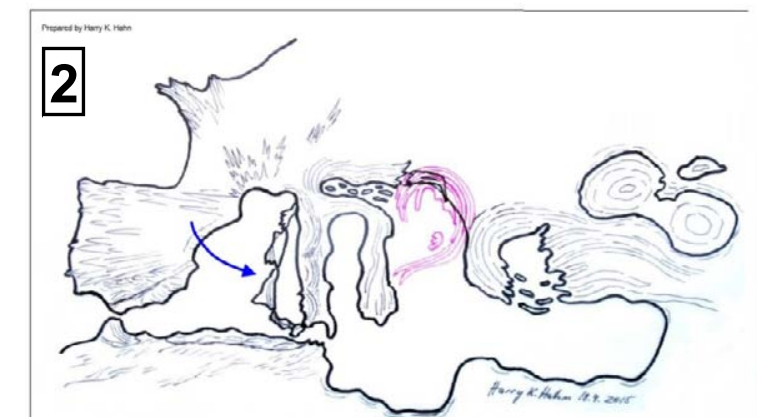
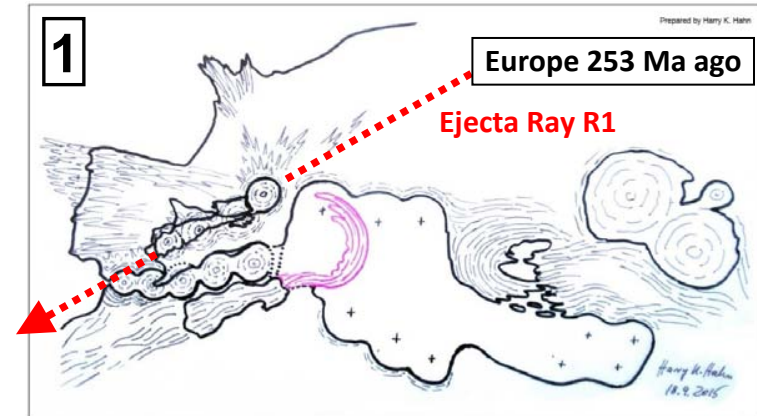


Gravity Anomaly Map of Europe & Africa



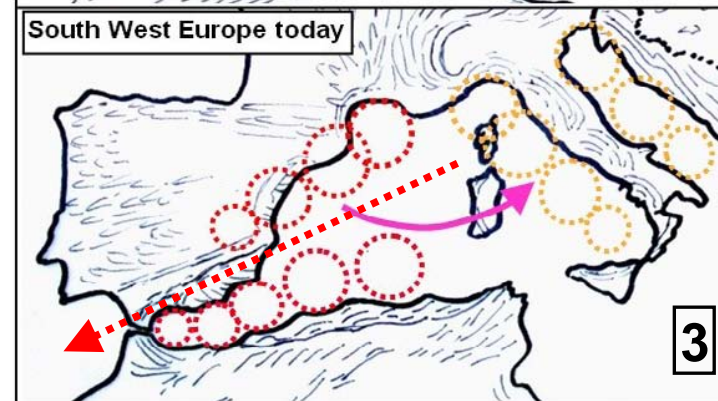
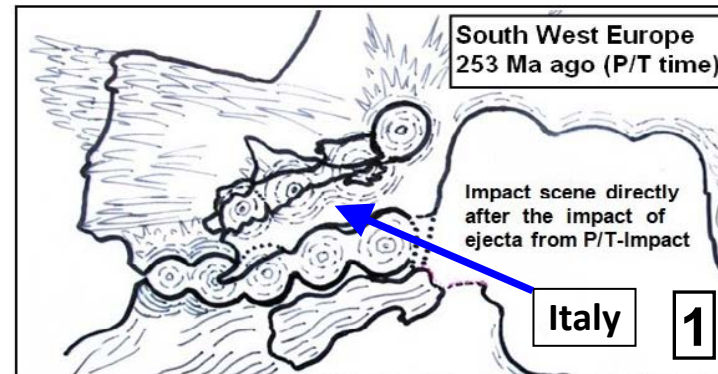
Tectonic Evolution of Europe after the P/T-Impact

→ the linear blue areas on the gravity anomaly map (on the left) indicate the impact crater chains caused by the P/T-Ejecta



Tectonic evolution of Europe after the impact of the P/T-Ejecta Ray R1 :

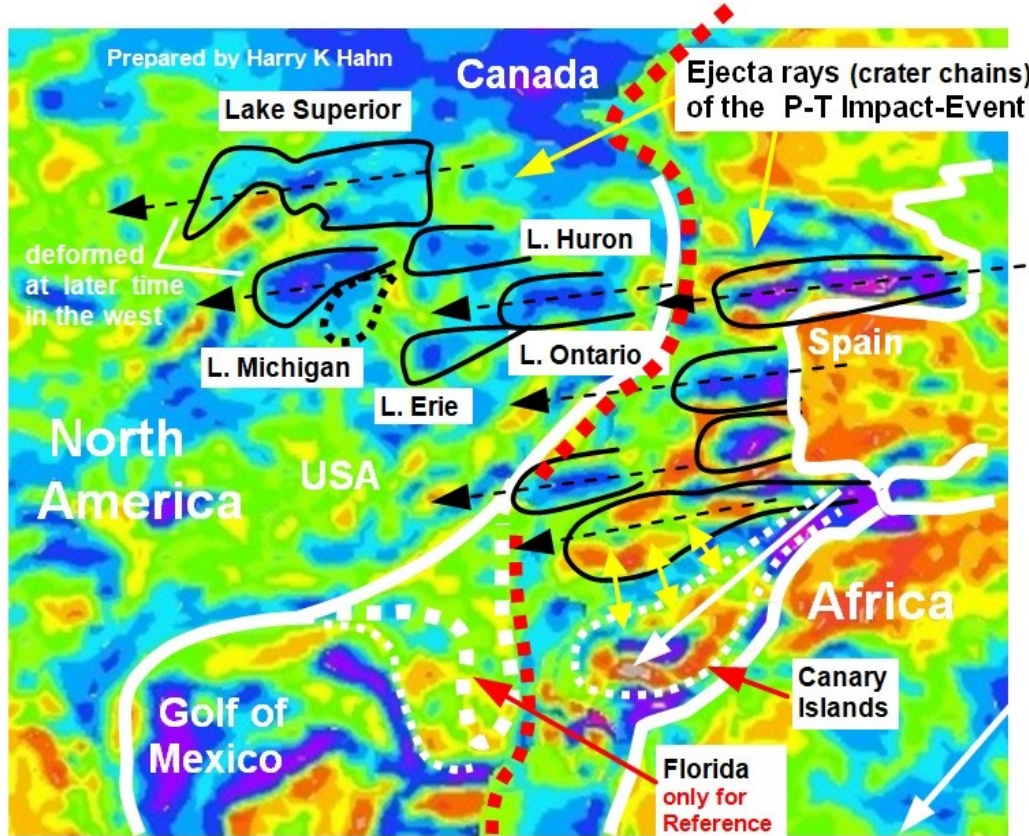
The drawings No. 1 to 3 show were ejecta material (thrown out of the P/T Impact Crater) impacted in Europe ~253 million years ago. This ejecta material (impactors with \varnothing 10-20 km) formed chains of secondary craters with \varnothing 150-200 km. These craters formed the original ocean basins.



Linear gravity anomalies in Europe, North-Africa & -America indicate PTI-ejecta-ray structures

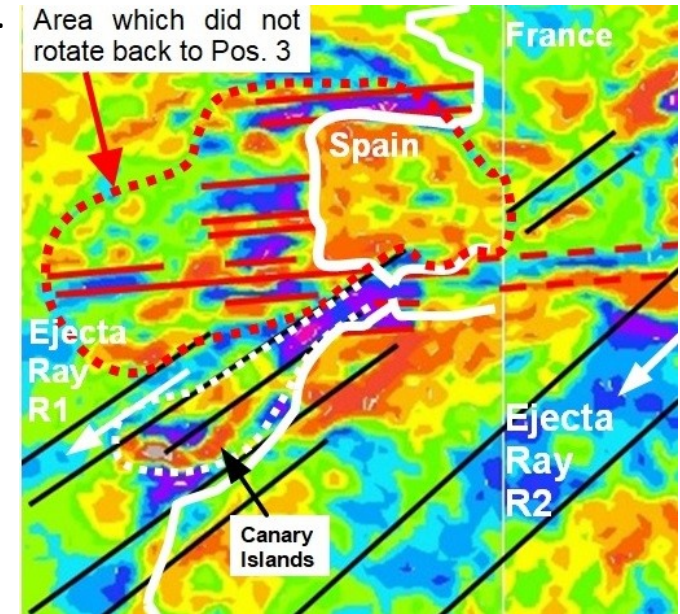
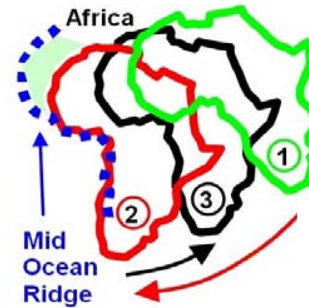
→ the Great Lakes in USA are probably also a result of impacting ejecta from the PTI.

Gravity Anomaly Map showing Europe & North-America (with Great Lakes marked) ~200 Ma ago

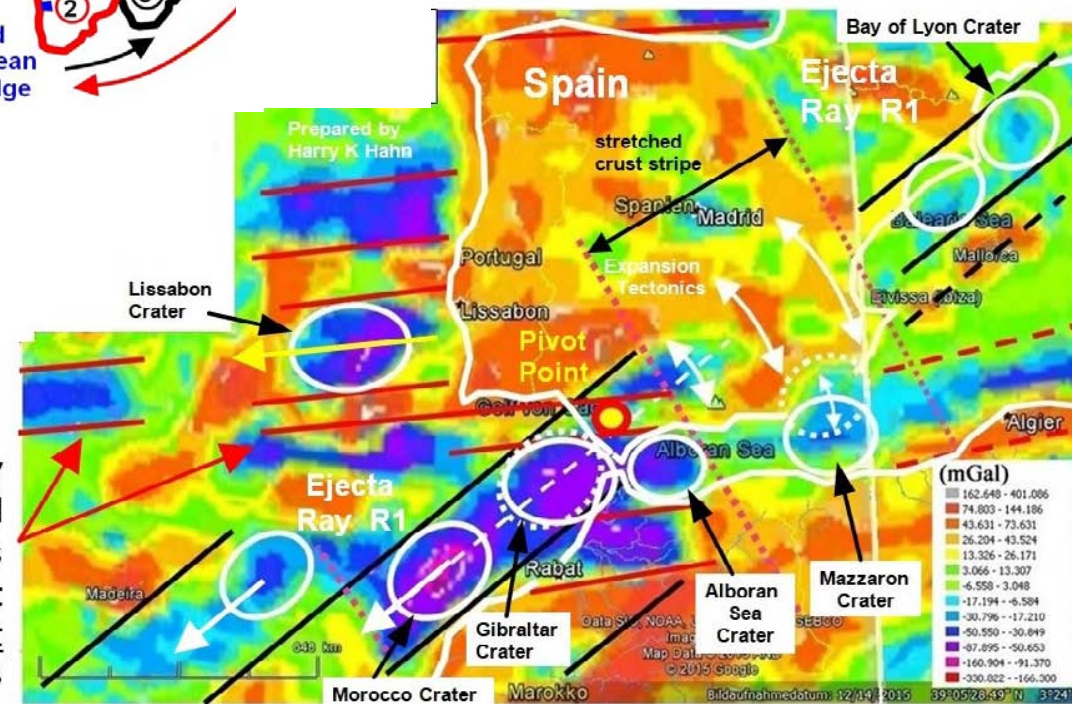


Caused by the impulse of the Ejecta Rays R1–R4 the African Plate rotated from **position 1** to **position 2** (→ see sketch).

But because Africa was still connected to Eurasia it later rotated back to **position 3**. But the majority of Spain and the ocean floor west from Spain did not rotate back to position 3 anymore.



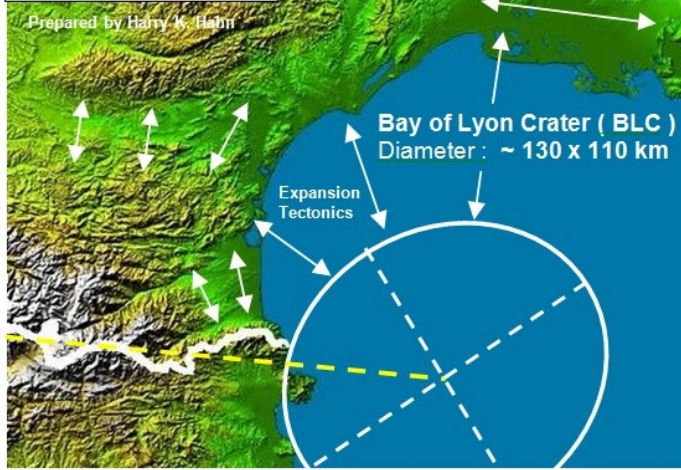
Detail View of Spain / Gibraltar



The set of gravity anomalies marked by the red lines indicates the crust area which did not rotate back to Pos 3

There is an oblique impact crater with Ø 130 x 110 km located in the **Gulf (Bay) of Lyon**, caused by the **PT- Impact Event**

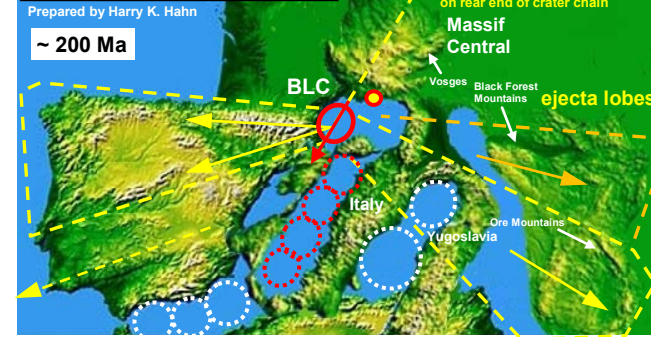
Topographic Map



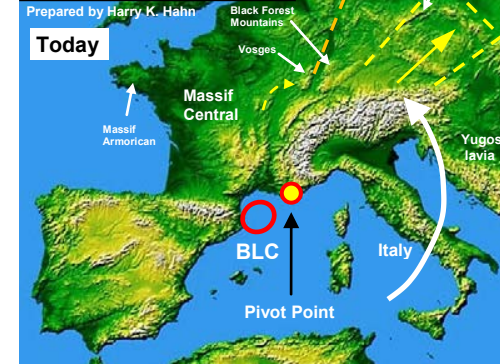
The ejecta structures of the **Bay of Lyon Crater** and of other craters from the secondary crater chain caused by the PT-I are easier to notice when we turn back the time and show Europe as it looked around 200 Ma (million years) ago. The manipulated topographic map on the right side shows ejecta structures of the **BLC** on their original location. For example the **Massif Central** & other mountain ranges (ejecta) in Poland Germany & Hungary etc.

The **Bay of Lyon Crater (BLC)** is the last crater of an impact crater chain caused by ejecta of the **Permian Triassic Impact Event**. Because of its location on the northern end of this crater chain, there are still ejecta structures visible today. For example **blow-out ejecta** from the rear end of the crater chain (from the BLC) which is the **Massif Central Mountain Range** & ejecta lobe structures.

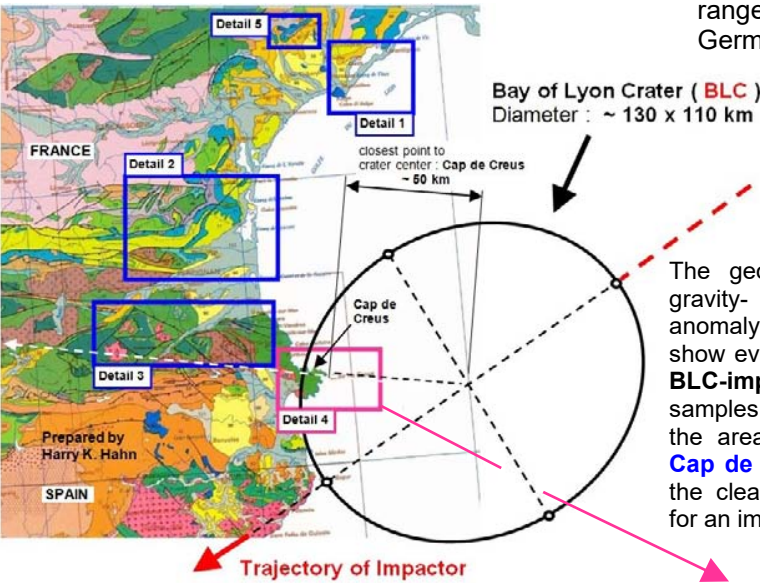
manipulated topographic map



Original topographic map



Europe around 200 Ma ago. Italy has just began to rotate around the BLC (→ rotation of Italy & Yugoslavia around the indicated pivot point)

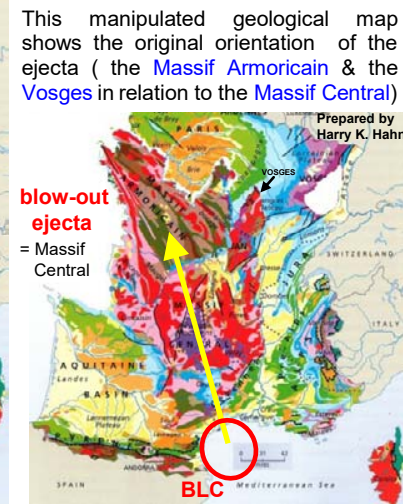


The geological map, gravity- & magnetic anomaly maps all show evidence for the **BLC-impact**. Rock samples were taken in the areas Detail 1-5. **Cap de Creus** shows the clearest evidence for an impact event.

Geology of France

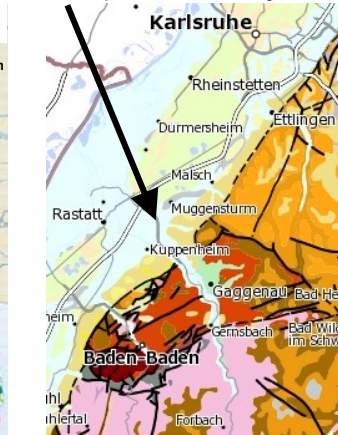


manipulated geological map :

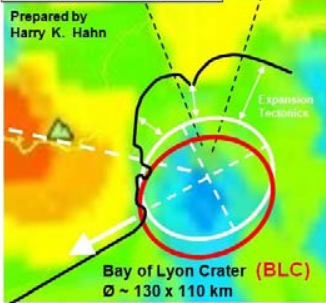


Germany / Karlsruhe area :

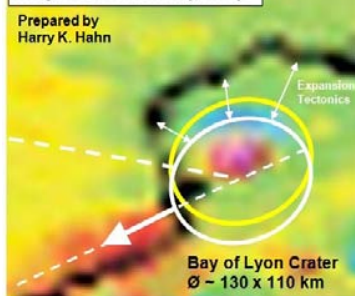
The **Black Forest** region just south of Karlsruhe & the **Ore Mountains** are also part of the **BLC-ejecta**.



