The 1270 x 950 km Permian-Triassic Impact Crater caused Earth's Plate Tectonics of the last 250 Ma

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Germany, July 2017

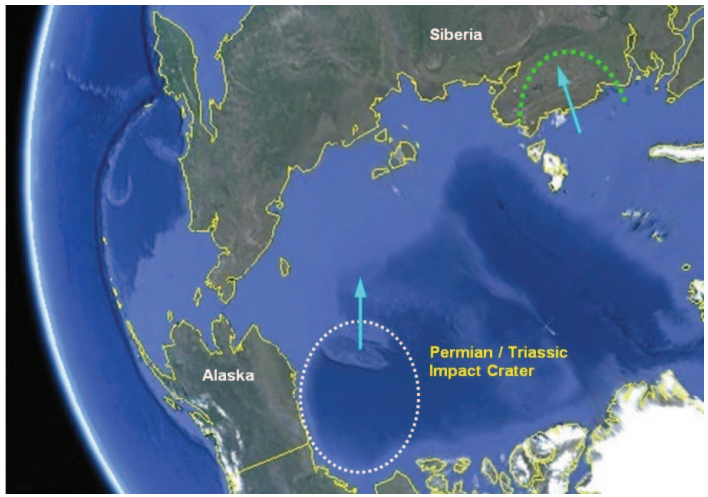
Abstract :

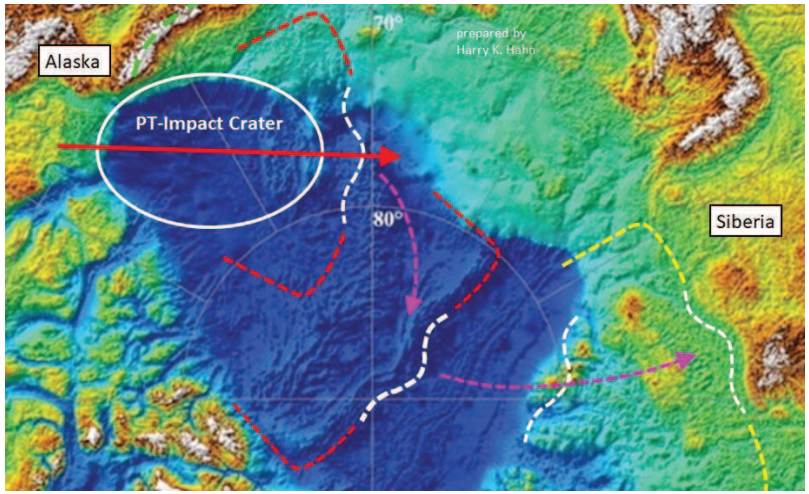
There is evidence for an enormous elliptical impact crater with the dimensions of **1270 x 950 km** in the ocean floor of the Arctic Ocean. This elliptical impact crater and the dynamic effects of the ejected material have formed the deep sea basin area below -3000m in the Beaufort Sea.

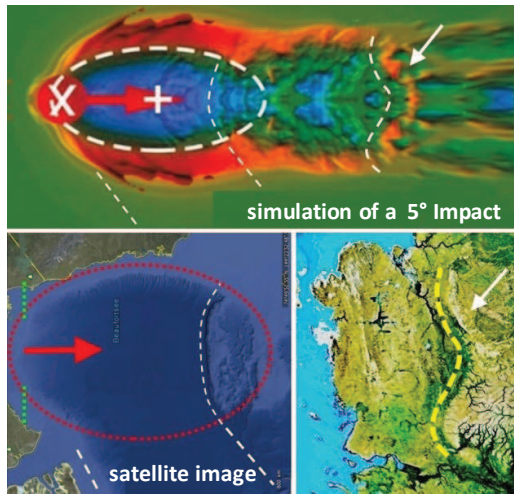
The assumed impact crater seems to be responsible for the Permian-Triassic boundary ~253 million years ago, which has caused the biggest mass extinction in Earth's history. This Permian-Triassic(PT)-Impact Crater was formed by an oblique impact. This means that the impactor, an asteroid or comet in the diameter range of probably 60 to 200 km, collided with our planet at a very shallow angle, of probably less than 8° , with a relative low impact velocity of around 8 km/s.
A computer simulation shows a close correlation between the topography of the assumed P/T-Impact Crater and the topography of a simulated elliptical impact crater that was created under similar conditions. The PT-Impact Event caused a gigantic butter-fly shaped ejecta blanket which covered the majority of the northern- and southern 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.