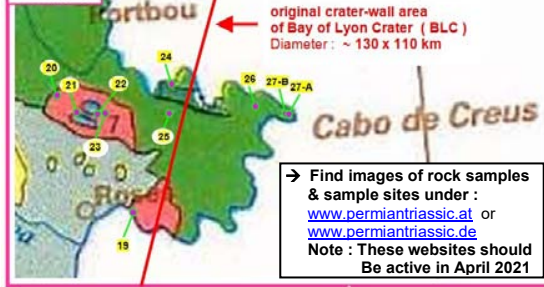
Gravity Anomaly Map



Magnetic Anomaly Map



Detail 4



Detail D :

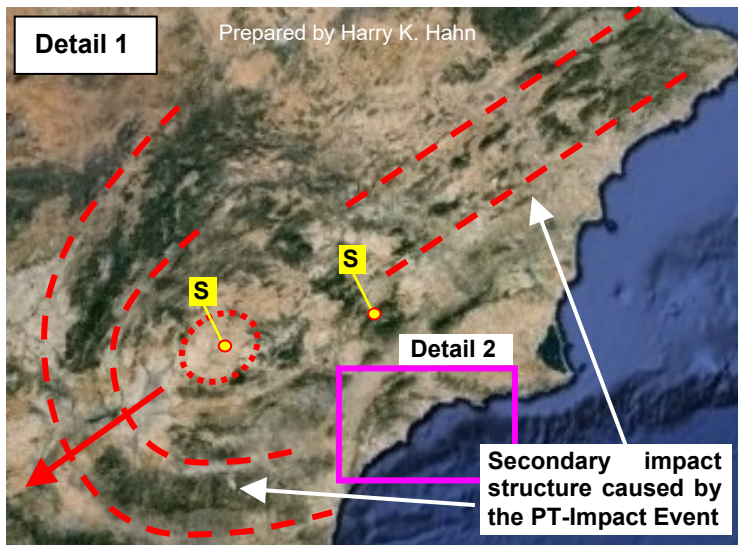
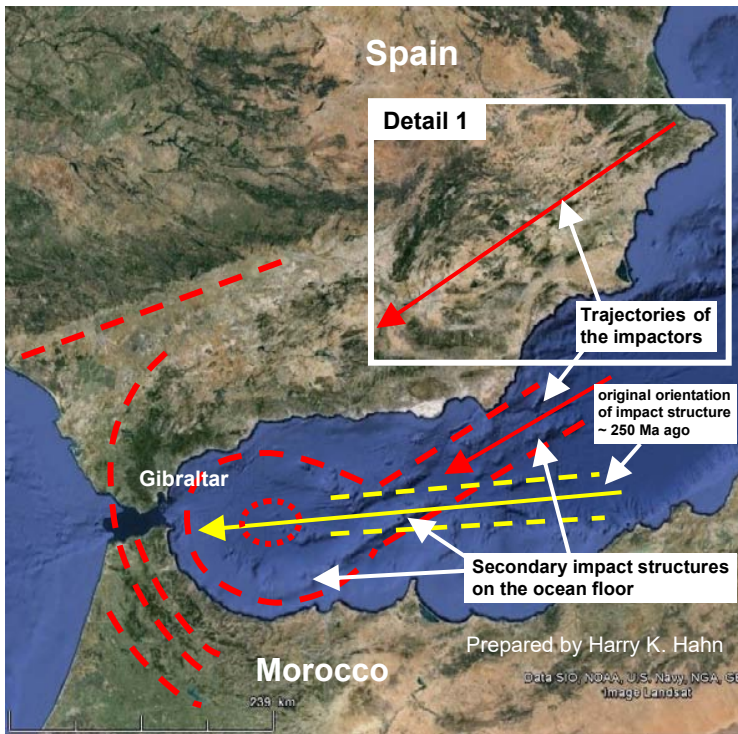


The sample sides No 27-A and 27-B near Cap de Creus show the clearest evidence for an impact event.

→ See **Detail D** sample side 24 just left of Detail D also shows proof.

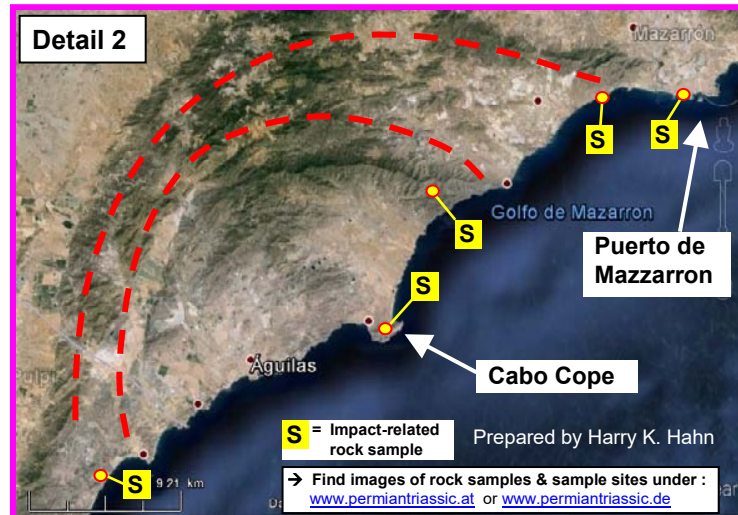
Further indications for a largescale impact event in Europe can be found in Spain & Portugal

In the South and South-East of [Spain](#), and in [Morocco](#), there are large-scale secondary impact structures visible, which obviously were caused by the same primary impact event. This was in all probability the [Permian Triassic₁](#) Impact Event, which happened 253 Ma ago close to the North-Pole.



There are linear structures and bow-shaped structures noticeable on land and on the ocean floor between Spain and Morocco. The linear structures indicate the direction where the impactors came from, which probably was the area of the [PT₂](#)-Impact Crater.

The bow-shaped structures clearly indicate that the two impactors, which produced these structures, were travelling towards south-west when they impacted. The bow-shaped structures further indicate the strong compression in Earth's crust which was caused by the impacts west & south-west of the impact centers. Because the whole area was obviously covered by flood lava directly after the impact (→ this is good visible on the 3D satellite-maps of Google Earth) only the areas which are free of flood-lava-remains will provide the impact related evidence to confirm this impact event !!



Rock samples which definitely indicate an impact event where found in the yellow marked areas shown in Detail 1 and 2 (e.g. the samples from Cabo Cope & Mazzaron) The samples show clear similarities to the samples taken in Italy. Therefore the rock samples collected near the described impact areas in Italy & Spain will confirm the evolution of Europe which I describe on the next pages :

The Rubielos Impact Structure in East-Spain :

The Rubielos Structure may be a direct result of the large secondary impacts caused by the PT-impact along the west-Coast of Spain (→ see next pages !)

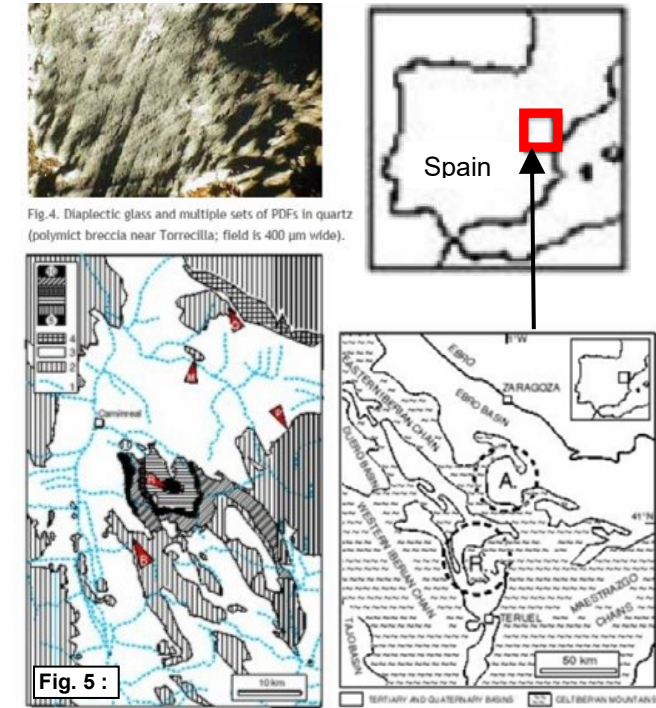
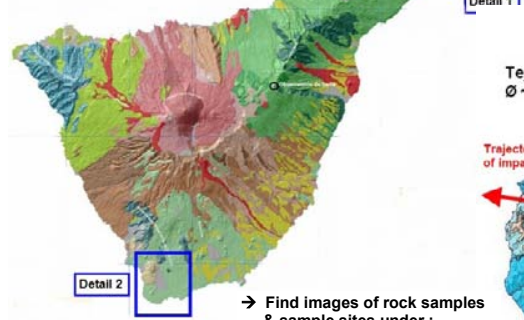


Fig. 5. Sketch-map of the Rubielos de la Cérda structure. 1 drainage pattern, 2 Paleozoic, Mesozoic and Lower Tertiary rocks, 3 Upper Tertiary and Quaternary rocks, 4 Pelarda Fm. ejecta, 5-10 Muschelkalk, Keuper, Jurassic, Cretaceous in the central uplift. About 50 km south of the Azuara impact structure (35 - 40 km diameter; Fig. 1) [1, 2], the Rubielos de la Cérda structure is defined by a circular to elliptical basin with a diameter of roughly 40 km, a circular central uplift with a diameter of about 15 km and a 500 m stratigraphic uplift, and a geometrically associated drainage pattern (Fig. 5). The most significant feature is the enormous compressive signature in the rocks including gries brecciation [3] (Fig. 9) and continuous megabrecciation up to chaotic criss-cross layering nearly everywhere (Fig. 10, 11). Apart from the general megabrecciation, all kinds of monomict and polymict breccias (Fig. 8) and breccia dikes (Fig. 6) occur. - Strong evidence for an impact origin of the Rubielos de la Cérda structure is given by the find of compact melt rocks within the structure between the central uplift and the northern rim. The melt rocks (silicate, carbonate, and phosphate melt) occur as blocks of variable size intermixed in a polymict megabreccia (Fig. 2, 3). A petrographic description of these melts is given in [4]. - More evidence of impact signature in rocks from the Rubielos de la Cérda structure is given by the occurrence of shock metamorphism. We observe heavily disintegrated feldspars with strong mechanical twinning and multiple sets of PDFs, crossing sets of isotropic lamellae in twinned feldspars, diaplectic quartz and feldspar together with multiple sets of PDFs (Fig. 4). Kinkbanding in mica from silicate Cretaceous rocks and strong microtwinning in calcite are frequently observed. As a macroscopic shock feature,

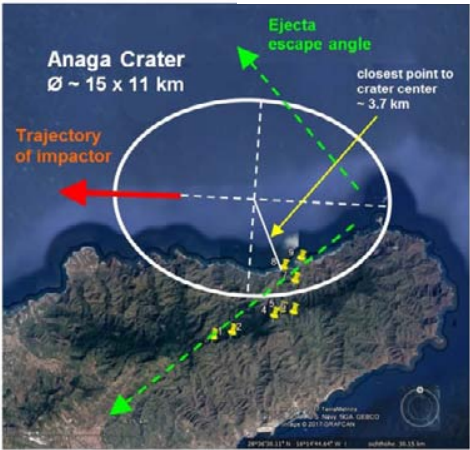
Geological Maps :

Tenerife

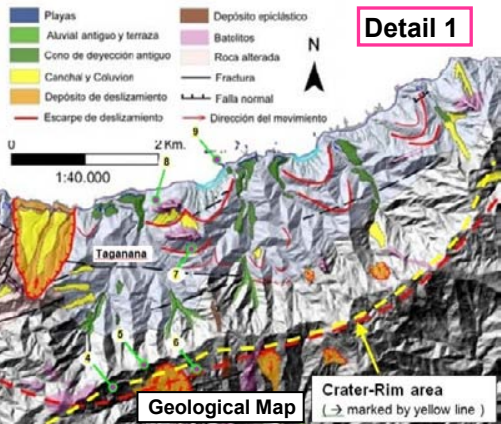


→ Find images of rock samples & sample sites under : www.permiantriassic.at or www.permiantriassic.de

Satellite Image :

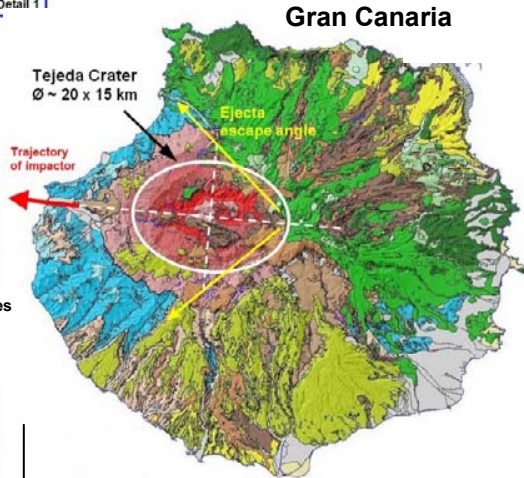


Detail 1

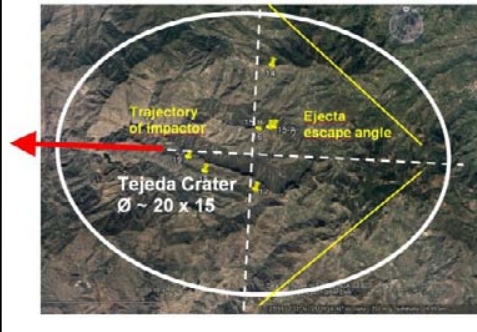


Two oblique impact craters Ø 20x15 km & Ø 15x11 km on the Canary Islands (Spain)

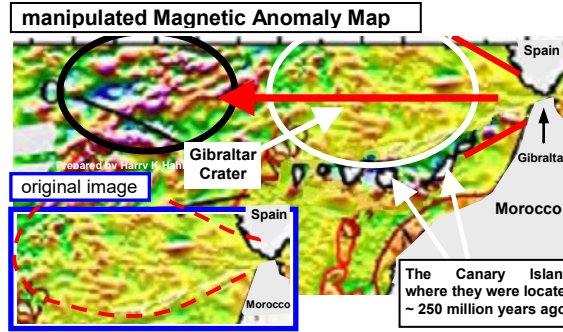
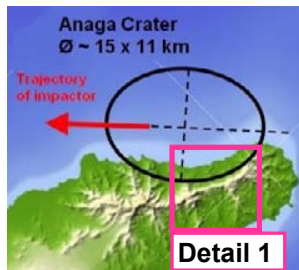
The **Canary Islands Tenerife & Gran Canaria** show evidence for two oblique impact craters (Ø 20x15 km & Ø 15x11 km) which were caused by impactors (ejecta) ejected from a much larger crater. This larger crater was a secondary crater which was produced by the **Permian Triassic (PT)-Impact Event**. The **“bases”** of the **Canary Islands Tenerife & Gran Canaria** (& all other islands of this island-chain) were part of the crater-wall of this ~ Ø 280 x 200 km secondary crater ~ 253 Ma ago, before they slowly drifted away in a SW-direction from the location of the initial ~Ø 280 x 200 km crater. **Gravity Anomaly-** & **Magnetic Anomaly** Maps provide the evidence



Satellite Image :

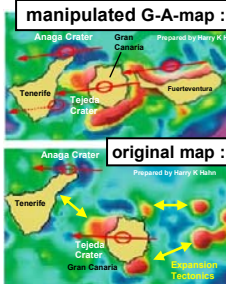


Note: the possible impact craters, the **Anaga Crater** Ø15x11km & **Tejada Crater** Ø20x15km have the **same orientation** ! Sample sites **No. 5, 7 & 9** (Anaga Crater) may provide proof for an impact event.



The **Magnetic Anomaly** Map of the ocean floor west & south-west of **Gibraltar** shows the clearest traces of the impact event which happend ~253 Ma ago. → see original map on right side (original image)

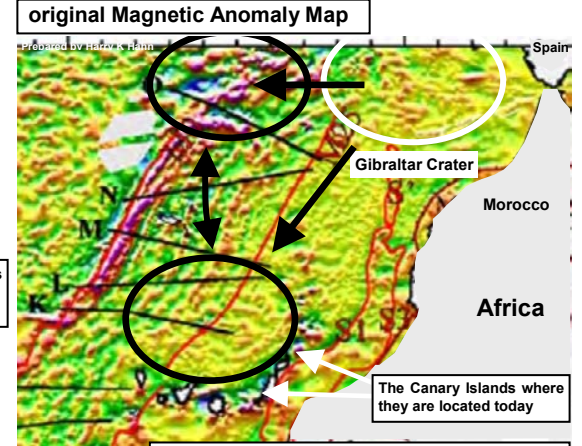
The area marked by a white ellipse, size: ~Ø 430 x 290 km is the remaining **magnetic signature** of the original crater (→ **Gibraltar Crater**). The black ellipses mark two **“drift-off copies”** of this signature in different crust-layers, caused by ocean floor spreading. The **manipulated Map** (left) shows the Canary-Islands on their original position ~ 250 Ma ago.



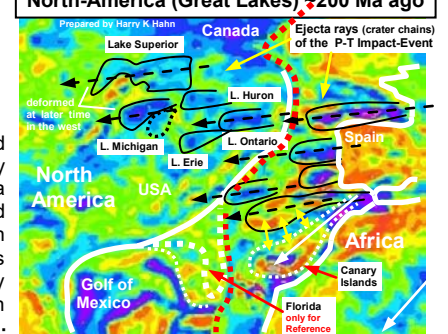
Analysis of Gravity Anomaly (G-A) Maps :

Magnetic anomaly maps, topographic maps and **Gravity Anomaly** maps show that the Canary Islands were part of the **southern crater-wall** of a **crater at the end of the R1-crater-chain** caused by the **PTI-event**. The gravity anomaly map on the left indicates that the Canary Island-Bases were initially close together & that they were hit by ejecta (impactors) coming from the same direction **The Great Lakes (USA) were formed by ejecta :**

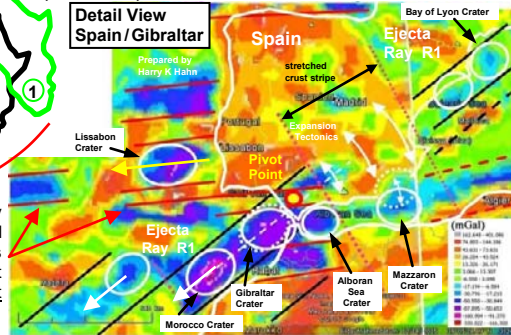
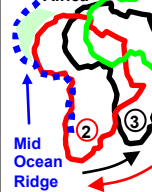
The map on the right side shows a Gravity Anomaly Map of Europe, Africa & North-America (without the Appalachians), ~200 Ma ago. The Great Lakes were caused by ejecta from the PTI-event (→R1)



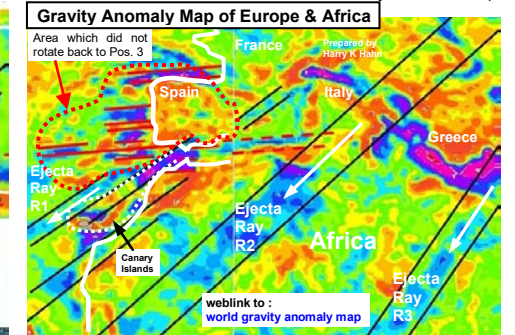
Gravity Anomaly Map showing Europe & North-America (Great Lakes) ~200 Ma ago



The **rotation of Africa** caused a **30° rotation of Spain in relation to Africa** : The **Ejecta Rays R1 to R4**, caused by the **PTI-event** accelerated the African Plate towards the SW. From its original **position 1** (green), the African Plate rotated clockwise essentially around a pivot point close to Gibraltar to the later **position 2** (red), from which it then rotated back to the current **position 3** (black). However Spain and a part of the new Atlantic Ocean Floor **did not rotate back from Pos. 2 to 3**. This is indicated by the G-A map



The set of gravity anomalies marked by the **red lines** indicates the crust area which **did not rotate back to 3**.



Canary Islands (Spain) – Fuerteventura / Lanzarote with possible Secondary Impact Craters from the PT- Impact Event

Overview of areas where samples were collected :

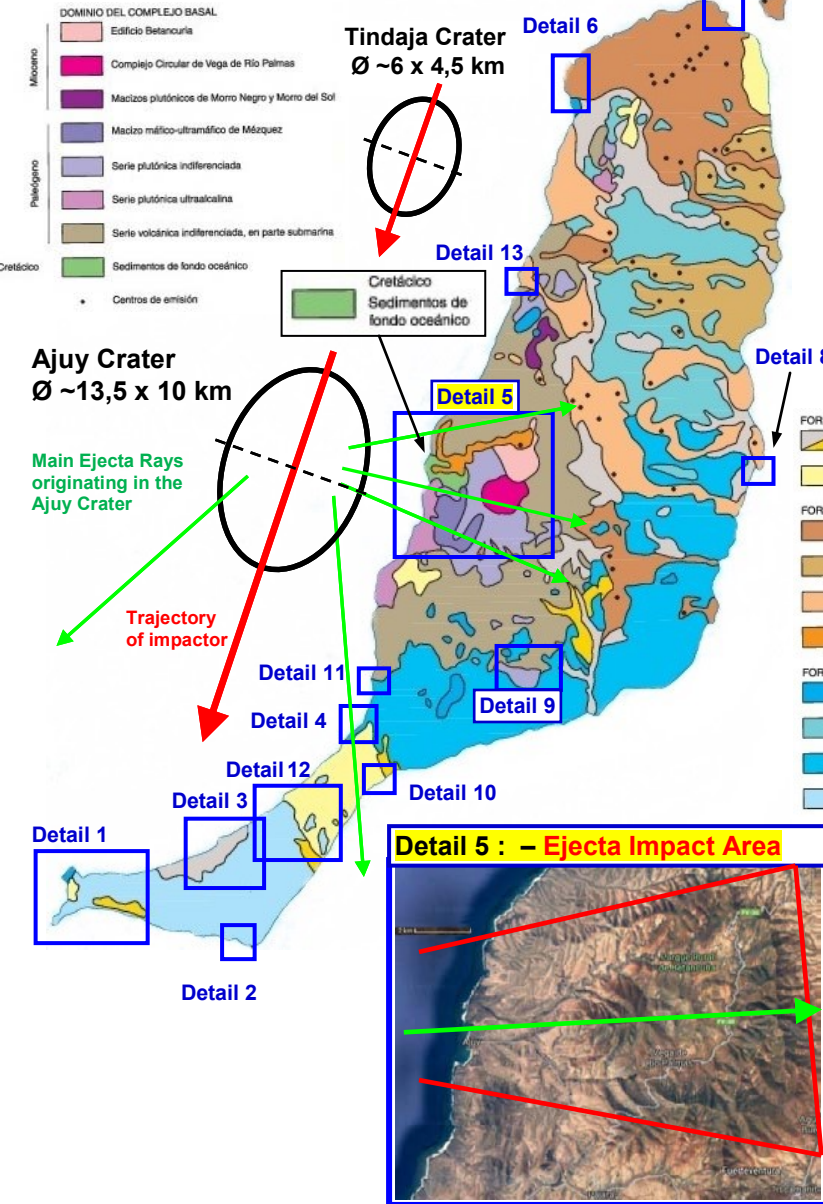
→ Geological Maps of Fuerteventura & Lanzarote with marked areas where rock samples were collected :

Fuerteventura

Lanzarote

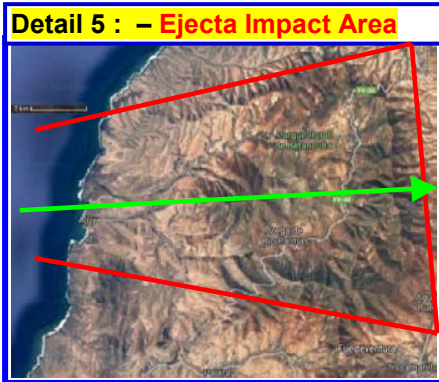
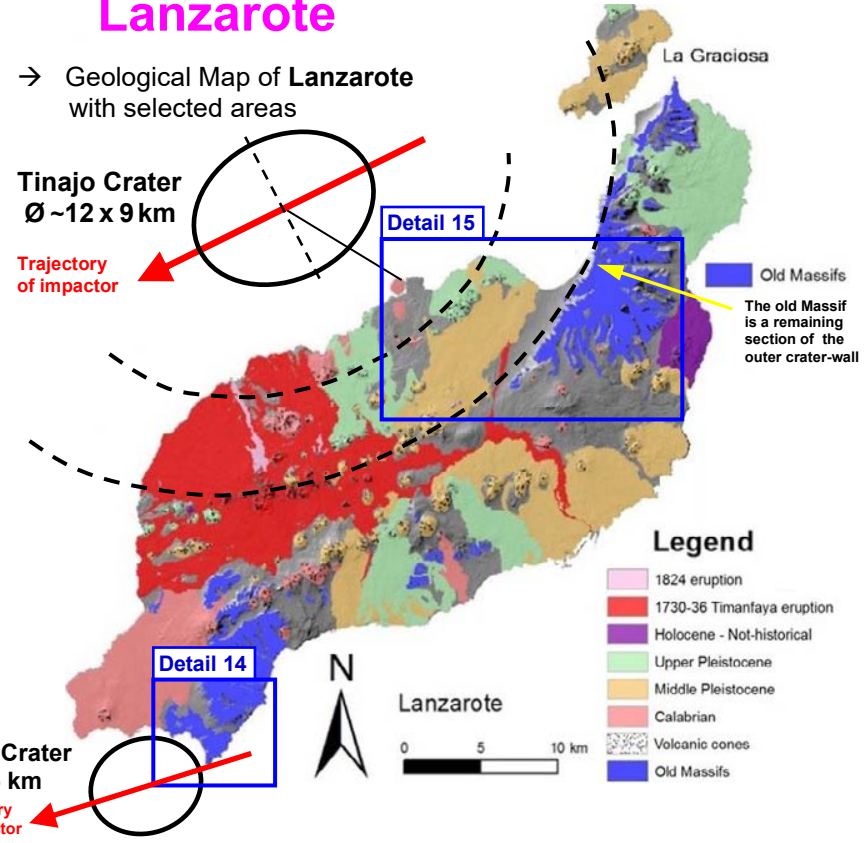
→ Geological Map Fuerteventura with selected areas

→ Geological Map of Lanzarote with selected areas



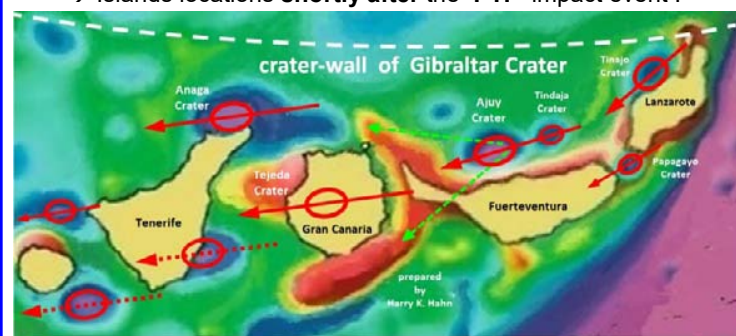
The two Canary Islands Fuerteventura and Lanzarote show evidence of a large scale Impact Event. This impact event probably was the result of ejecta from the PTI (Permian Triassic Impact) which impacted in this area and caused the Ø 430x290 km Gibraltar Crater (GIC). The shown smaller oblique impact craters belong to this impact event and are located along the original crater-wall (-rim) of the GIC.

The gravity anomaly map of Fuerteventura indicates a larger 13,5x19 km and a smaller 6x4,5km elliptical crater offshore of the west -coast of Fuerteventura on the ocean floor. The gravity anomaly map also indicates a 12x9 km crater offshore of the north-west coast of Lanzarote and a smaller 7x5 km crater offshore of Lanzarote's southern end.



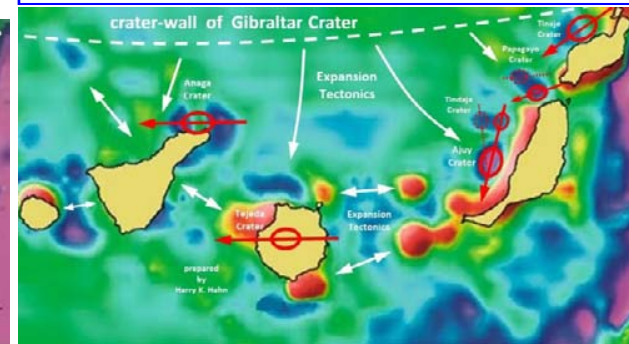
manipulated Gravity Anomaly Map :

→ Islands locations shortly after the PTI - impact event :



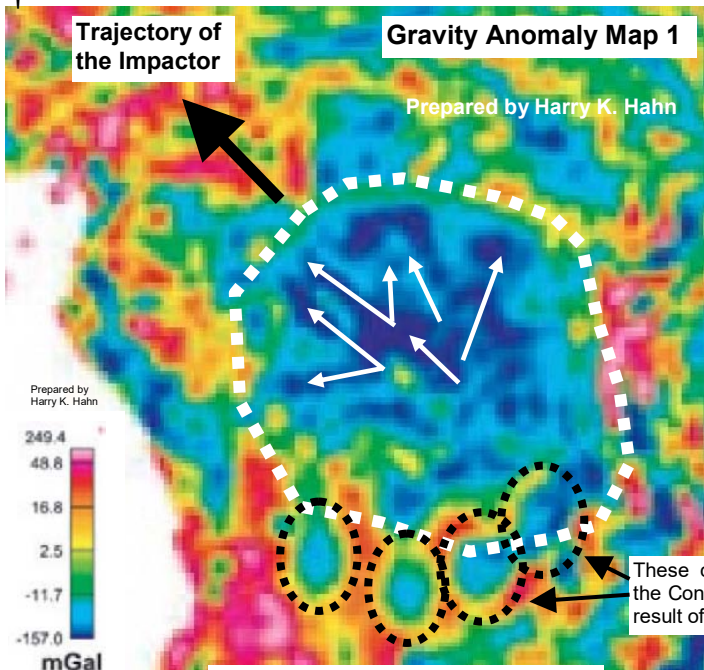
→ original Gravity Anomaly Map :

Gravity Anomaly Map – Canary Islands (today) :



The Congo Crater was formed by a multiple Impact Event probably caused by an asteroid or comet that collapsed before impact

The **gravity anomaly** map of Africa shows a large **1200 x 850 km multiple impact crater structure** where the **Congo Basin** is located today. The gravity anomaly map provides the evidence for a complex impact crater structure which probably was formed by ≥ 40 fragments of a large asteroid or comet which broke into pieces just before impact. The impact signature shows precisely where each fragment impacted. The impactor-fragments probably had $\geq \varnothing 3 - 10$ km each, and the original asteroid or comet probably had a diameter of 30 – 50 km, and it impacted in a shallow angle. The assumed trajectory and age of the impactor indicate that it wasn't related to the **PT-Impact** !. It seems that this impact was responsible for the acceleration of North- & South-America towards North-West ≈ 180 -200 Ma ago. Additional there are 3 strong Ejecta Rays (secondary crater-chains) of the **PT-Impact** visible on the map



(A) EIGEN-GL04C free-air anomaly, **→ Eigen-GL04C free-air gravity anomaly map**

3 METHODOLOGY

As our main interest is the depth of the crust-mantle boundary, the gravity data are first subjected to a high-pass filter using a 1000-km cut-off wavelength to remove deep mantle sources (Obenson 1974).

A crustal thickness map of Africa derived from a global gravity field model using Euler deconvolution

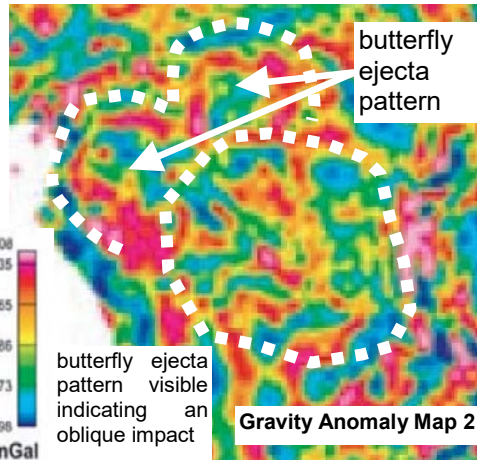
Getachew E. Tedla,^{1,2} M. van der Meijde,¹ A. A. Nyblade^{2,3} and F. D. van der Meer¹

¹University of Twente, Faculty of Geo-Information Sciences and Earth Observation (ITC), Enschede, The Netherlands. E-mail: tedla@itc.nl, get11@uon.edu

²Department of Geosciences, Pennsylvania State University, University Park, PA 16802, USA

³School of Geosciences, The University of the Witwatersrand, Johannesburg, South Africa

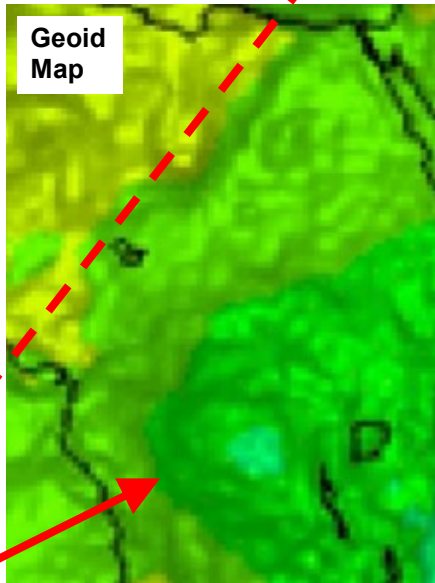
Block *et al.* 2009, Fig. 1B). Undesired tapering effects are minimized by expanding the grid up to 20 per cent of the total grid area. We then calculate the X, Y, Z derivatives of the filtered gravity anomaly on a 0.25° grid (Figs 1C, D and E) and use them as input to the 3-D Euler equation.



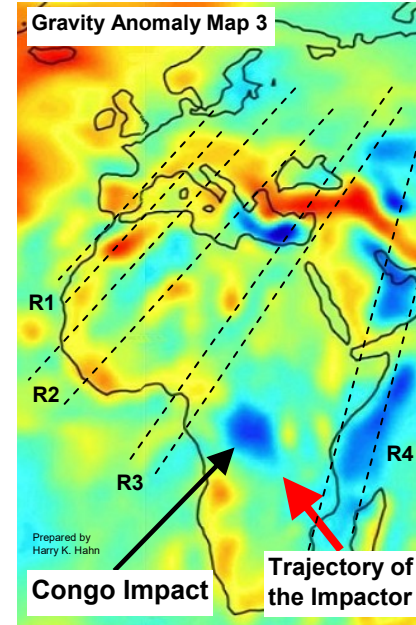
(B) High-pass filtered gravity anomaly map

These craters probably don't belong to the Congo Impact. They are probably the result of PTI-Ejecta Rays.

Linear structure from the Ejecta Ray R3 of the PT-Impact Event



Congo Impact & Butterfly Ejecta pattern visible on Geoid Map



The two images on the righthand side show the other impact structures on the gravity anomaly map, which are independent from the Congo Impact. The bottom Map was rotated a bit to make the impact structures clearer. The impact crater chains R1 to R4 in all probability are caused by the **Permian-Triassic** Impact. Therefore the indicated craters with $\varnothing 150$ -250 km, must be secondary craters which are caused by ejecta from the **PTI**. In the crater areas many oil/gas-fields may exist.

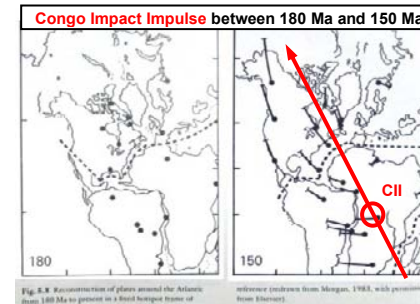
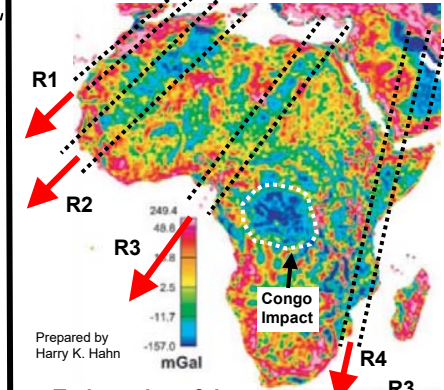


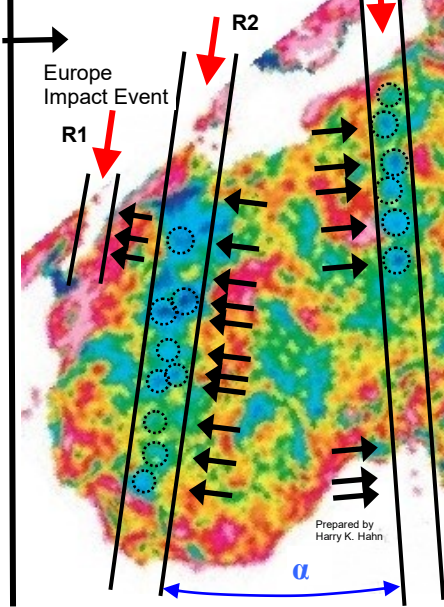
Fig. 8.8 Reconstruction of plates around the Atlantic from 180 Ma to present in a fixed hotspot frame of reference (redrawn from Morgan, 1983, with permission from Elsevier).

Other Impact Structures in Africa

There are four impact crater chains R1 to R4 visible on the gravity anomaly map of Africa, which must be caused by ejecta from the PT-Impact. The rays all meet in the center of the PTI-Crater ! (considering that Africa has rotated clockwise 5-10 degrees)



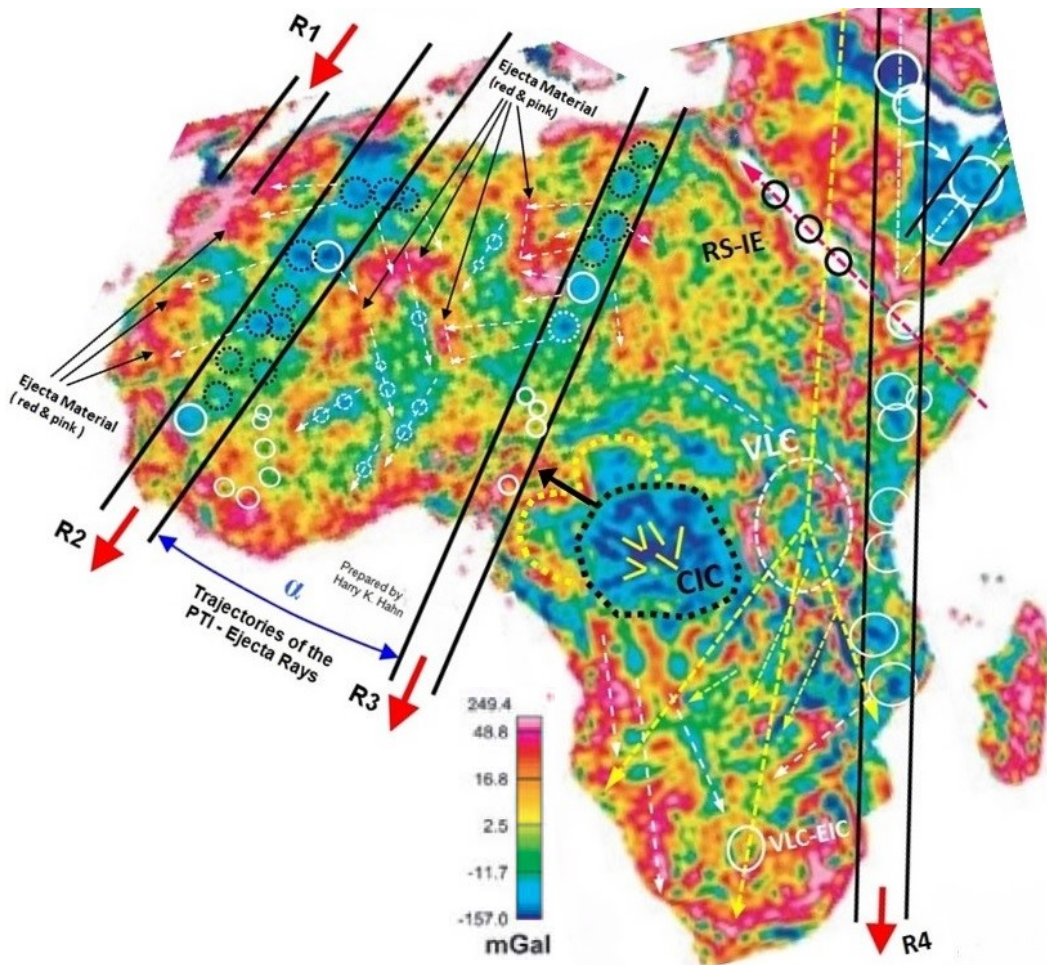
Trajectories of the PTI - Ejecta Rays



Prepared by Harry K. Hahn

Gravity Anomaly Map of Africa showing the PT-Ejecta Rays R1-R4 :

- Ejecta Rays R1 to R4 of the Permian Triassic impact (PTI) are marked on the map. (→ smaller crater chains are also indicated)
- Impact Craters appear as negative anomalies (blue or green areas)
- Congo Impact Crater (CIC) also shown on the map



(A) EIGEN-GL04C free-air anomaly,

A crustal thickness map of Africa derived from a global gravity field model using Euler deconvolution

Getachew E. Tedla,^{1,2} M. van der Meijde,¹ A. A. Nyblade^{2,3} and F. D. van der Meer¹

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²Department of Geosciences, Pennsylvania State University, University Park, PA 16802, USA

³School of Geosciences, The University of the Witwatersrand, Johannesburg, South Africa

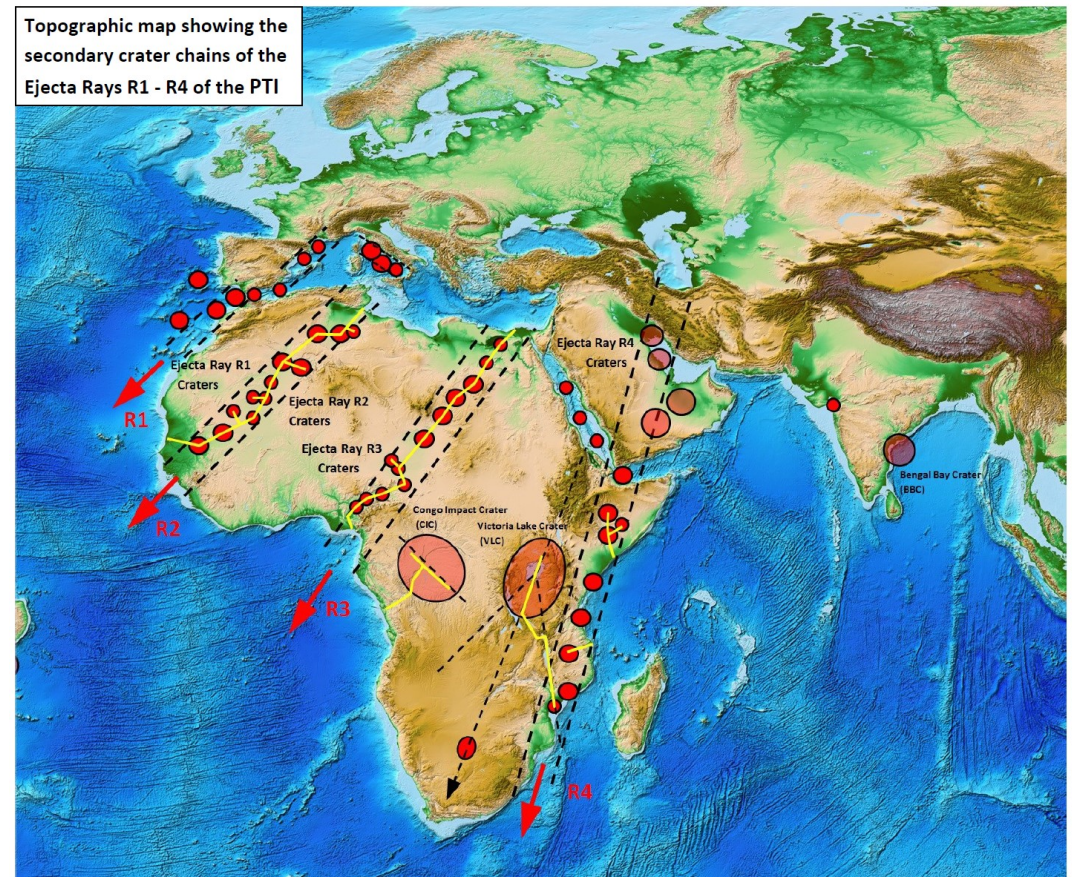
3 METHODOLOGY

As our main interest is the depth of the crust-mantle boundary, the gravity data are first subjected to a high-pass filter using a 1000-km cut-off wavelength to remove deep mantle sources (Obenshain 1974;

Block *et al.* 2009, Fig. 1B). Undesired tapering effects are minimized by expanding the grid up to 20 per cent of the total grid area. We then calculate the X, Y, Z derivatives of the filtered gravity anomaly on a 0.25° grid (Figs 1C, D and E) and use them as input to the 3-D Euler equation.