Please also read **Part 2** of my hypothesis, where I describe many of the secondary impact-craters and -structures in more detail, which were caused by the PT-Impact Event. In Europe probably up to 20 large secondary craters were caused. In India a secondary impactor produced a 450 x 380 km elliptical crater which formed the Bay of Bengal. A similar crater was caused off the NW-coast of Australia. In South-America a large 840 x 630 km was found. And in Africa four extensive impact crater chains were caused.

The impulse of the PT-impact and the impulses of the ejecta and secondary crater impacts, which were produced by the ejecta material, caused a global fracture pattern on Earth's crust that was the trigger for the break-up of Pangea and a global expansion-tectonic process which is still going on today. The topographic map and the ocean floor age map of the Pacific Plate provide further evidence of the PT-Impact Event and the resulting expansion tectonic process caused by the Permian-Triassic Impact Event.







Mid of 2012 I informed ~ 10 geologists and impact researchers about the discovered 300 km diameter Cape-York Crater and other possible impact structures on Australia's east coast. End of 2015 I informed the head office & geologists from the University 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 was : My discoveries aren't explainable with the current state of geophysics

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 proof 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 April 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 succeded 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 Sibirian 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.

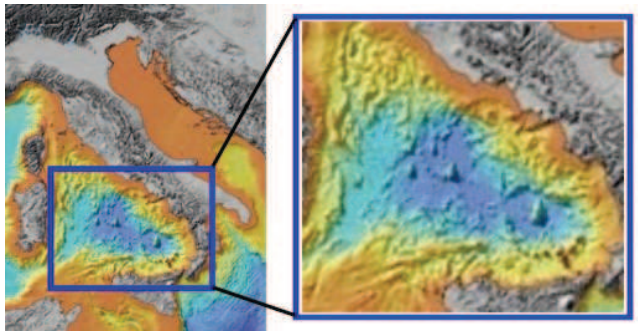
Page 111 : We propose that the Siberian Traps, which are accessible and currently under considerable scrutiny, may be better explained by a large impact than by a conventional mantle plume. The closure of a former ocean between Siberia and Mongolia, as well as amalgamation with north and south China blocks may also have been occuring 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** in 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 collided with our planet at a very shallow angle of probably less than 8°.

The impactor, an asteroid or a carbon-rich comet with a diameter of 60 to 150 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. In Europe (in the mediterranean area) at least 8, but probably up to 20 such large secondary craters were formed by the impacting ejecta, which was thrown out of the PT-impact crater. These impact craters and the resulting large-scale magma (lithospheric) flow is responsible for the tectonic development of Europe during the last ~253 Ma. Two of these secondary craters (∅160 & ∅220 km), which formed the Tyrrhenian Sea north of Sicily (Italy) and which are still noticeable on topographic- & geological maps (see below), should provide the evidence to confirm the described impact scenario



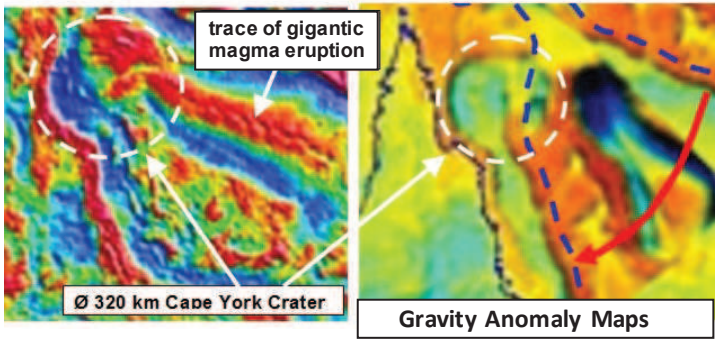
The main impulse of the PT-impact, together with the impulses and secondary craters, produced by the ejecta material, caused a global fracture pattern on Earth's crust, which was the trigger for the break-up of Pangea and a global expansion tectonic process. This expansion tectonic process caused the dichotomy on Earth → the formation of continents and ocean basins. And it is responsible for the transport of large amounts of volatiles from Earth's mantle to Earth's surface. Earth's diameter increased from an estimated diameter of 6500-7500 km ~253 million years ago to a diameter of 12756 km today, with an average expansion rate of ~ 20mm/year. The expansion of Earth was caused by abrupt decompression of Earth's mantle, which led to the large-scale expansion of volatiles, especially H_2O (water), in Earth's mantle. Through the sudden decompression of Earth's mantle, caused by the extensive fracturing of Earth's crust, the solubility of H_2O and other volatiles in the mantle material decreased below the volatile concentration. That's why Earth's mantle became super-saturated with H_2O and other volatiles (e.g. CO_2 & SO_2), which then started to exsolve and form small gas-bubbles in the mantle material. These gas-bubbles continued to grow, and they were responsible for the transport of magma and volatiles (especially H_2O) to Earth's surface, through the overpressure which they caused in the mantle material. 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 (H_2O) over the last 253 Ma. This water was, and still is, transported from Earth's mantle to Earth's surface through the fractures caused by the PT-impact, and through the Mid-Ocean Ridges were the new surface areas of our 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 this study, in all probability all took place within the last 300 million years !

But back to the Perm-Triassic (PT)-Impact ! :
The main impulse of the Perm-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, were China and Australia were located at that time. The following powerful south-ward 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 (→ 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.

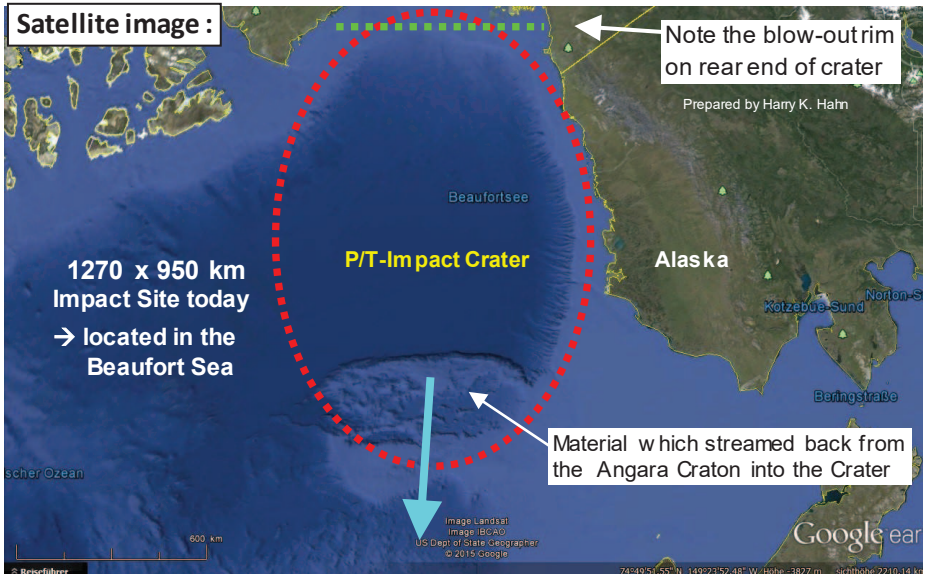
A large elliptical crater with the dimensions of 840 x 630 km , found in South-America, which can be identified on topographic maps and on satellite images, may also be related to the PT-impact event.

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 !