Topographic Map of Africa indicating the crater chains R1 to R4 :

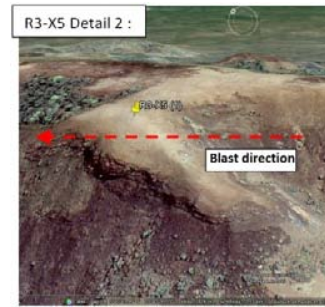
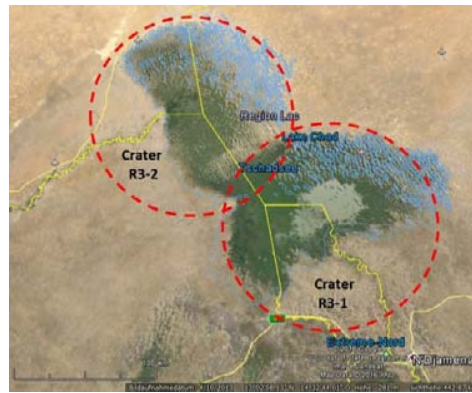
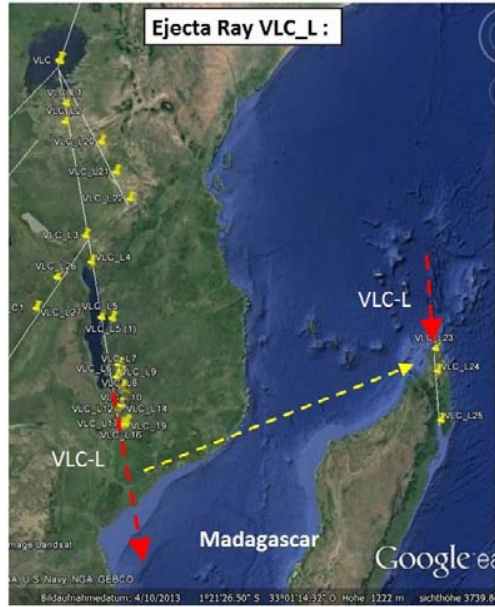
- The Chains of impact craters (R1 to R4) shown on the topographic map (→ marked in red) in all probability represent oil- & gas-rich areas.
- The Impact Crater areas can easily be connected by an oil-pipeline (Pipelines marked in yellow)
- The Congo Impact Crater (CIC) and the Victoria Lake Impact Crater (VLC) probably also represent oil- & gas-rich areas.



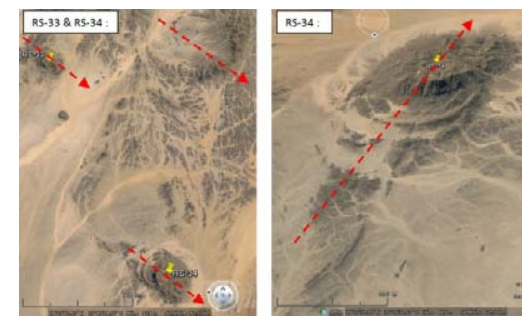
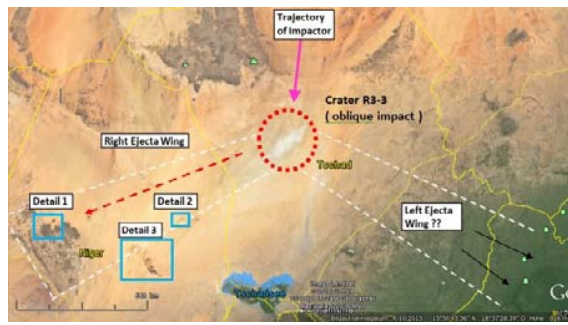
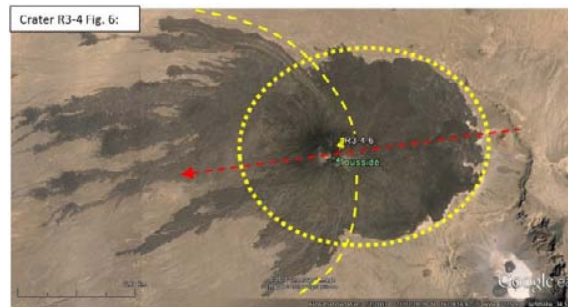
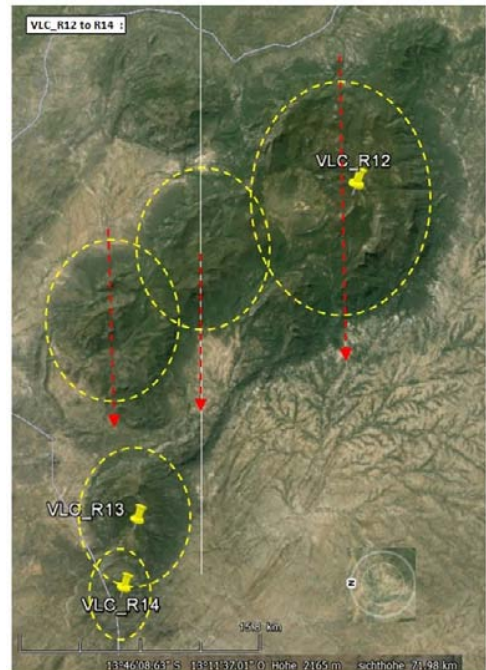
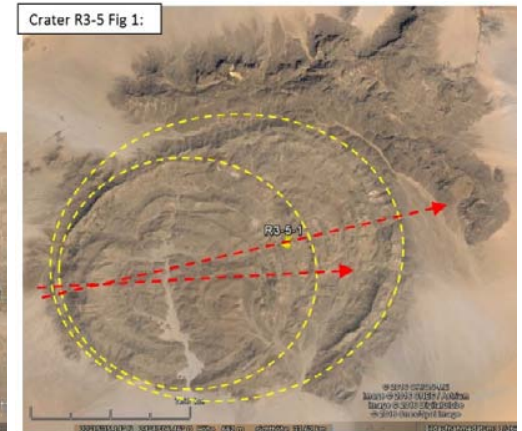
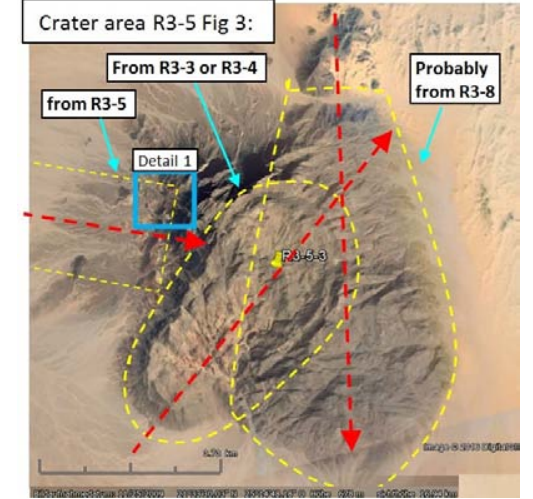
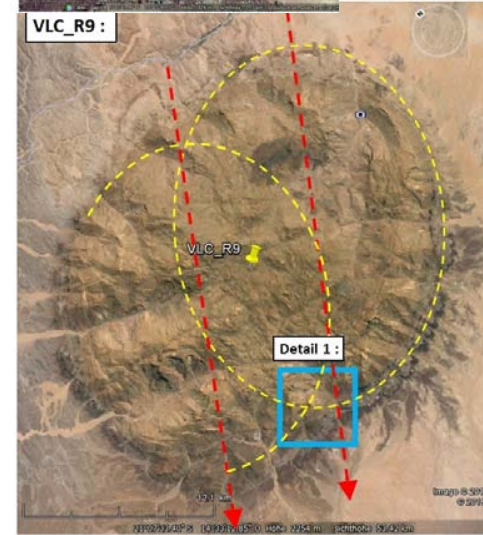
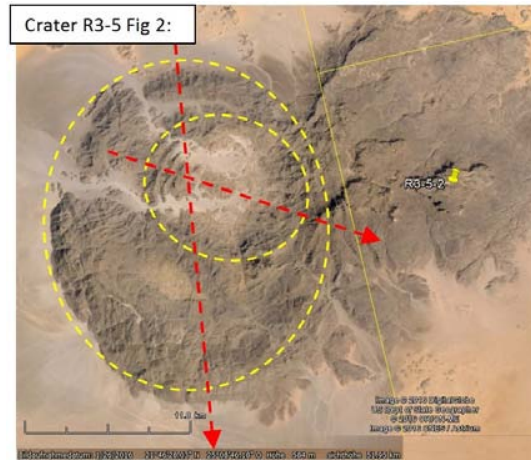
In the oil-exploration industry it is common knowledge that large oil-fields can be expected in an area effected by a big impact crater. Because a large impact not only produces the required structural traps (by impact induced fracturing and brecciation of the rock under the crater, which results in very effective porosity & permeability of the fractured rock), but also the palaeo-environment for the deposition of post-impact shales that provides the oil & gas.

There are geological examples available, like the Ames Crater (Ø 14 km) in Oklahoma / USA, or the worldclass Cantarell Oil-field, which is located near the Ø 180 km Chicxulub Crater in Mexico, which clearly indicate the close connection of impact craters & oil- & gas-fields

Interesting secondary PTI-Impact Structures in Africa :



There are many large-scale structures visible, e.g. perfect elliptical & double-elliptical structures, linear-structures, structures which have a drop-like shape, crater-wall structures, fan-like structures, structures which have a shutter-cone-like appearance, and many volcanic structures which clearly were formed by high dynamical events (→ they probably represent ejecta (molten material) from the PTI, or from secondary craters caused by the PTI).



A powerful Ejecta Ray from the Victoria-Lake Impact Event (~Ø 1550x1100 km) started the separation of Madagascar from Africa

The separation of Madagascar from the African Plate was initiated by secondary impact events which were caused by the Permian-Triassic (PT) Impact ~253 Ma ago. Especially the secondary impact which caused the “Victoria Lake Crater“ (VLC) contributed to this separation of Madagascar from Africa. This powerful Impact Event, which was an oblique impact, and which occurred in the Victoria Lake area, produced two strong “ejecta wings” or ejecta rays (VLC-R & VLC-L) and a “Central Ejecta Ray” (VLC-C) which caused the Iron-Ore Deposits in South-Africa (→EIC). From the location and shape of the secondary impact structures caused by the Victoria Lake Impact (→ yellow pins on satellite map → see following pages !), the orientation of the two ejecta wings and the trajectory of the main impactor can be reconstructed. This provides strong evidence that the VLC was caused by the PT-Impact. (→ similar to the Bengal Bay Crater). In all probability the impact impulse of ejecta ray VLC-L (L=left), which runs from the VLC over Malawi Lake (→ a result of the impact of VLC-L) towards the original position of Madagascar, caused fractures (→ on the western border of the Madagascar-Fragment) which are responsible for the break-off of Madagascar from the African Plate. This happened at the same time when Ejecta Ray R4 caused a major fracture between Africa and Australia/India (→ see modified map below) Gravity Anomaly- & Topographic- Structures provide further evidence for this scenario. And Gravity Anomaly- & Magnetic-Anomaly Structures also confirm the VLC-Impact Scenario.

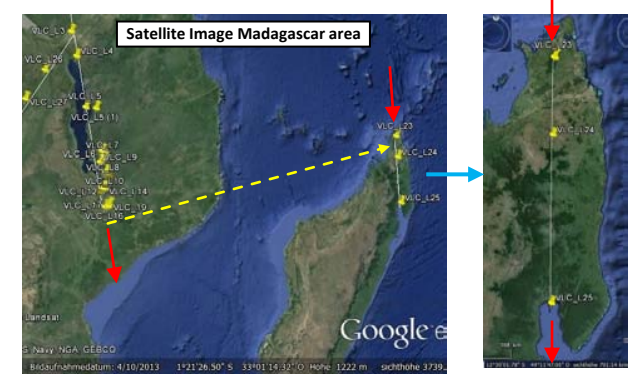
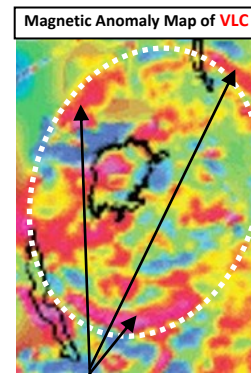
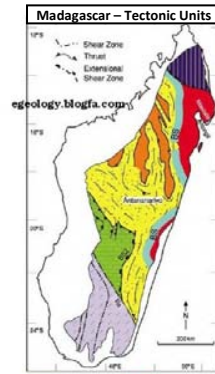
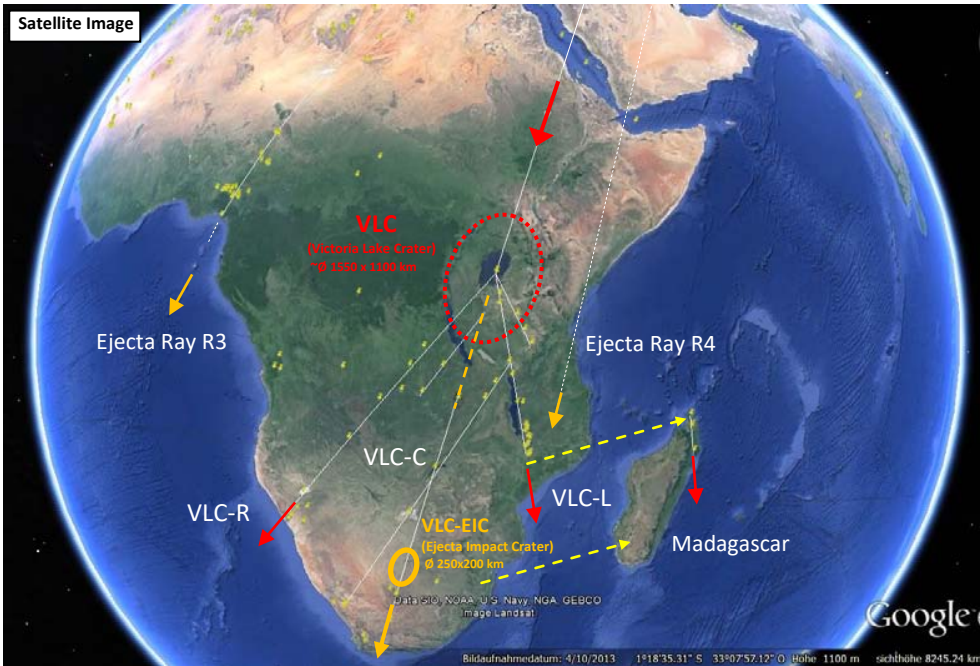
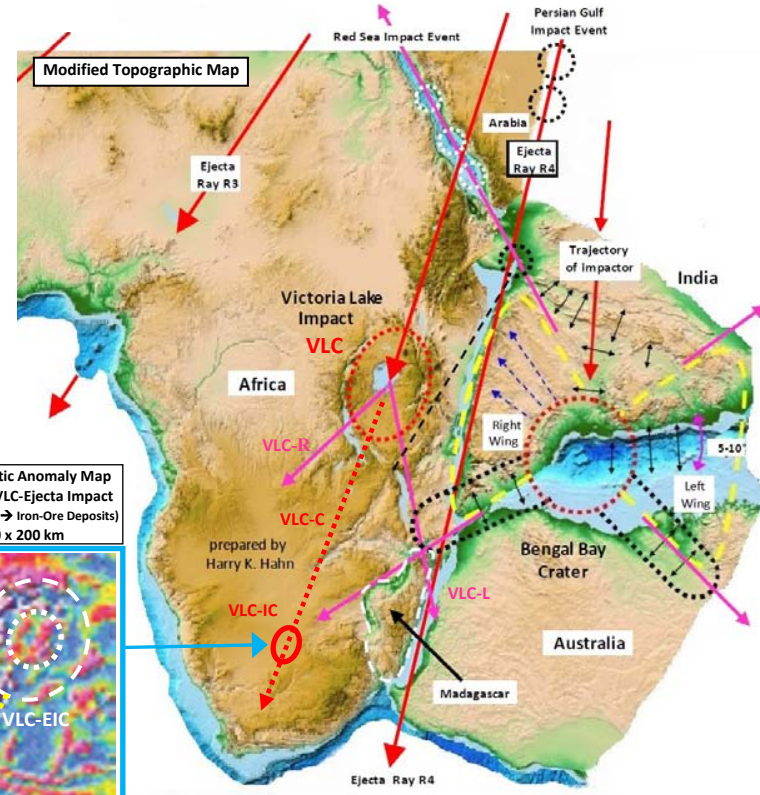


Figure 6 A simplified geological map showing the major tectonic units of the Proterozoic basement in Madagascar: Ha. Haribana Shear Zone; BZ. Betsibo Shear Zone. (Reproduced with permission from Collins and Windley 2002.)

The modified Topographic Map on the righthand side shows how Africa, India and Australia were positioned to each other, and how this land area of Pangea broke apart, caused by the powerful Ejecta Rays and Secondary Impactors from the PT-Impact Event.