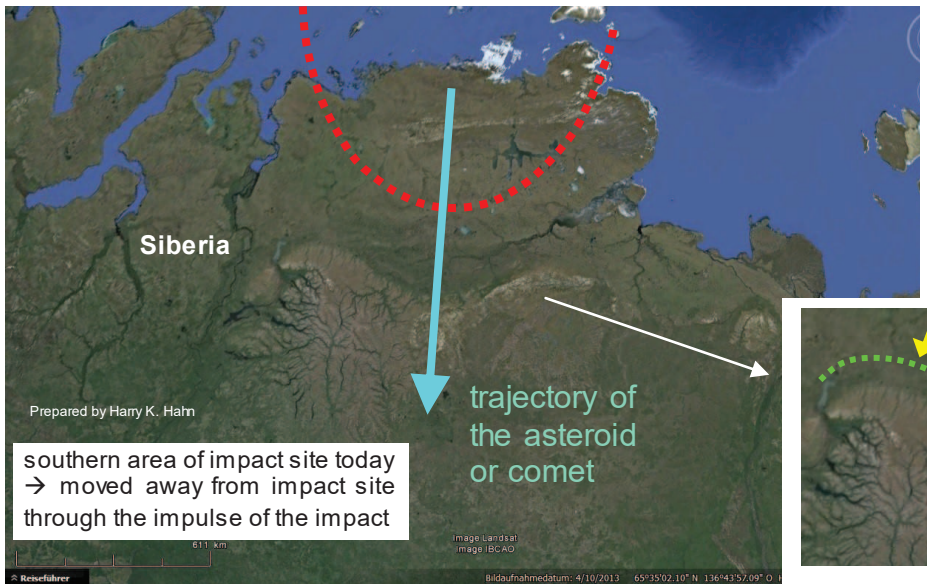
1 253 Million years ago a big Asteroid or Comet collided with Earth and caused a 1270 x 950 km elliptical Impact Crater

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 [1], 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.

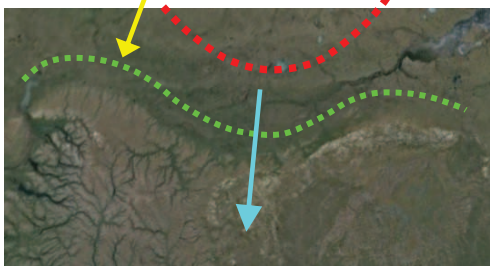
The following images and explanations describe the impact event and its effects on our planet Earth during the ~ 253 million years from this event. As everyone can imagine, this powerful impact event completely reshaped our Earth's appearance !

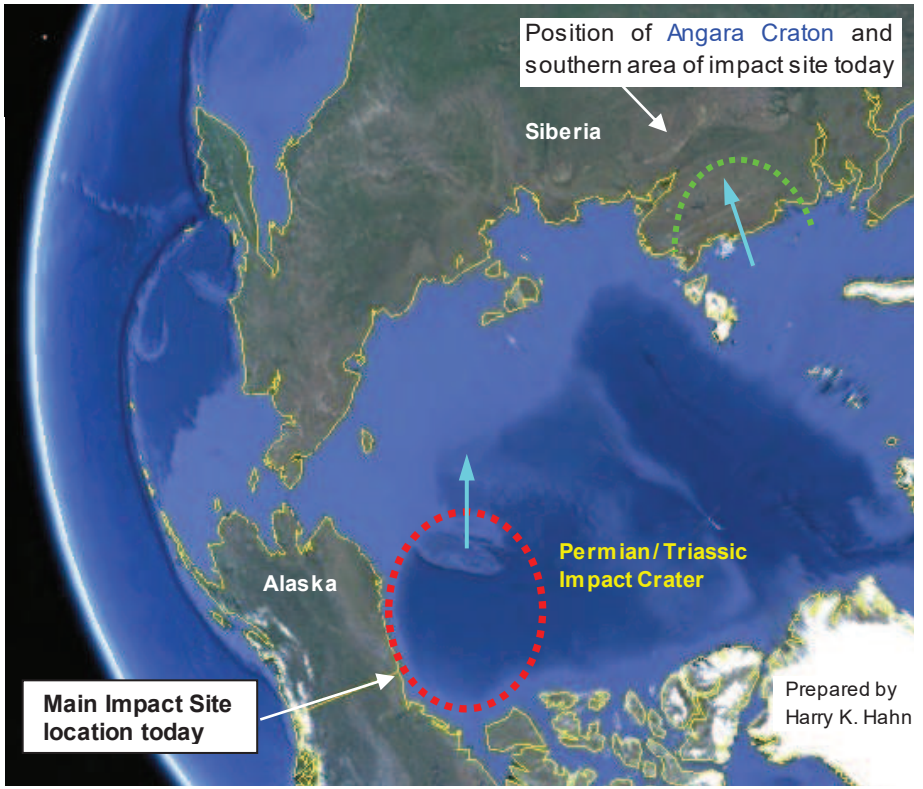


The two images on the left show the remains of the impact site as it appears today.
The main impact site is located in the Beaufort Sea close to the coast of Alaska. Another part of the impact crater which moved away from the impact site through the impulse of the impacting asteroid is located in Siberia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



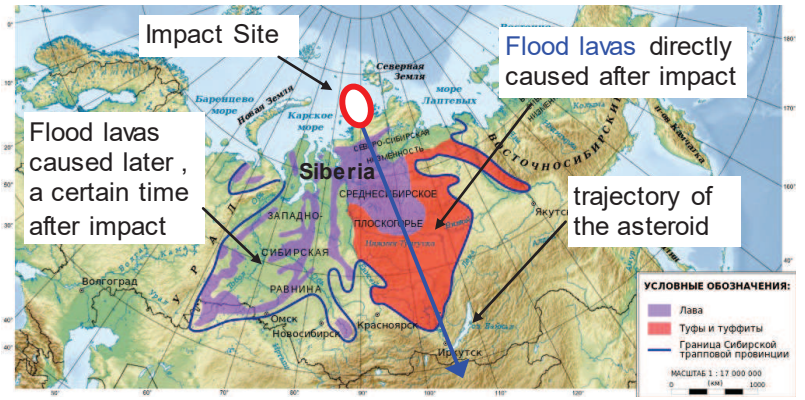
Note the bow-shape of the northern edge of the flood-lava formation
→ similar to bow-waves produced by ships !





→ Here 3 informative **movies about the P/T-Event** : PT_Movie 1 ; PT_Movie 2 ; PT_Movie 3

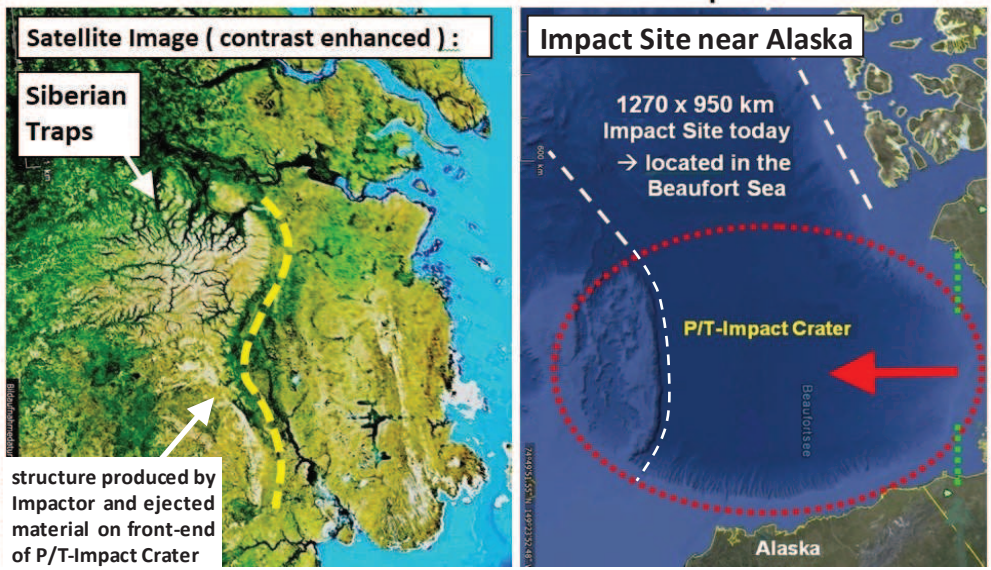
The flood lavas caused by the impact : The Siberian Traps