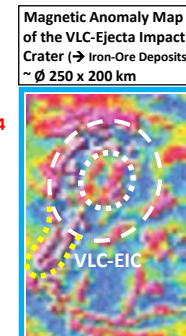
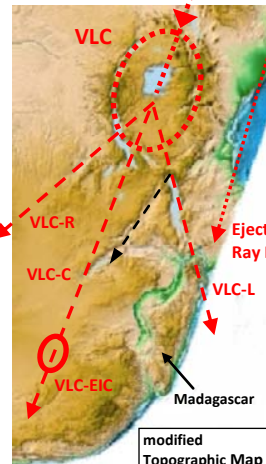
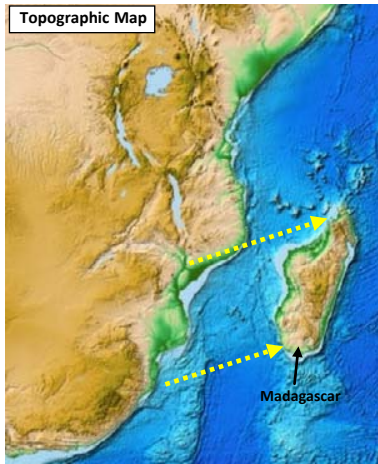
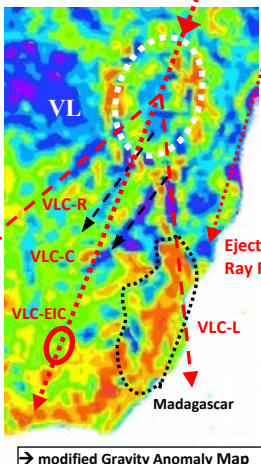
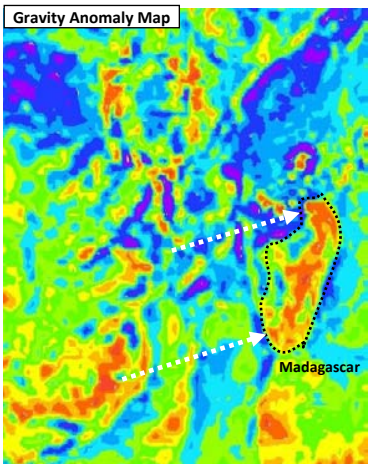


Madagascar – Position Today

Madagascar – Original Position

Madagascar – Position Today

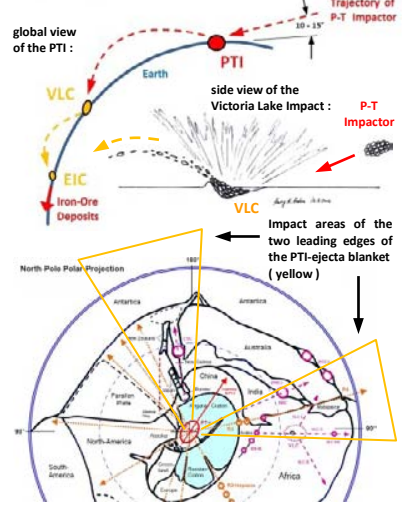
Madagascar – Original Position



The African - LLSVP, and the Pacific - LLSVP which is responsible for the magma eruptions, were caused by the PT-I :

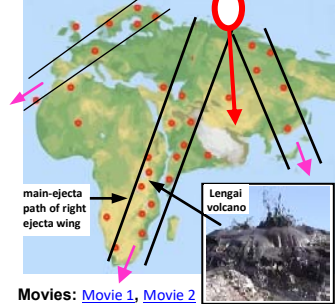
There is strong indication that the **Permian-Triassic Impact (PT-I)** and the ejecta rays which were caused by this enormous impact are responsible for the formation of the two main **LLSVPs** (**Large low-shear-velocity provinces**) inside Earth's mantle. These two large structures, which are characterized by slow (seismic) shear wave velocities and which consist of much hotter material (~4000°K) than the surrounding mantle material (~2000°K), extend laterally and vertically for thousands of kilometers from the core-mantle boundary. In all probability the remains of large secondary impactors and the powerful ejecta of the leading edges of the two ejecta-wings of the PT-I descended deep into Earth's Mantle and caused the **LLSVP's** as a result.

Impact Scenario of Victoria Lake Crater (VLC) & Ejecta Impact Crater (EIC):

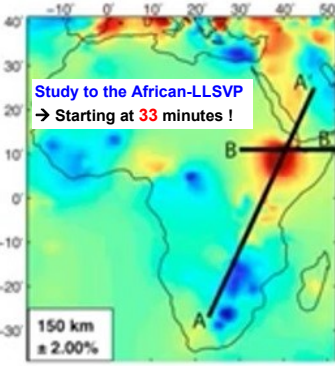


The diagram on the left shows the shallow (oblique) impact of the PT-Impactor which probably had a diameter of around **~60 to 200 km**. It also shows a side view of the **Victoria Lake Impact** (crater) (→**VLC**) which was caused by a large secondary impactor ejected from the PT-I-crater. Part of the ejecta from the VLC was ejected forward in impact direction where it formed another secondary crater, the EIC. The rest (the majority) of the VLC-ejecta was again ejected in a butterfly-ejecta-pattern. Traces of "forward-ejecta", which always seems to be dense & ductile metal-bearing material, are also visible near the CYC- and PHC (BBC)-craters. The majority of the ejecta from the PT-I-crater was ejected in the form of a gigantic butterfly-shaped ejecta blanket. Where the leading edges of the two ejecta wings of this butterfly-ejecta blanket impacted on Earth's crust (in the yellow marked areas) extensive fractures (new continent borders) were formed. The north-polar-projection of Earth, shown on the left shows Earth at P/T boundary time

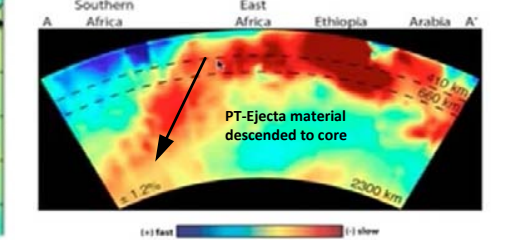
Carbonatite distribution along main-ejecta paths of the PT-I :



Movies: [Movie 1](#), [Movie 2](#)
see : [Study about Carbonatite Lava](#)



A large part of the ejected material and a number of big secondary impactors impacted in these two yellow marked areas. → see also larger map in the chapter : "**Earth at the time of the PT-Impact Event**" The world map on the left shows the distribution of **Carbonatites** in Africa & Eurasia. I have rearranged the position & orientation of Africa, Europe and India so as they were just after the PT-Impact 253 Ma ago (→ original map, Le Bas 1987). **It is clearly visible that the carbonatites are mainly located along the paths where the leading edges of the ejecta wings of the PT-I impacted !!** This is especially clear for the impact path of the leading edge of the right ejecta wing along the east-coast of Africa (→ ejecta ray R4 & VLC-ray). Because the **Carbonatites** are probably derived from Earth's lower mantle, we can conclude that the shock-wave of the PT-I-impact, or PT-I-ejecta descending into the mantle, brought carbonatites from the lower mantle to the surface, or the carbonatites were brought-in by the impactor itself ! Lengai Volcano in Tanzania still erupts Carbonatite-Lava today ! (→ from the African LLSVP !)

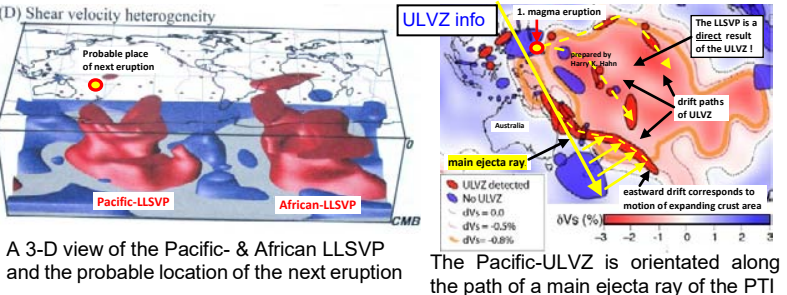


The two images on the bottom left side show a section view of the **African-LLSVP**. The section view A – A' runs from the Arabian Peninsula through the **African Rift Valley** and the **Victoria Lake (VLC)** area towards South-Africa. The section view runs essentially along the same path where the leading edge of the right ejecta wing of the PT-I impacted. It is clearly visible that the main structure of the African **LLSVP** is orientated along the same path as the impacting right leading edge of the PT-I-ejecta. (→ LLSVP = red, orange & yellow area in the section view A – A'). The images are from a study of Andy Nyblade which used **African-Array Data**. He claims that evidences indicate that the African LLSVP is a thermochemical **whole-mantle-structure** without a separation in the 410-660 km region. The same principles applies for the **Pacific LLSVP** especially the **ULVZ** at the **core mantle boundary (CMB)** within the Pacific LLSVP is mainly orientated along the path where the leading edge of the left ejecta wing of the PT-I impacted. Because this ULVZ has a distinct chemical signature there is a high probability that the **ULVZ** is a direct result of ejecta of the PT-I which descended to the CMB in this area.

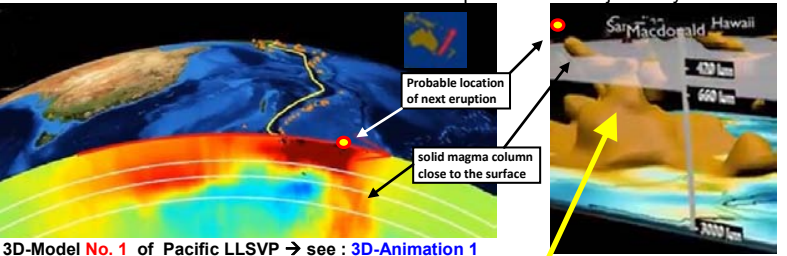
Note: it seems that the Cape York Impact produced a permanent channel in the mantle which connects the Pacific-LLSVP /ULVZ with the surface. Through this channel in the mantle ≥8 violent magma eruptions occurred over the last ~200 Ma causing a number of big **LIP's** on the Pacific Plate (e.g. the **Ontong LIP**)

Warning : There is a high probability that another such violent magma eruption will occur !! My study indicates that the next magma eruption will take place near the **Fiji-islands** → see image on the right which shows the path of the source (outflow channel positions = yellow dots) of the magma eruptions. It seems the Pacific LLSVP is due for an eruption soon ! The solid upward pointing column at the top-end of the LLSVP, near the **Fiji's** may indicate the coming eruption (& **mass extinction** !). The vertical expansion rate of this column must be measured !!!

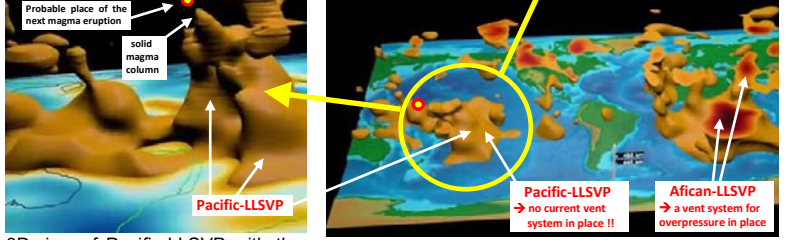
Note : All volcanos of the **Pacific Fire Ring** and all other volcanos on Earth can be explained by the Permian-Triassic Impact ! They are all located in the (fractured) crust areas which were directly caused by the ejecta of the PT-I !! The magma (molten mantle material) which causes these volcanos, in all probability is **exclusively** a result of the impact of ejecta & secondary impactors from the PT-I !!! Therefore a revised model for **Earth's mantle** is required, which must consider a much higher share of **volatiles**, e.g. H₂O & CO₂ within the mantle material



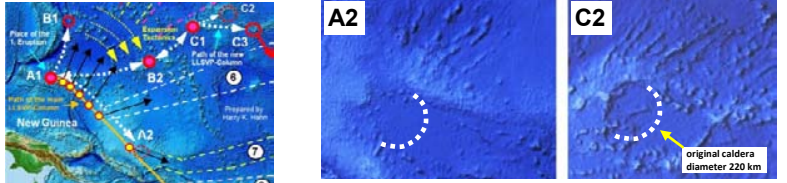
A 3-D view of the Pacific- & African LLSVP and the probable location of the next eruption



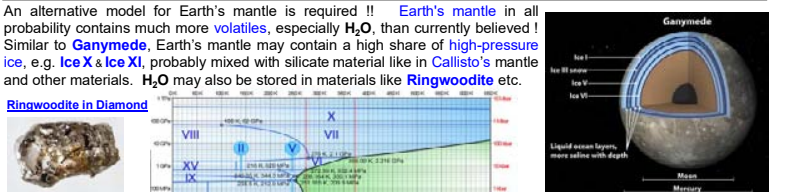
3D-Model No. 1 of Pacific LLSVP → see : [3D-Animation 1](#)
3D-Model No. 2 of Pacific LLSVP → see : [3D-Animation 2](#)



This 3-D Animation shows the African-LLSVP has a large vent system for overpressure in place, but the Pacific-LLSVP doesn't !



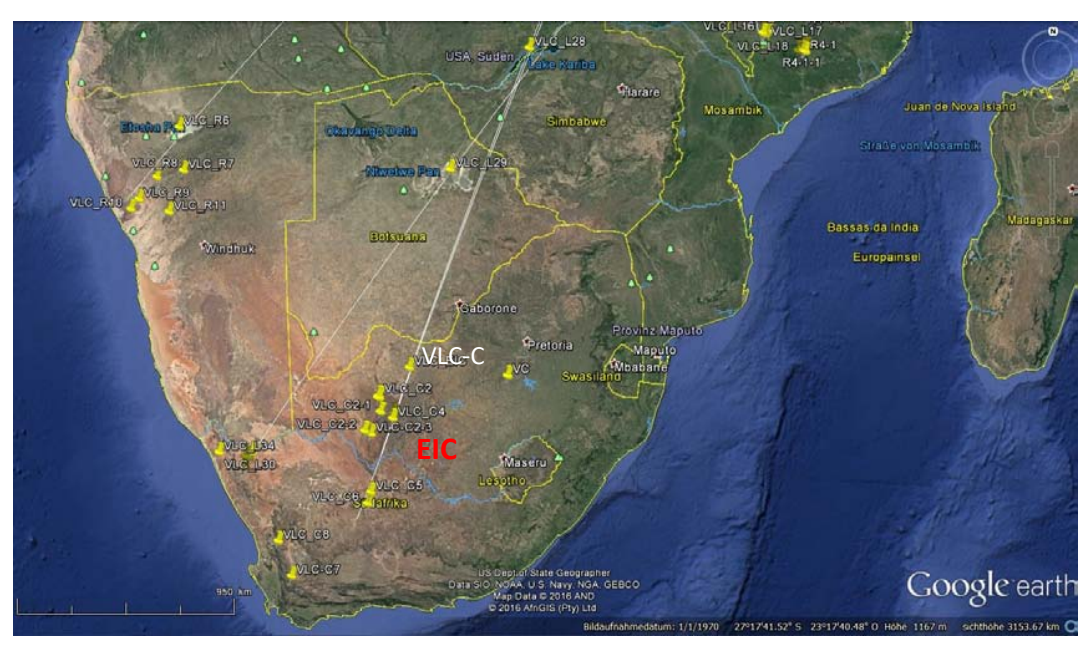
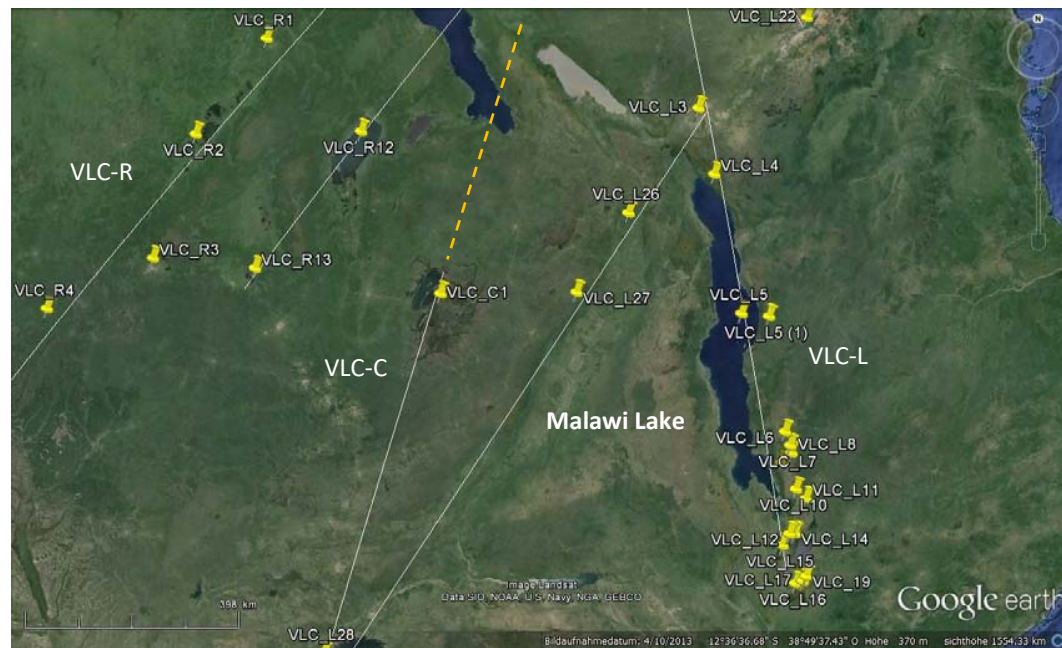
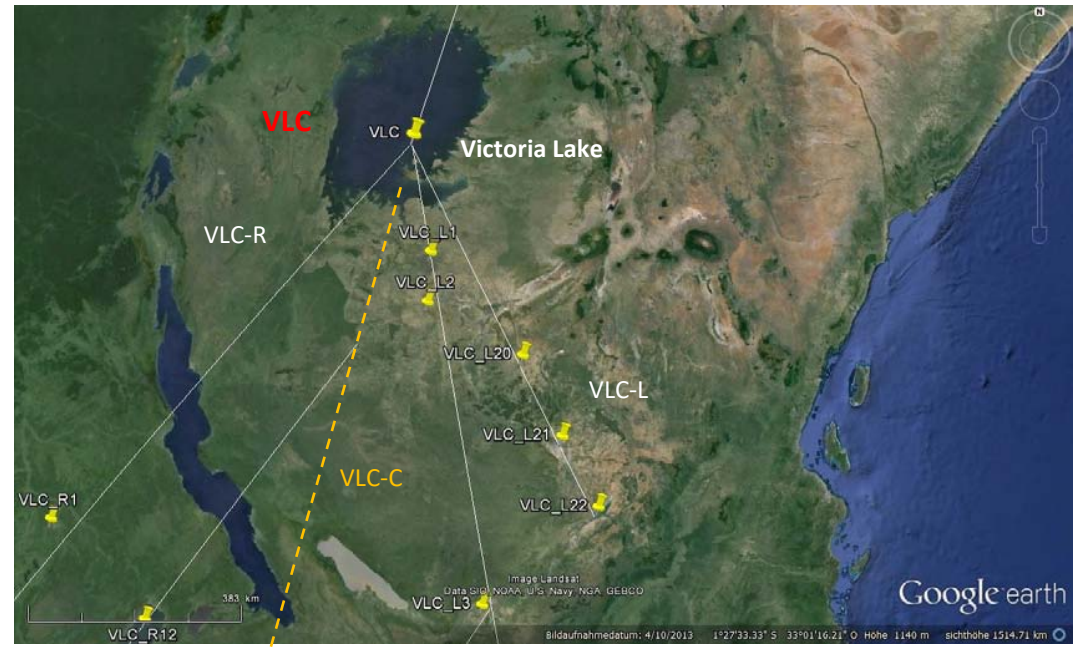
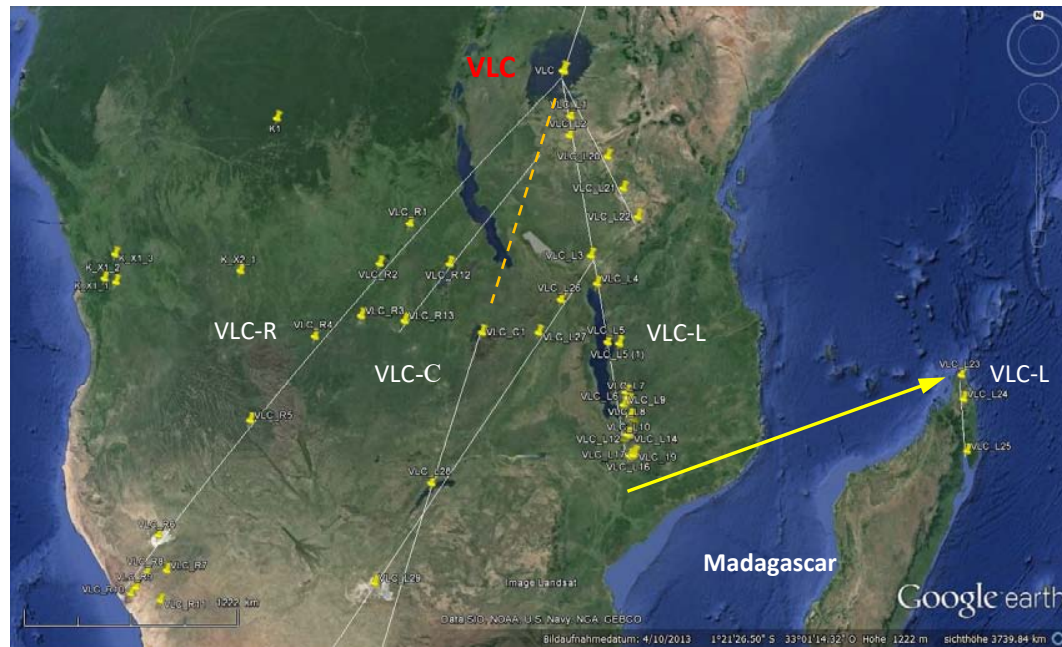
These two different ocean floor areas A2 & C2 which are thousands of km apart represent the same structure !! These "drift-off-copies" are an image of the **first** magma eruption which took place on position A1 ! These nearly identical structures, from two different crust layers (?), probably show the remains of a burst shield-volcano with a base Ø-450 km and a caldera Ø-220 km.