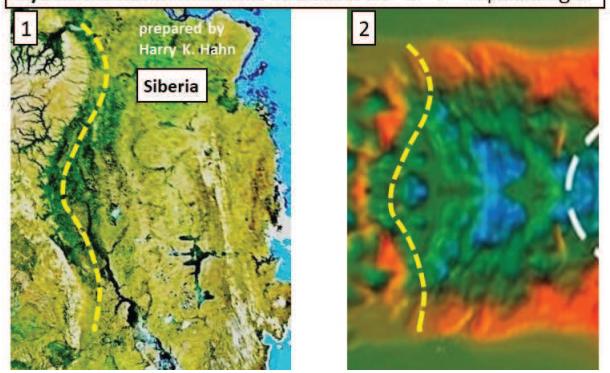
To the crater formation of the Ø 1270 x 950 km P/T-Impact Crater

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

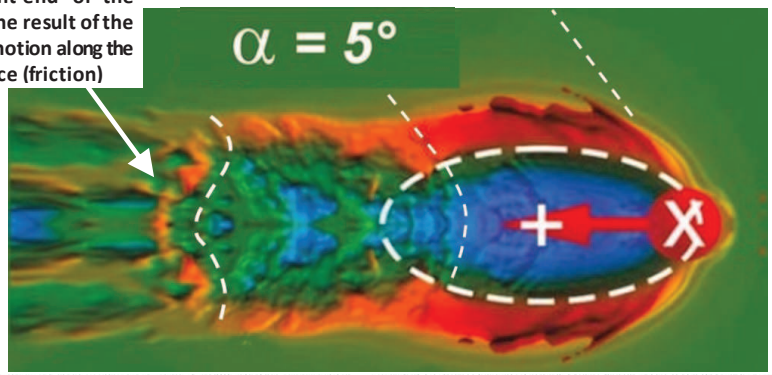


Compare → impact structures on front-end of crater :
1.) Reality : Satellite image **Siberia** (contrast enhanced)
2.) Simulation : front-end structure at ~ 5 - 7° impact angle



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

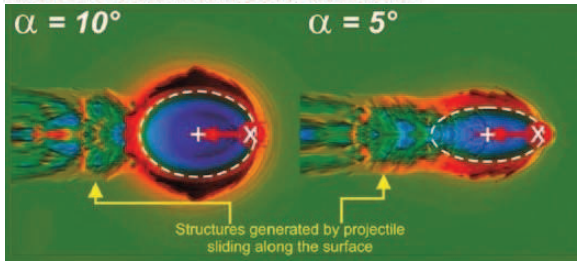
Simulated Impact Structure of a 5° oblique Impact :



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 transition from circular to elliptical impact craters

Dirk Elbeshausen,[1] Kai Wünnemann,[1] and Gareth S. Collins[2]

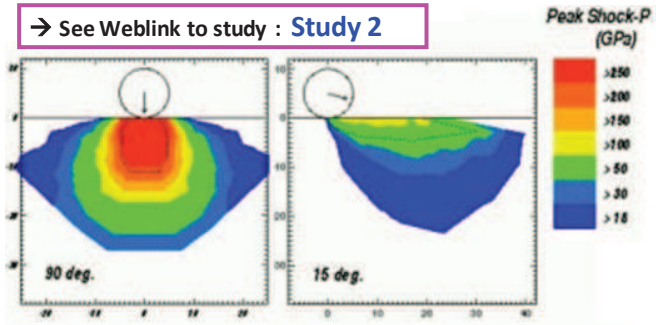
2. Model Setup → Weblink to Study : **Study 1**

[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 ($g = 9.81$ 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 ($\alpha < 30°$), since we expected the transition from circular to elliptical craters in this range. We used impact velocities of $U = 8$ km/s, 12 km/s,

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**

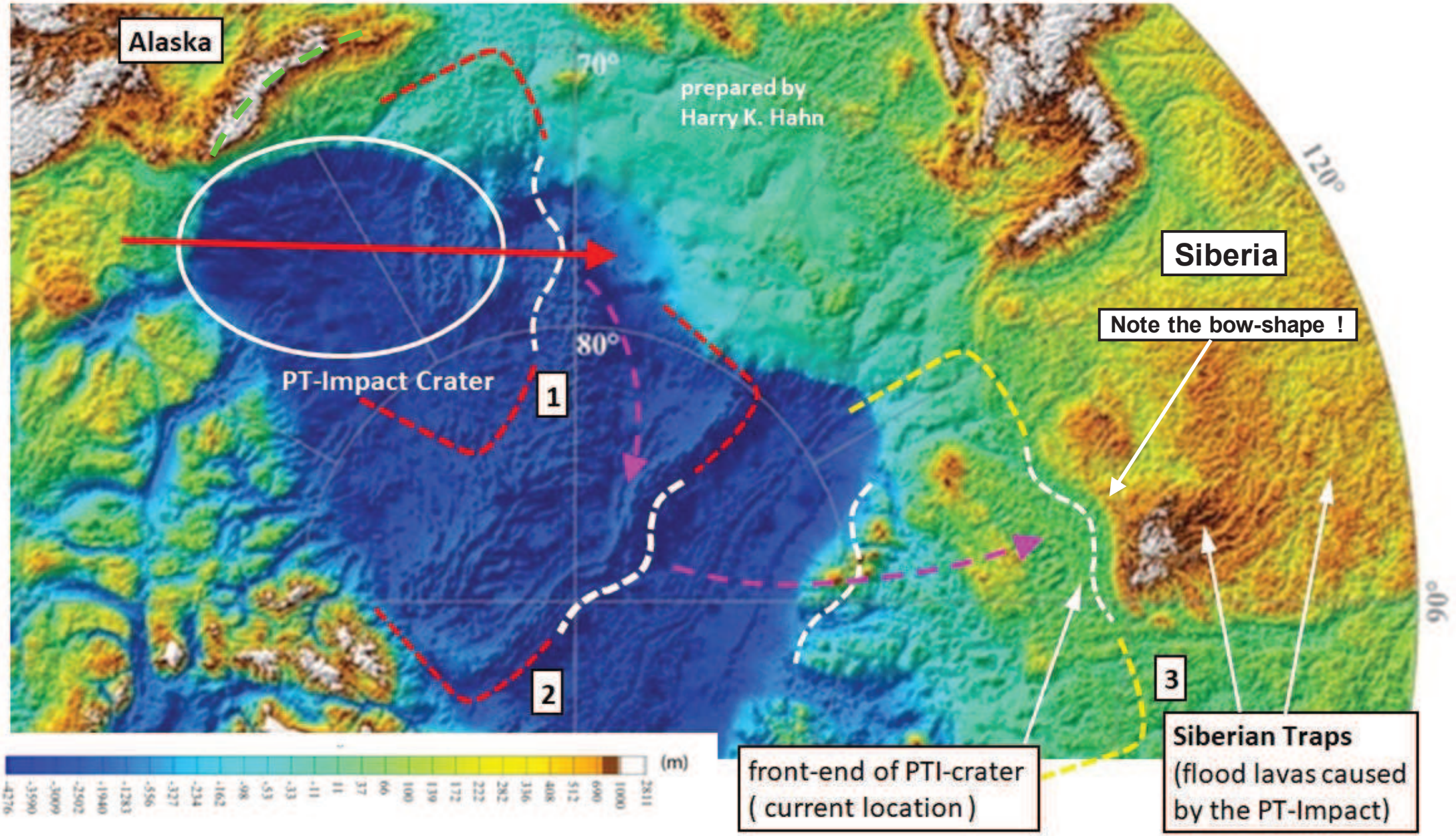


The topography provides structural evidence for the P/T-Impact Event

There are clear topographic traces visible in order to identify the front-end of the crater and its tectonic motion