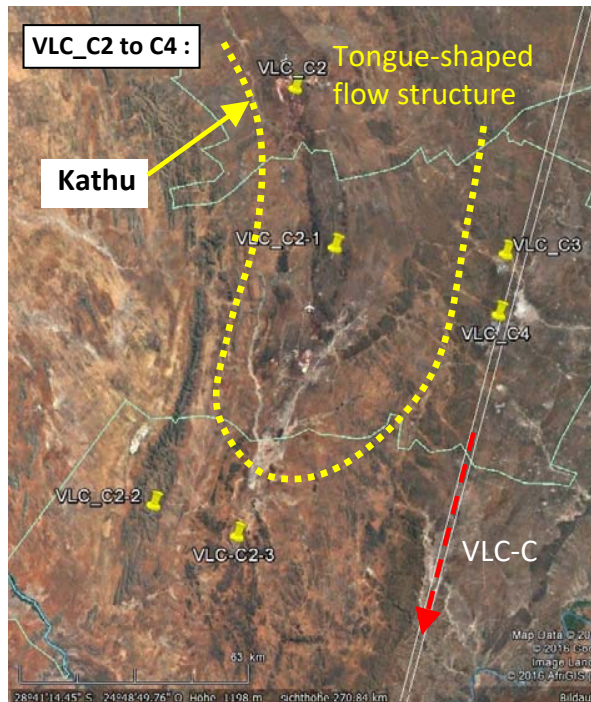
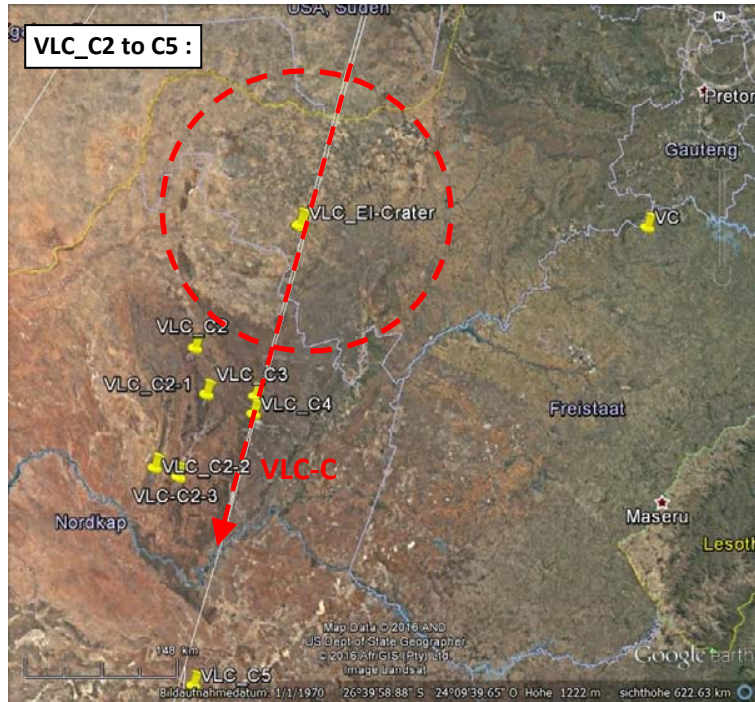
An alternative model for Earth's mantle is required !! **Earth's mantle** in all probability contains much more **volatiles**, especially H₂O, than currently believed ! Similar to **Ganymede**, Earth's mantle may contain a high share of **high-pressure ice**, e.g. **Ice X & Ice XI**, probably mixed with silicate material like in **Callisto's** mantle and other materials. H₂O may also be stored in materials like **Ringwoodite** etc. **Ringwoodite in Diamond**

Overview of the locations of selected Secondary Impact Structures, caused by the VLC-Impact Event

The secondary impact structures are mainly located along the Ejecta Rays (ejecta wings) VLC-L & VLC-R, along the Central Ejecta Ray VLC-C , and along other (secondary) ejecta rays which branch off from the main ejecta rays. The left Ejecta Ray VLC_L ends on the African Plate around 300 km south of the southern end of **Malawi Lake**. But there is strong indication that it continuous in the North of **Madagascar**. If this is correct, then this would constrain Madagascar's original location precisely to the location shown on the first page of this document. The Central Ejecta Ray VLC-C ends in South-Africa where the ejecta from the VLC has caused extensive Iron-Ore deposits → a further proof for the Impact Hypothesis



The Ejecta Impact Crater (EIC) Ø~ 250x200 km, located on the VLC-C (Central) Ejecta Ray of the VLC caused Iron-Ore Deposits in South Africa



VLC-C2 : Kathu : → Iron-Ore Mines :

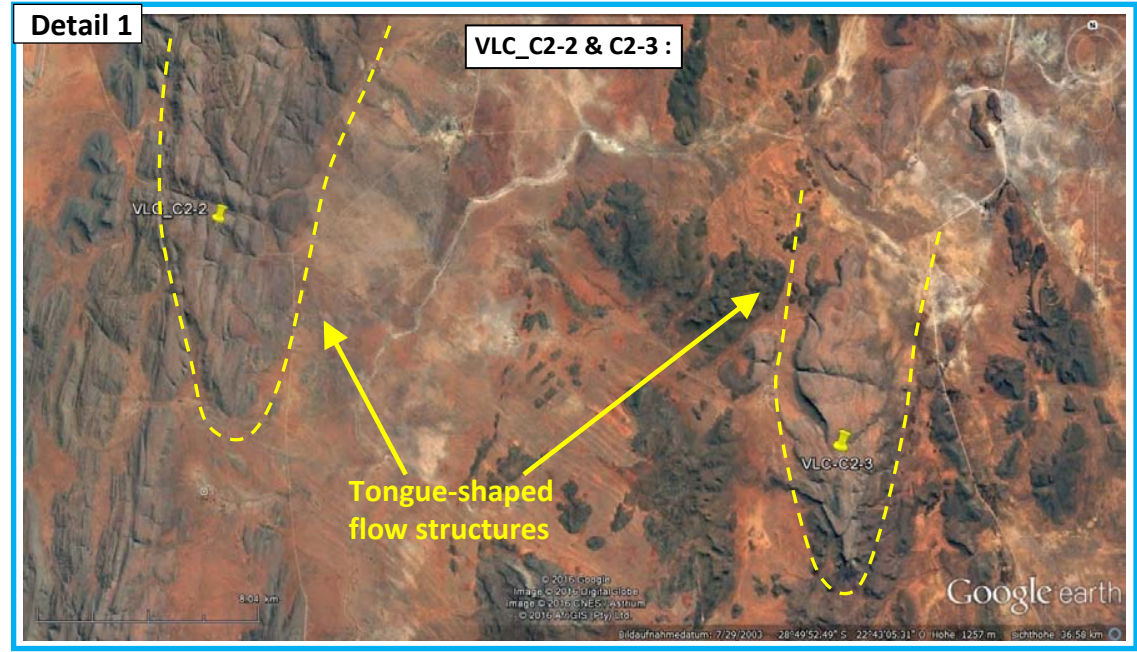
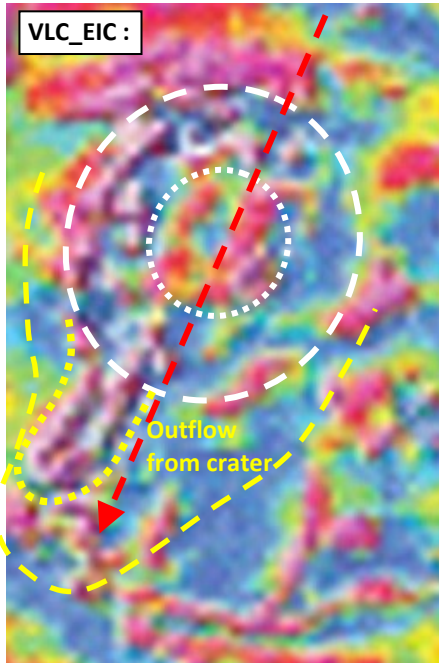
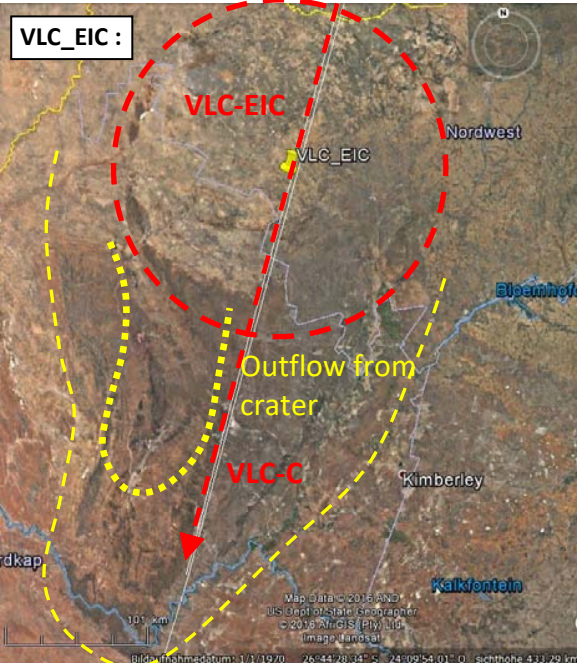
e.g. **Sishen Mine** 30km from Kathu is one of the largest Iron-Ore Mines in the world. Lump ore is extracted from a large **Hematite** ore body hosted by a Lake Superior-type banded iron formation (BIF) called **Kuruman Formation** (see also → **manganese field**). The lump to fine ratio of the Sishen ore is 60:40. The ore body measures approximately 14km long, 3.2km wide and 400m deep.

VLC-C2-1 : Postmasburg : → Iron-Ore (Hematite), Manganese Ore, Diamonds, Asbestos

Satellite Image - Ejecta Impact Crater (EIC) Ø 250x200km

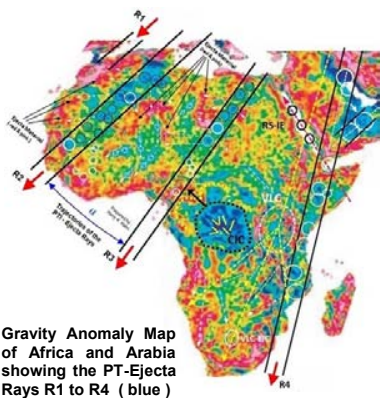
→ red arrow indicates the trajectory of the impactor
yellow lines indicate flow direction of Ejecta

Magnetic Anomaly Map of EIC



Epilogue

All the new impact craters discovered during my study (see Parts 1 - 6) should lead to new oil- & gas-fields with more than 600 billion barrels of oil-reserves, and with more than 300 trillion cubic feet of gas-reserves ! (→ at a ~50 % success rate)

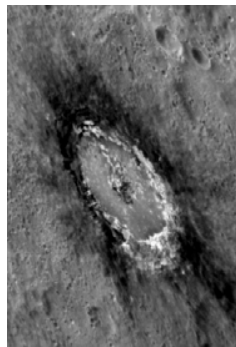


Gravity Anomaly Map of Africa and Arabia showing the PT-Ejecta Rays R1 to R4 (blue)

Especially the crater chains R1 to R4 and the CIC which are located on or near the African Continent, will contain a large share of these impact related oil- & gas-reserves. Because at least 50 ≥ Ø150km craters are located within the crater-chains R1-4 & the CIC

The expected reserves in this areas alone should exceed 400 billion barrel oil & 200 trillion ft³ of gas. Additionally large reserves of metal-ores should be located in the ejecta areas of these impact craters.

I now want to mention an interesting discovery on Mercury. The image on the right shows the Ø 80 km Basho Crater on Mercury. The low-reflectance material (black) which is surrounding the crater is a form of carbon called graphite. The scientists believe it was excavated by the impact from the planet's original, ancient crust which lies deeper.



It is thought that Mercury was once covered by a crust composed of graphite, when much of the planet Mercury was still molten.

An alternative explanation would be that the carbon was brought-in by the impactor itself, for example if the impactor was a carbon-rich comet. This would be my first guess when I look at this image. However an origin from within Mercury (from Mercury's mantle) is also possible.

I mention this discovery for the following reasons :

- 1.) In all probability the PT-impactor was a carbon-rich comet with a diameter of ≥ 50km.
- 2.) Lengai Volcano located in Tanzania within the strong ejecta ray R4 is erupting Carbonatite Lava, Carbonatites are formed essentially of carbonate. Because the distribution of carbonate rocks in Europe seems to be closely related to the impact event in Europe, caused by PTI-ejecta, it must be considered that the carbonate which formed the carbonatite lava originates from the PT-impact.
- 3.) The 12 km “Kola super-deep borehole” showed that at a depth > 7 km the rock in Earth's crust is saturated with Hydrogen (H₂) and H₂O which originates from deeper sources in the mantle ! Therefore we must take into consideration the possibility that certain amounts of the hydrocarbon reserves found close to impact structures could be the result of thermochemical processes which are going on during and after an impact event !

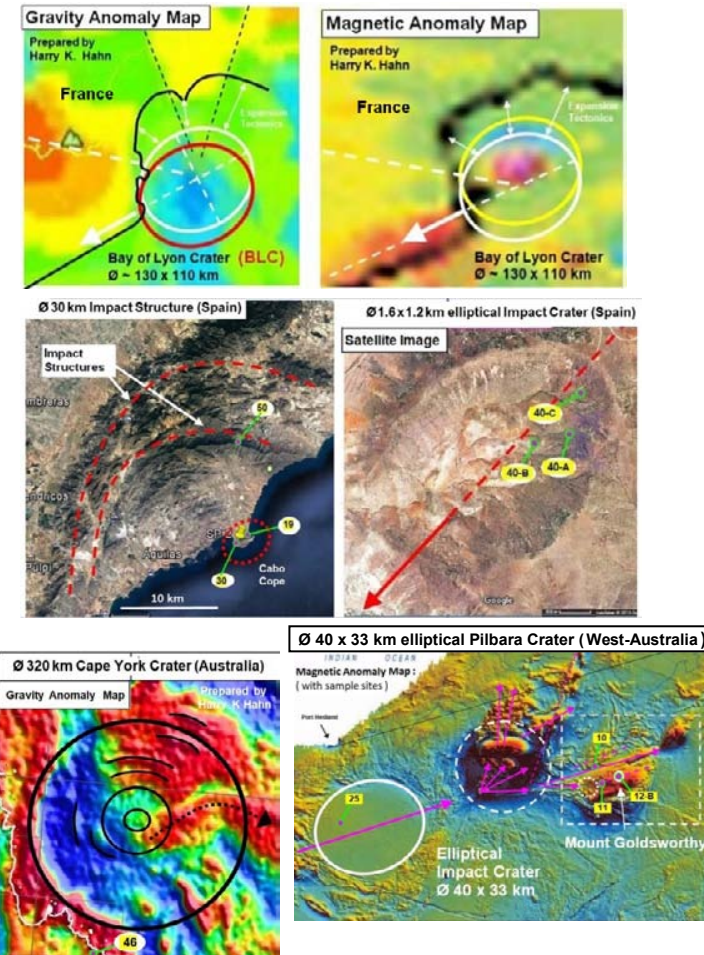
First indication for six PT- Secondary Craters :

I have found indication for shock-metamorphic effects in the rock-samples of **six possible Secondary Craters** of the PT-Impact Event.

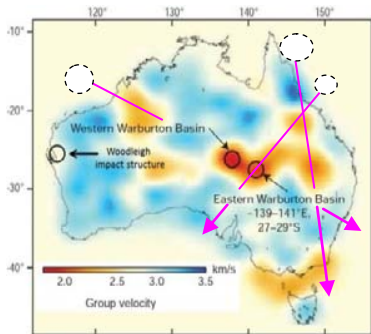
This provides the first scientific evidence for real impact structures caused by the PTI-event !

I used **Micro-Raman Spectroscopy on quartz-grains** to provide the evidence for a shock event, that in all propability was caused by the PT-Impact Shifts of the Raman peaks in quartz-samples of these six possible PT-secondary-craters indicate that the quartz-grains were shocked with a shock-pressure in the range of 20-22 GPa in some cases

This is clear indication for an impact shock event ! The most interesting PT-Secondary-Craters for further scientific research in Europe, to proof the PT-Impact Event, are the Ø 130 x 110 km „**Bay of Lyon Crater**“ and the Ø 30 km **Impact Structure** near Puerto de Mazarron and the Ø 1.6 x 1.2 km **elliptical Impact Crater** near Rodalquilar, both in southern Spain. In Australia the most interesting PT-Secondary Craters are the Ø320 km **Cape York Crater**, the Ø 40 x 33 km **elliptical Pilbara Crater** and the Ø 8 x 7 km **elliptical Warwick Crater**, as well as the possible Ø 30 km Mt Warning Crater. All these PT-Secondary Craters are unknown yet ! **A detailed analysis in Part 6 (P6)** of my hypothesis



There are still many other large-scale impact structures on Earth which need to be properly analysed, in order to figure out the correct tectonic model for Earth before & after the PT-Impact Event → e.g. the East- & West-Warburton Impact Basins.



→ see image on the left !
 There are two craters which formed the East- & West Warburton Basins approx. 300-360 Ma ago (estimated diameter \varnothing 100-200km each)
Weblinks :
[News Article 1](#) , [News Article 2](#)
[East-Warburton Basin](#)
[Eromanga Basin](#)
[\(Woolleigh Crater\)](#)

However this work must be carried out by experienced planetary scientists & geologists now, together with the analysis of all planets and moons

Because we need to know the root causes of all global impact events which took place in our Solar System and we need to find all impact structures !!

After reading this study about global impact events
What practical measures should be taken ??

1.) The first and most important measure must be the continuation of the research work, regarding global impact events and their causes & effects, which was started with this study here !

Scientists from many different disciplines must take on the challenge to find further evidence for the global impact structures described in this study

2.) Rock samples from all new impact craters and impact structures described in this study (Part 1-4) should be collected and analyzed.

3.) After the confirmation of the P/T-impact crater and related secondary impact structures a new

analysis & simulation of the tectonic processes in Earth's past, in the last 253 Ma, must be done !

4.) Then the cause of the expansion tectonic process, which obviously was triggered by the P/T-impact, must be found. And because there are other planets & moons in our solar system where expansion tectonic processes were triggered by a global impact event, a teamwork of scientists from different disciplines is required. To find the driving physical / chemical process for the mantle expansion visible on different planets and moons, a close collaboration of planetary scientists, geophysicists, geologists, chemists and physicists (especially with expertise in fission research and high-pressure / high-temperature material research) is required.

5.) A more precise and more detailed computer analysis of the collisions (pericenter events) of the Sagittarius Dwarf Galaxy with our galaxy must be done. In all probability debris- (mass) streams resulting from these collisions are the cause of periods of violent global impact events in our solar system ! That's why it is important to find out the exact composition, extension & the effects of the debris streams, caused by these collisions, on our solar system !!! The starting point of this analysis should be the study from Mr Chris Purcell

Important ! : Especially the effects and the position of the leading tidal tail of the **Sgr-DG** in the past (-300Ma) & in the future must be studied !!

6.) Because the distribution of metal-ores and energy resources, like crude oil or natural gas in Earth's crust, is mainly caused and defined by large (global) impact events, knowledge of the precise location and size of all impact craters on Earth is crucial for future explorations of ore deposits, and especially for the exploration and discovery of new large oil- and gas-deposits !!

Good knowledge of all large impact structures on Earth will make a big difference in future

explorations, in order to find these important energy- and ore- deposits for mankind !!

Especially the correlation of big impact craters with the formation and the development of large oil-fields & gas-fields must be precisely analysed !! It seems that in particular the impact-related tectonic motion of crust fragments and magma streams, which were created during large impact events, are an important condition for the development of large oil- and gas deposits !!

This correlation must be studied & analysed !

Having seen and analyzed the Permian-Triassic Impact and the global destruction which it caused :

THE FOLLOWING WARNING MUST BE GIVEN :

We must consider different worst case scenarios in regards to one or more impactors (asteroids or comets) which are on a collision course with our planet Earth !!! And we must find solutions, and build and install suitable defence technology in space, in order to deflect the impactors of all assumed worst case scenarios away from Earth !!!

Possible Worst Case Scenarios to consider !! :

1.) Accumulations of **Asteroids** and/or **Comets** with a density like in the **Asteroid Belt** are approaching from deep space and they are on a collision course with Earth, having velocities up to 100 km/s !!

2.) Up to 10 Asteroids in the diameter range of \varnothing 10-40 km with velocities of 20-100 km/s are on a collision course with Earth and all are arriving at the same time !! Pre-Warning Time < 18 months !!!

3.) A large **Asteroid** with \varnothing 200 km and a velocity of 100 km/s is approaching from deep space (from outside the solar system !!) and is on a collision course with Earth. Pre-Warning Time < 2 years !!!

As long as we don't exactly know what astrophysical processes have caused the global impact events within the last 300 million years, described in this study, we must take sufficient precautions !! in this violent and merciless universe !!

Because if we don't do so !!, Mankind and most other species on Earth could go extinct within a very short time !!, just like the Dinosaurs !!!

There are already some ideas and plans for the realization of technology to deflect small asteroids.

But every idea or plan which I have seen so far regarding the deflection of an asteroid or comet is far away from being able to cope with one of the described worst case scenarios !!!

If we are very lucky we could survive Worst Case Scenario 1.) But only if all asteroids or comets > Ø 10 – 20 km would miss our planet Earth !!!

Because we are not able to deflect such large impactors yet !!! We just don't have the required defense capability and technology to do that !!!

I have made an own assessment, and I found a few suitable defense strategies which are able to cope with large impactors, up to Ø 200 km !!

However these strategies only work if the required technology is installed in space (in defined locations in our solar system !) and if we are ready (well trained !!) to use this technology. And it would only be possible to cope with high-velocity Asteroids or Comets (with velocities >30-40 km/s) if the technology is installed with maximum rocket performance which is possible and if it would be installed on many locations in our solar system !!!

It would probably take at least 20 years to design, build and install such a defense system and it would probably cost ≥ US\$ 100 billion !

However if all members of the UNO cooperate in the effort to build such a defense system for our planet Earth, then it shouldn't be a problem to finance it !!! And it also shouldn't be a problem to

convince the UNO members to invest in such a defense system for our planet Earth !! Because this is really the only possible insurance against a global impact event and the extinction of mankind and the total destruction of our world !!

And we shouldn't wait until the devil comes around the corner! Fast and smart action is required !

How such a defense system for our planet Earth could look like is described in my following study :

→ see Weblink : **[“To the deflection of asteroids in the diameter range of 5 to 200 Km”](#)**

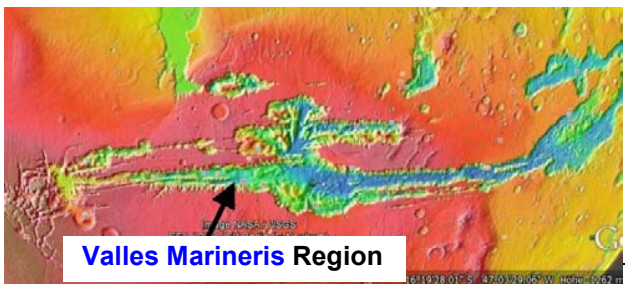
(This study will also be available at www.vixra.org soon. Just type-in my author-name in the search field and press enter. Then you will find the study.)

The interested readers should also have a look at the following Wikipedia page :

→ [Asteroid Impact Avoidance Strategies](#)

The strategies and the technology described in my above mentioned study : **“To the deflection of asteroids in the diameter range of 5 to 200 Km”** can also be used for doing Terra-Forming on Mars and on other planets & moons

With the described asteroid deflection strategies it would be possible to carry out controlled impacts of asteroids in the 10-20 km diameter range on Mars and on other planets & moons !!



The Valles Marineris is a deep 2400 km long Canyon on Mars probably caused by a crack in the crust of Mars.

Note : Mars' ocean water came out of the mantle here !

An action plan for Terra-Forming on Mars :

In order to create an additional “Second Earth” for Mankind we should perform Terraforming on Mars as quick as possible before the settlement starts !! With a controlled impact series of probably 3 to 4 asteroids in the Ø 10-20 km range a large crack in the crust of Mars could easily be produced.

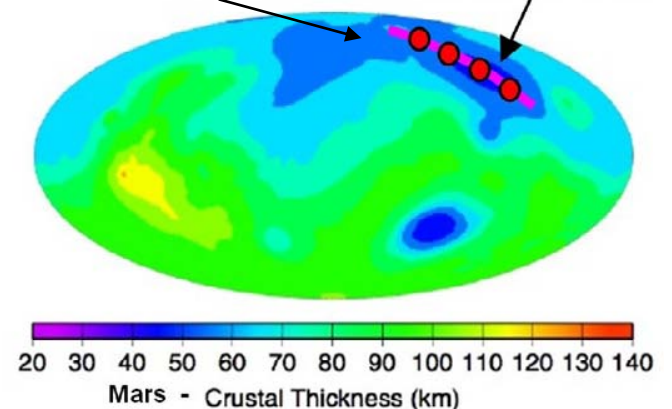
Alternatively a few 50 MT Fusion-Bombs located in 10km deep drill-holes can be used to achieve this.

In order to achieve the crack with the smallest possible impactor diameter & energy expense, the optimum area for the intended crack would be the thinnest crust area of Mars. This is in the center area of the northern lowland (→ the former ocean floor on Mars) Here the crust is only 40 km thick!

A large crack in this area should cause large amounts of volatiles (e.g. H_2O) to rise up to the surface, similar as it happened in Valles Marineris. This would quickly produce a small ocean near the crack and a thicker atmosphere, which would improve the living-conditions on Mars considerably!

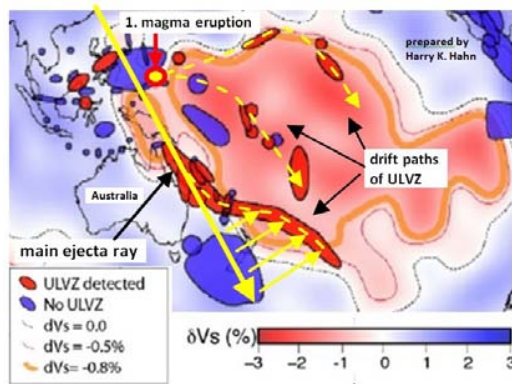
Such a Terra-Forming project should first be tested on another planet or moon which is located further away from Earth, and which is not a primary target for human settlements. It could be tested for example on Jupiter's moon Ganymede..

From this crack large amounts of salt-water from Mars' mantle can fill up the old ocean basin ! Ø 10-20 km impactors produce a crater chain which causes a crack



A few words to the dangerous Pacific-LLSVP :

An essential new discovery in comparison to the first edition of my study is the fact that the Pacific Plate and the expansion tectonics process which has formed it, is the result of ≥ 8 gigantic magma eruptions in the west pacific region over the last 200 Ma. These magma eruptions were caused by the Pacific-LLSVP-(ULVZ), which in all probability is a direct result of impacting ejecta of the PTI !



Further new discoveries were the Victoria Lake Impact event, the Canary Islands Impact event, the localization of the "Bay of Lyon" Crater, the correct position & orientation of the Indian Plate, Madagascar and South-America at the time of the PTI-event and some other new interdependencies.

Regarding the described magma eruptions in the West Pacific the following **Warning** must be given :

With high probability another magma eruption will take place in the west pacific region ! In all probability it will occur in proximity to the Fiji Islands. When it will happen is difficult to say ! Therefore the mantle area below the Fiji region must be examined with seismic tomography in more detail, e.g. the vertical velocity of the magma flow under the Fiji region must be measured ! **see Part 1**

Note that a new mass extinction, caused by another gigantic magma eruption of the Pacific-LLSVP, can begin at any time ! Within a short time period such a largescale magma eruption could kill up to 60% of all

species on Earth ! Like the other eruptions in the past it will cause an oceanic anoxic event (like the OAE-1a & OAE-2 and PETM (Paleocene-Eocene Thermal Maximum.), which will release vast amounts of CO_2 , H_2S etc. into the oceans and will kill up to 60% of all marine species. Largescale explosive volcanism with vast amounts of CO_2 released will be a result too (e.g. see Ajupa Island)

It could begin in a few years, or it may not happen in the next million years. But in all probability it will happen sometime within the next ~ 5 million years !

A solid column at the top end of the Pacific LLSVP near Fiji, which is located close to the surface, may be an indication of the next due magma eruption !

And there seems to be a connection between these magma eruption events in the west pacific region and the **62 Ma bio-diversity cycle** on Earth (\rightarrow Extinction-cycle with two half periods of ≈ 31 Ma)

In all probability some of these violent magma eruptions were triggered by extreme earthquakes, e.g. caused by impact events, like the Chicxulub-Impact in Mexico. Like a punch which triggers an eruption of the contents of a heated Coke-bottle, the shock waves of an extreme earthquake may finally trigger a magma eruption from the Pacific-LLSVP (\rightarrow caused by a sudden pressure spike) !

But to make it clear : We are looking at two different periodic cycles here !

The periodic magma eruptions of the Pacific-LLSVP are caused by thermochemical processes which are going on inside the LLSVP & ULVZ. There seem to be longterm thermochemical processes at work with cycle lengths of 10 - 30 Ma (million years).

(\rightarrow the cycle length seems to decrease over time)

Please note : It may also be the case that a large amount of superheated mantle-water streams out of the Mid-Ocean-Range-crevices before a magma eruption starts, causing in this way climate change and sea-level rise !! see weblink to : [News Article](#)

And the final stage of this cycle, the magma eruption, can be triggered by an outer shock event The 62 Myr Bio-Diversity Cycle (or 62 Ma Extinction-cycle !) is caused by a precise periodic astronomical event going on for at least 500 Ma !

In all probability it is caused by the periodic crossing of the galactic plane by our solar system every 31 Ma. Every second crossing of the galactic plane seems to be particularly dangerous, because it has produced a worldwide mass extinction every time for the last 8 (62 Ma)-cycles !

6 of this 8 crossings caused a mass extinction each time, killing ≥ 70 % of all marine species on Earth ! Because our solar system moves along a spiral path around the galactic center, at every second crossing our solar system crosses the same ring area of the galactic plane, which in all probability is densely packed with debris resulting from collisions of our Galaxy with the Sagittarius Dwarf Galaxy (Sgr-DG).

And to point this out : Our solar-system is currently crossing the galactic plane in this obviously dangerous ring-area ! We know that the last worldwide extinction took place 65 Ma ago !

Therefore the next worldwide extinction event seems to be overdue and can happen at any time ! Maybe we just haven't passed the dense debris-layer yet !

By the way : This assumed debris-ring (or debris accumulation) may be the cause of the Oort Cloud (\rightarrow the source area of comets !) around our solar system, and the densely packed debris ring(s) in the galactic plane (similar to Saturns ring) may offer an alternative to explain the Dark Matter problem !!

Looking at the other global impact events which I have discovered on the planets Venus, Mars & Pluto, and on the moons Ganymede & Charon, which all indicate orbit inclinations $\geq 40^\circ$ for the original orbit of the impactors (comets or asteroids), then it certainly must be taken into consideration that the impactors came from outside our solar system !! \rightarrow either from the Oort Cloud, or from the assumed debris ring (layer) in the galactic plane !

Because these global impact events probably all occurred within the last ~250 Ma, we must expect large impactors which are coming with high velocity from deep space !

As long as we don't exactly know the physical process which has caused the global impact events within the last 300 million years, described in this study, we must take sufficient precautions !!

Because we are not able to deflect such large impactors yet ! We just don't have the required defence capability and technology to do that !

Therefore an asteroid- & comet deflection system must be built which protects our planet!

I have made an own assessment, and I found a few suitable defence strategies which are able to cope with large impactors, up to Ø 200 km !!

How such a defence system for our planet Earth could look like is described in my following study :

See : → [“To the deflection of asteroids in the diameter range of 5 to 200 Km”](#)

It will probably take at least 20 years to design, build and install such a defence system and it would probably cost ≥ US\$ 100 billion ! But it is our responsibility to build such a system !

It is also our task & responsibility to settle on our neighbour planet Mars as soon as possible, and to establish an independent civilisation on Mars, which doesn't need support from Earth to survive !

This is the only way to make sure that our advanced technological civilisation will survive in the case of a global impact event on Earth, caused by a large impactor coming from deep space, or in the case of another gigantic magma eruption caused by the Pacific LLSVP !

We may be able to build a defence system against a large impact on Earth. However it's not possible to build a defence system against a gigantic magma eruption coming from Earth's mantle !!

That's why the development of nuclear drives for spaceships must be accelerated. We need much more payload capacity ! Instead of just being able to lift 10 tons into orbit, we need payload capacities of thousands of tons to really make progress in establishing settlements on Mars and on other planets and moons. If we shift our focus to the development of nuclear driven spacecraft we can achieve this within a few decades !

Please note that 10 kg enriched Uranium contain as much energy as thousands of tons of rocket fuel ! We already have enough fuel (enriched uranium) to build hundreds of spaceships with payload capacities ≥ 1000 tons ! The weapons industry worldwide must be redirected to build such large spaceships, and the space-technology which we need for the colonization of Mars, instead of ever-increasing the weapons-piles on Earth ! We must shift our focus !

At last a few words to our political leaders :

The G20 & UNO must set a new framework, so that “Resource Wars” can't happen anymore !

Therefore I suggest an **Action Plan** and a **number of Global Regulations** with the following goals :

1.) **Secure & explore the required resources for mankind far in advance before they are needed !**

2.) **To define which resources should be extracted first and which ones should be put on hold**, in order to minimize the environmental impact of the mining industry, in particular regarding very sensitive natural environments.

3.) Altogether there should be a **better longterm planning for a safe and environmental friendly resource exploitation worldwide.**

Speculation on commodity markets must be restricted by setting bandwidths for trading !

Commodity prices must be forced into defined bandwidths to provide stability for world's economy.

A worldwide analysis of all available mineral- and energy- resources and -reserves must be carried out under control of the UNO and G20.

A precise projection of the resource needs for the next 30 years must be done, and a 30 Year plan for food-, water-, energy- and mineral resources supply for mankind must be set up.

Because the next 30 years will be the most challenging time in human history, with maximum resource consumption !

→ see Part 4 of my study for further information

4.) **Mining industries** which are critical for the resource supply for mankind **should be under observation and protection of the UNO & UNSC.** (for example the crude oil exploration industry)

5.) **More food and energy reserves (oil & gas) must be kept in stock** (e.g. during the coming very low sun-spot-cycle minima, in which cold Winters and shortened harvest seasons must be expected !) (see following links : [link_1](#) , [link_2](#) , [link_3](#) , [link_4](#))

6.) The **population growth** in the fastest growing countries **must be reduced as quickly as possible** with the financial help from the G20 & UNO.

And much more irrigated farmland is required !!

A Top-Down Approach is required to reduce resource consumption ! First it must be defined how much resources can be used over the next 30 years. Then all key-industries must get limits for the use of resources, which they shouldn't exceed !

We need to refocus !!! We must start many international projects where all members of the UNO & G20 work together to achieve a better and saver life for all people, a healthy environment and in general good & positive visions for mankind !

One of these positive visions must be the Realization of a constant Settlement of Mankind on Mars → realized by the G8, G20, EU and the UNO !

Other important visions for mankind must be : (→ also realized by the G8, G20, EU and the UNO !)

That we really must get serious Now about the Protection of the remaining Rainforests on Earth, otherwise they will be gone in 10 years !! and with it millions of rare species !! The rich countries must pay compensation to the Rainforest-Countries in order to achieve this goal !

The rainforests are the lungs and filters of our atmosphere, and they reduce climate change !!!

And the species which live in the rainforests (plants & animals) contain billions of highly interesting organic substances for mankind, which all have the potential to create great progress for mankind and big profits for the Pharmaceutical- and the Chemical-Industry for hundreds of years into the future !

That's why it should be a high priority for the big Investment Banks and the world's Pharmaceutical- and Chemical-Industry to protect the Rainforests !!

The Pharmaceutical- and Chemical-Industry together with Investment Banks and governments should work out contracts in which they agree to pay money to the Rainforest-Countries for the longterm protection of the Rainforests. For this they would get e.g. exclusive rights for the copying & using of interesting organic-substances & molecules found in the Rainforest Species. This will be a Win-Win situation for both parties and for the rainforests !

And we must get serious about removing the plastic waste from the rivers and oceans !!!

The source of plastic waste which ends up in the world's oceans is plastic-waste which gets dumped in rivers and flood-areas !

This happens especially in highly populated mostly asian countries and in India. The ten biggest rivers in these countries transport ≈ 70-80% of the plastic waste into the world's oceans !

Especially the monsoon-rain and the following floods transport all plastic waste from the once- a-year flooded areas into the worlds oceans !

To prevent this pollution the authorities in these countries must define dumping-sites for waste on higher flood-save areas, and there must be high penalties for dumping waste elsewhere !! Penalties for poor people who pollute the environment could be that they must help for a week to collect waste.

Cleaning up the oceans with specialized machines won't work. The task is just to big !!

The root-cause must be eliminated, which is the dumping of waste in rivers and flood-areas !!

It's high time to get serious on all this tasks !!!

The Author : Harry K. Hahn - 8.7.2017

(update 18.1.2021)

Here the weblinks to the Parts 1 to 6 of my hypothesis

→ They are available on vixra.org and on archive.org

Weblinks to my studies on → vixra.org :

Weblinks to my studies on → archive.org

Part 1 : <https://vixra.org/abs/2012.0210>

[Study-Part 1](https://archive.org)

Part 2 : <https://vixra.org/abs/2101.0052>

[Study-Part 2](https://archive.org)

Part 3 : <https://vixra.org/abs/2101.0096>

[Study-Part 3](https://archive.org)

Part 4 : <https://vixra.org/abs/2101.0067>

[Study-Part 4](https://archive.org)

Part 5 : <https://vixra.org/abs/2101.0127>

[Study-Part 5](https://archive.org)

Part 6 : <https://vixra.org/abs/2104.0099> → see also : [Part 6b](#)

[Study-Part 6](https://archive.org) and : [Study-Part 6b](#)

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2. A.H.F. Robertson, D. Mountrakis : **Tectonic Development of the Eastern Mediterranean Region** ; Geological Society, Special Publication 260
3. G. Moratti, A. Chalouan : **Tectonics of the Western Mediterranean and North Africa** ; Geological Society, Special Publication 262 ; London 2006
4. W. Frisch, M. Meschede, Ronald Blakey : **Plate Tectonics** ; Germany 2011, Springer Verlag ; ISBN : 978-3-540-76503-5 , (e-ISBN: ...-76504-2)
5. G.R. Foulger, D-M. Jurdy : **Plates, Plumes, and Planetary Processes** ; The Geological Society of America, Special Paper 430 ; Boulder Colorado 2007 ; ISBN: 978-0-8137-2430-0
Interesting Chapters : 1.) **Speculations on Cretaceous tectonic history of the northwest Pacific and a tectonic origin for the Hawaii hotspot** ; Ian O. Norton
2.) **An alternative Venus** ; Warren B. Hamilton. 3.) **The OIB paradox** ; J. Godfrey
6. R. Hekinian, P. Stoffers, J.L. Cheminee : **Oceanic Hotspots** ; Germany 2004, Springer Verlag ; ISBN: 3-540-40859-2
7. P. Kearey, F.J. Vine : **Global Tectonics** , England 1996, Blackwell Science Ltd. , ISBN : 0-86542-924-3
8. **The African-Superplume (LLSVP) a whole mantle structure, Start at 33 minutes** by Andy Nyblade, from the University of the Witwatersrand (South-Africa)
9. Two studies about Carbonatite Lava: [Study 1](#), [Study 2](#) see also: [Movie 1](#), [Movie 2](#)
10. **Permian-Triassic Extinction Event** : → Two informative studies about the P/T-event
Study 1 : [Study_1](#) ; Study 2 : [Study_2](#)

Impact Cratering :

8. C. Koeberl, F. Martinez-Ruiz : **Impact Markers in the Stratigraphic Record** 2003 ; Springer Verlag ; ISBN : 3-540-00630-3
9. G. R. Osinski, E. Pierazzo : **Impact Cratering** ; USA 2013, Wiley-Blackwell Publication ; ISBN : 978-1-4051-9829-5
→ companion website of book : www.wiley.com/go/osinski/impactcratering
10. W.U. Reimold, R.L. Gibson : **Meteorite Impact** ; Council for Geoscience, Germany 2009, Springer Verlag
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12. I. De Pater, J.J.Lissauer : **Planetary Sciences** ; USA 2010, Cambridge University Press , ISBN : 978-0-521-85371-2
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3.) **Geol. recent water flow in the NE Sulci Gordii region, Mars** ; M.C.Towner...
15. C. Vita-Finzi, D. Fortes : **Planetary Geology** ; London 2013, Dunedin Publ.
16. Kent C. Condie : **Earth as an Evolving Planetary System** ; 2011, Elsevier Academic Press, ISBN : 978-0-12-385227-4
17. J.I.Lunine : **Earth Evolution of a Habitable World** ; 2013 , Cambridge University Press, ISBN : 978-0-521-85001-8

Interesting Online Documents & Websites :

Note : If weblinks don't work, then type-in or copy the shown web-address directly in your internet browser, or search with titel & author !

Images of **Rock-samples & Sample sites** of some of the described impact structures can be found on these websites : www.permiantriassic.at or www.permiantriassic.de

- 1.) Introduction : **Impact Metamorphism** , by Dr. Ludovic Ferriere
→ <http://www.meteorimpactonearth.com/impactmeta.html>
- 2.) **Numerical modelling of basin-scale impact crater formation**; R.W.K. Potter
→ <http://www.lpi.usra.edu/lpi/potter/publications/RossThesis.pdf>, see also: [Orientale impact](#)
- 3.) **Cycles in fossil diversity** : R.A. Rohde, R.A. Muller, 2005, www.nature.com
→ <http://muller.lbl.gov/papers/Rohde-Muller-Nature.pdf> → see Introduction in my study
- 4.) **The Sagittarius impact as an architect of spirality and outer rings in the Milky Way**, C.W. Purcell & others, → see also : [Computer Simulation](#)
→ <http://arxiv.org/ftp/arxiv/papers/1109/1109.2918.pdf> - (www.youtube.com → type in titel !)
→ Presentation: http://hipacc.ucsc.edu/Lecture%20Slides/GalaxyWorkshopSlides/purcell_santacruz2011.pdf
- 5.) **Asteroid/Comet Impact Craters and Mass Extinctions** , Michael Paine
→ <http://users.tpg.com.au/users/tps-seti/crater.html>
- 6.) **Brooks Range (Alaska) Orthogneiss : SHRIMP Zircon Analysis of the complex U-Pb situation** ; USA 1999, J.Toro, W.C. McClelland, T. Ireland
→ <http://pages.geo.wvu.edu/~jtoro/Research/shrimp/shrimp.htm> → Chapter 2 in my study

- 7.) **A Breakup of Pangaea and plate kinematics of the central Atlantic and Atlas regions**, A.Schettino, E.Turco → <http://gji.oxfordjournals.org/content/178/2/1078.full>
- 8.) **Stresses that drive the Plates from below**, Peter Bird, Z. Liu, & W. K. Rucker → http://peterbird.name/publications/2008_torque_balances/2008_torque_balances.htm
- 9.) **A crustal thickness map of Africa derived from a global gravity field model** ; G.E. Tedla & others, Geophysical Journal International 2011 → http://www.africaarray.psu.edu/publications/pdfs/Tedla_et_al_GJI_2011.pdf → see Ch.4
- 10) **Fraser Range – West-Australia** : current theory of the geology explained → <http://www.oriongold.com.au/wa-fraser-range> → see last page in Chapter 5 in my study
- 11) **Triassic-Jurassic Rifting : Continental Breakup and the Origin of the...**
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- 12) **To the deflection of Asteroids in the diameter range 5 to 200km**; Harry K. Hahn → <https://archive.org/details/ToTheDeflectionOfAsteroidsInTheDiameterRangeOf5To200Km>
- 13) **Ghawar / Saudi Arabia - The world's largest oil-field**, Energy Consulting Group → http://energy-cg.com/OPEC/SaudiArabia/OPEC_SaudiArabia_Ghawar.html
- 14) Publications of **Dr Andrew Glikson**: → <http://archanth.anu.edu.au/staff/dr-andrew-glikson>
→ Studies about large-scale impact events in Australia
- 15) **Info to the Sagittarius Dwarf (Elliptical) Galaxy (SagDEG)** :
<http://www.solstation.com/x-objects/sag-deg.htm>
- 16) **A 2MASS ALL-SKY VIEW OF THE SAGITTARIUS DWARF GALAXY. V. VARIATION OF THE METALLICITY DISTRIBUTION FUNCTION ALONG THE SAGITTARIUS STREAM**
→ <http://authors.library.caltech.edu/16714/1/CHOapj07.pdf>
- 17) **Galaxy: VI. s-Process and Titanium Abundance Variations Along the Sagittarius Stream**
→ <http://arxiv.org/pdf/0911.4364v1.pdf>

Animations, Simulations & Movies in the Web :

- 1.) **3D-Impact Crater Simulation** , Museum für Naturkunde / Berlin
→ **Clic on the images to run the animation !!** :
→ <http://www.isale-code.de/redmine/projects/isale/wiki/Media>
(Especially watch the 3. animation !! clic on the third image !)
- 2.) **The Sagittarius Impact as an Architect of Spirality and Outer Rings in the Milky Way**
→ <https://www.youtube.com/watch?v=pig-ugRehNM&feature=youtu.be>
- 3.) **Two more animations which show the current collision situation with the Sgr-DG !**
Sagittarius Dwarf Galaxy flyaround : → <https://www.youtube.com/watch?v=qfujsDMI0jU>
The Sagittarius Dwarf galaxy and the Milky Way → <https://www.youtube.com/watch?v=SxJkTDtCG5w>
- 4.) **Ganymede - Rotating Globe Geology** , NASA Jet Propulsion Laboratory
→ <https://www.youtube.com/watch?v=Jkerr60mhf8>

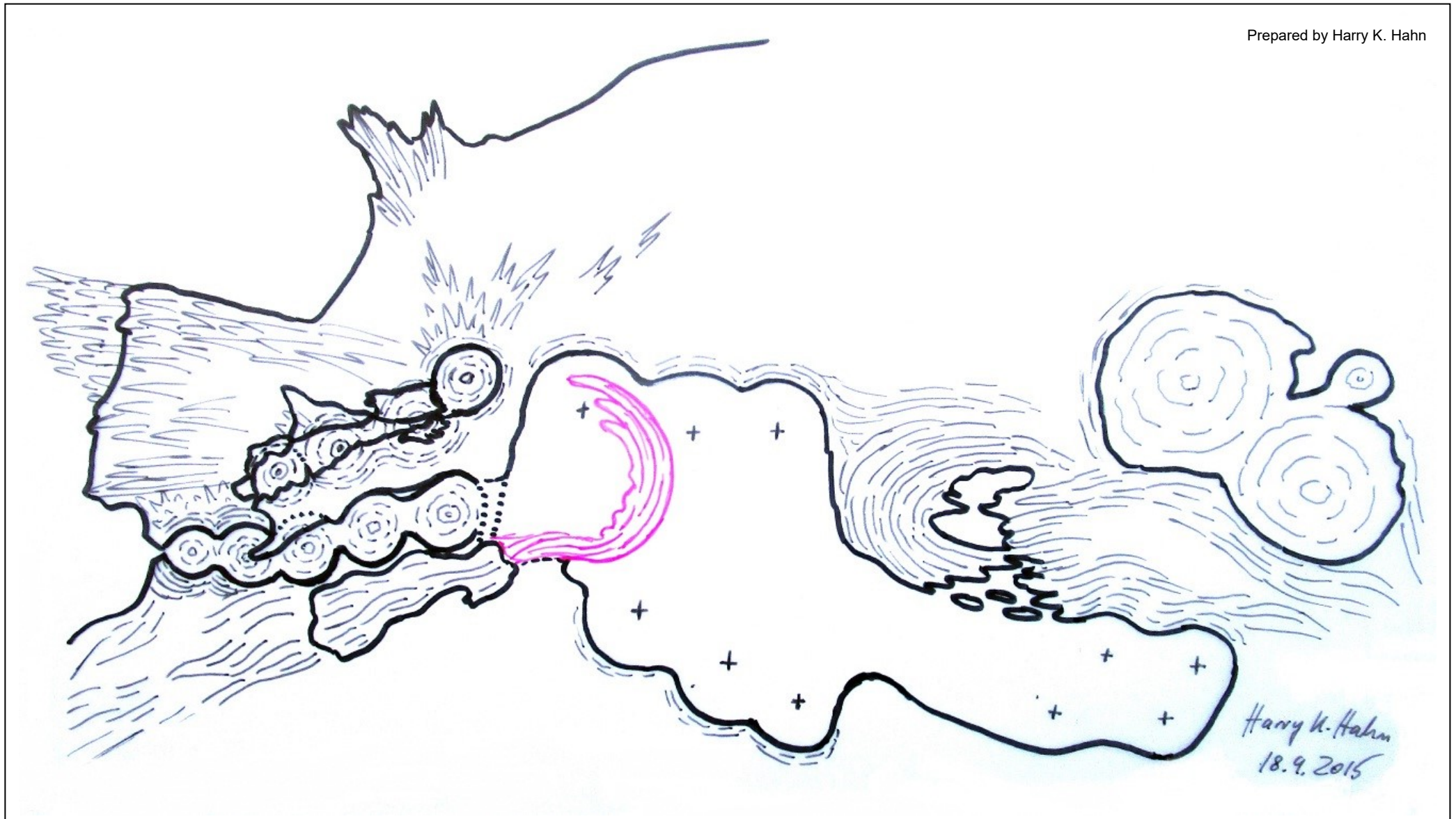
- 5.) **Mars - Rotating Globe Geology, Topography & Gravity texture** , USGS
→ Geology : <https://www.youtube.com/watch?v=quZMhSohIEU>
→ Topography : <https://www.youtube.com/watch?v=TFmWI5O9My4>
→ Topography & Gravity Map : <https://www.youtube.com/watch?v=BIPKqLwmXK0>
- 6.) **Permian-Triassic Extinction Event** : → Three informative movies about the P/T-event
[PT_Movie 1](#) ; [PT_Movie 2](#) ; [PT_Movie 3](#)
- 7.) **Global 3D-tomographic model of Earth's mantle** , by David Pugmire & others
→ A joint Tomography was used. Simulation made with ORNL Supercomputer
- 8.) **The Ring of Fire from below (Earth's mantle)** , by Scott Burdick
- 7.) **At last : Titanic Impact Energy unleashed !! Andromeda/Milky Way Collision**
→ **A must-seen for Impact-Researchers !!**: <https://www.youtube.com/watch?v=PrIk6dKcd0U>
From Prof. **Jeffrey Kenney** from Yale University
→ **See also the following animation** : <https://www.youtube.com/watch?v=1keSq3Wg024>

References regarding the Global Expansion Tectonics Theory :

- 1.) **Global Expansion Tectonics - A more rational explanation** - by James Maxlow
→ http://tmgnow.com/repository/global/expanding_earth.html → see Introduction in my study
- 2.) **Website of Dr. James Maxlow** : <http://www.jamesmaxlow.com/>
- 3.) **The expanding Earth: a sound idea for the new millennium** , Giancarlo Scalera
→ <http://www.earth-prints.org/bitstream/2122/1152/1/A%20SOUND%20IDEA%20....pdf>
- 4.) **Expansion Tectonics** ; → <http://db.naturalphilosophy.org/topic/?topicid=1>
- 5.) **Expanding Earth vs. Plate Tectonics** , Geologist 2010, Timothy Casey B.Sc.
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- 6.) **Microscopic structure of water at elevated pressures and temperatures**
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- 7.) **Factors Influencing the Eruption of Water-Based Magmas through Europa's Ice Crust.** L. Wilson, J.W. Head; → <http://www.lpi.usra.edu/meetings/lpsc97/pdf/1139.PDF>
- 8.) **Water content in arc basaltic magma in the Northeast Japan and Izu arcs**
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- 9.) **Role of Water in Magma Generation and Initiation of Diapiric Uprise in the Mantle**, P.J.Wyllie, → <http://authors.library.caltech.edu/51417/1/jgr12274.pdf>
- 10) **Volatiles in subduction zone magmas** , USA 2003, P.J.Wallace
→ http://www.geo.mtu.edu/EHaz/ConvergentPlatesClass/wallace/Wallace_2005_SOTA.pdf
- 11) **Composition of Earth's mantle → new research results**, Li Zhang , Yue Meng
<http://www.anl.gov/articles/composition-earth-s-mantle-revisited-thanks-research-argonne-s-advanced-photon-source>

Appendix : The Evolution of Europe : It started with the impact of Ejecta from the **PT**-Impact around 253 Ma ago

The following drawing shows what happened around 253 Ma ago when the ejecta from the **PT₂**-Impact near the north-pole impacted in the European Region. At that time whole Europe was an impact area which was hit by at least a dozen large impactors with diameters in the range of 5 to 20 km, which produced a series of craters which fractured Earth's crust and formed several crust fragments. Because of an opening-up of the mediterranean area, caused by the **PT₃**-Impact itself and the impact of the ejecta, a large vortex was triggered (marked with purple lines) which probably reach down > 100 km to the **Asthenosphere**. This vortex then caused the further evolution of Europe. → **see next pages !**



→ Note : Scroll up & down the next three pages quickly to see an animation of the tectonic evolution of Europe !!!

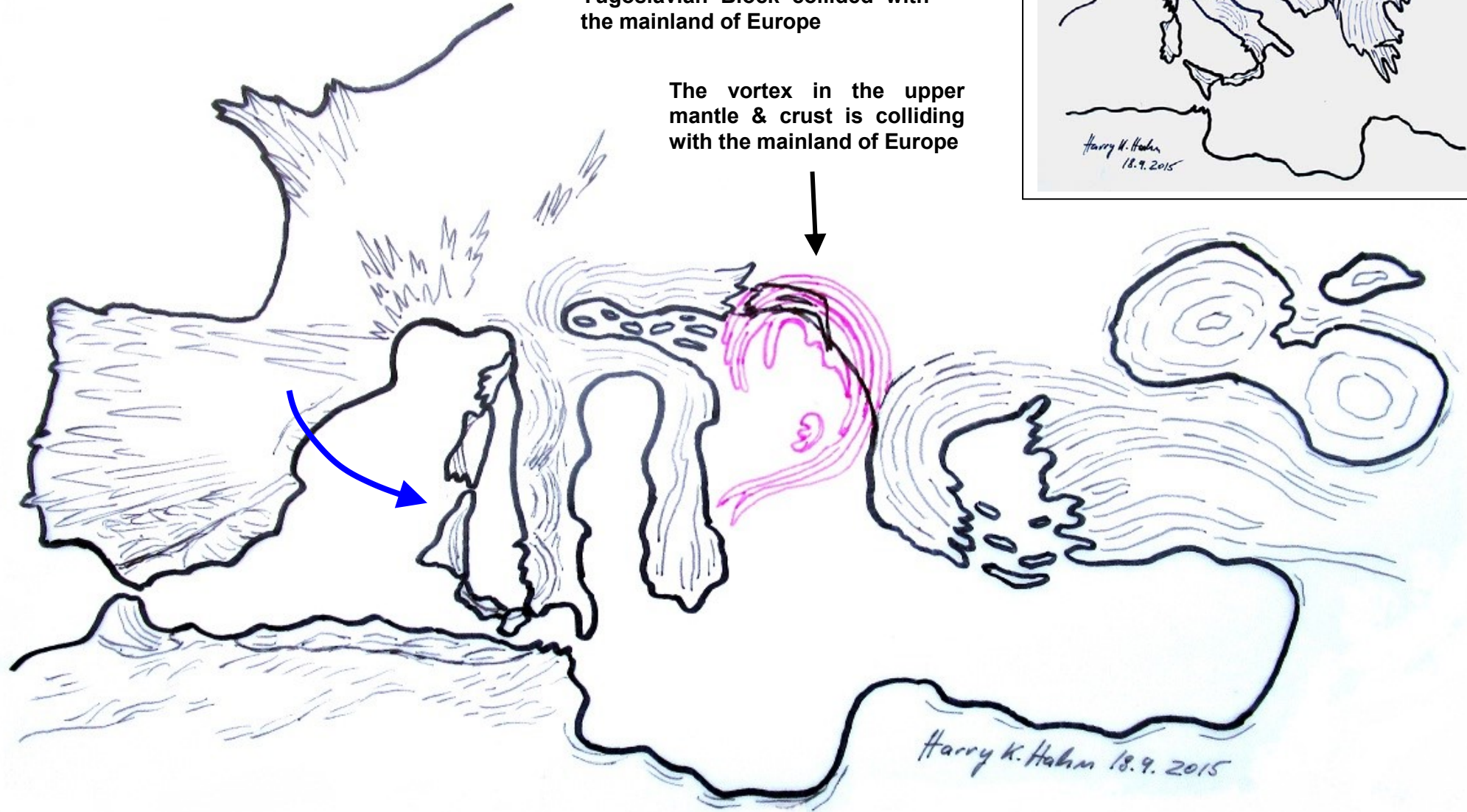
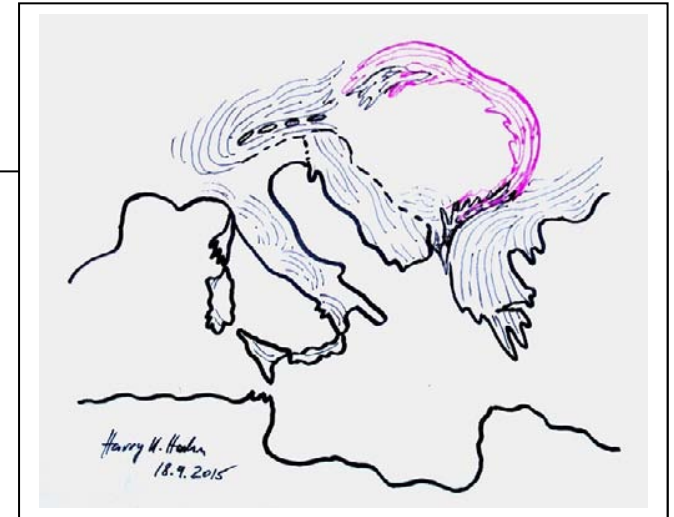
The flow of mantle material in the vortex then moved Italy slowly towards East

The resulting rotary movement of Italy around its last fixing point with the main land Europe, caused by the vortex in the upper mantle & crust, started to form the Alps :

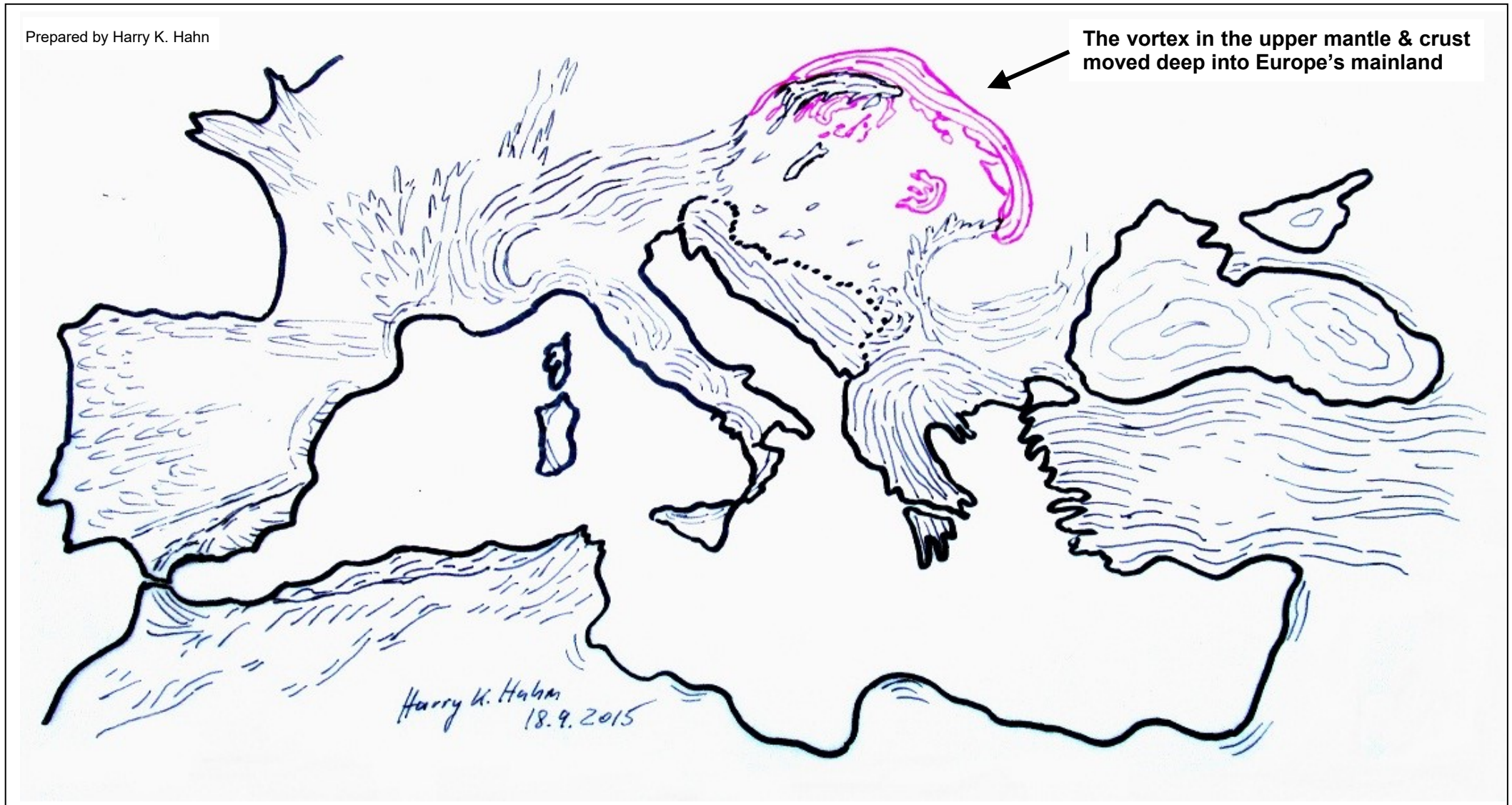
Prepared by Harry K. Hahn

The tectonic situation when the Yugoslavian Block collided with the mainland of Europe →

↓
The vortex in the upper mantle & crust is colliding with the mainland of Europe



Here now the present appearance of Europe today, 253 Ma years after the impact of the ejecta from the **PT-Impact**
The continuous rotatory movement of Italy around its fixing point has produced the Alps and other mountain ranges in Europe.



→ **Note** : Scroll up & down the last three pages quickly to see an animation of the tectonic evolution of Europe !!!