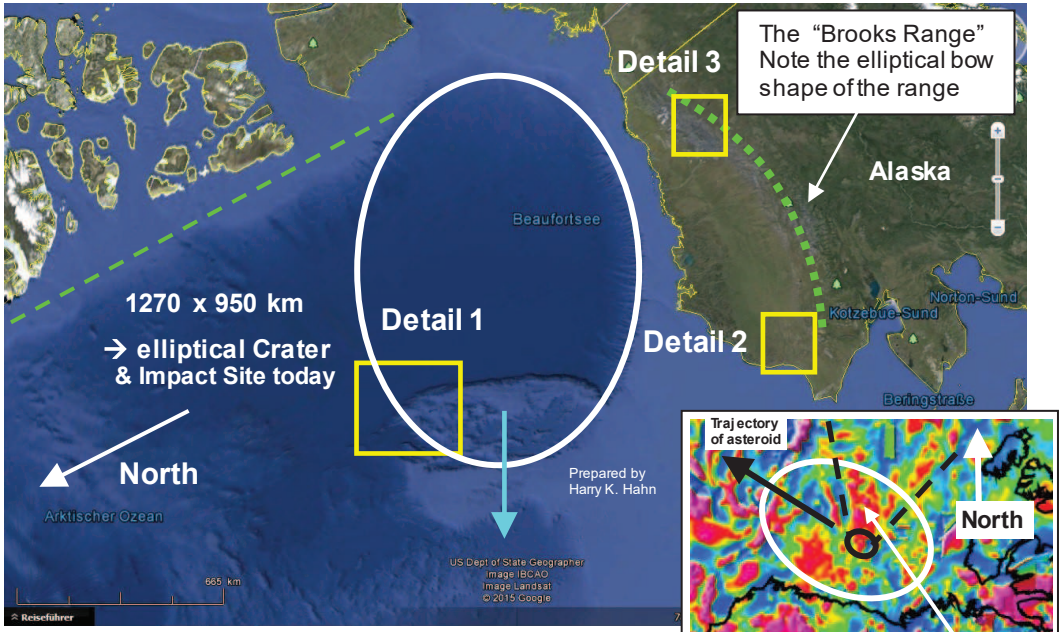
Polar-Projection of PT-Impact Area – Topographic Map of the **Arctic Ocean**

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



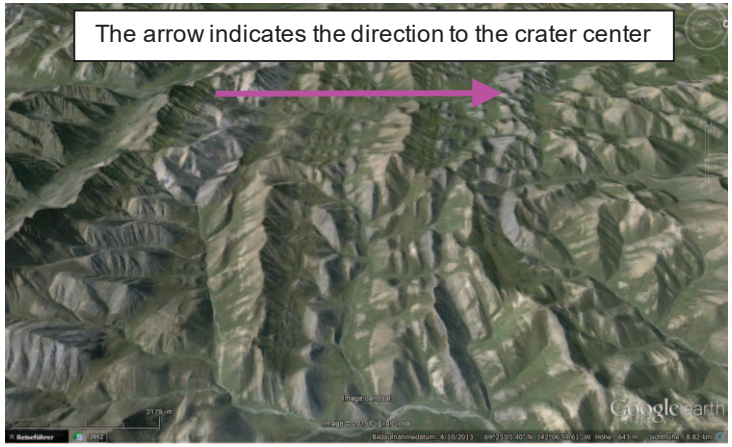
Geological structures caused near the 1270 x 950 km PT – Impact Crater (→ the Permian-Triassic-Impact Crater)

When the asteroid impacted it produced extreme shockwaves which ran trough Earth's crust and mantle. In close proximity to the impact site the shockwaves formed the Brooks Range. The Brooks Range has an elliptical bow-shape which fits to the elliptical shape of the main impact crater. An age analysis of rocks from this mountain range shows strong evidence for an age of 240 to 250 Ma, for the formation of the Brooks Range. This is further evidence for the Permian Triassic$_2$-Impact Crater ~250 Ma years ago. The magnetic anomaly clearly indicates a cone-shaped Ejecta blanket !

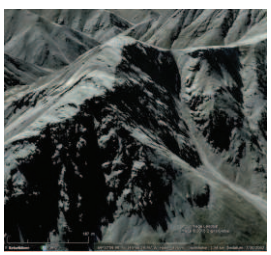


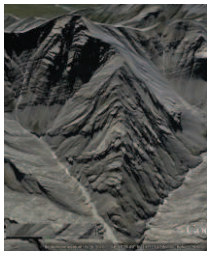
Magnetic Anomaly Map →

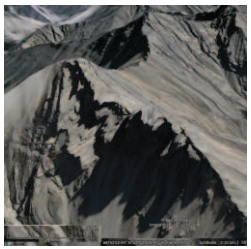
Detail 3 : The Brooks Range formed through compression of the crust surrounding the impact crater , which was caused by the extreme shockwaves of the impact event.
Note the linear structure of the mountain ridges and the rock layers which are tilted in a defined angle towards the crater center.



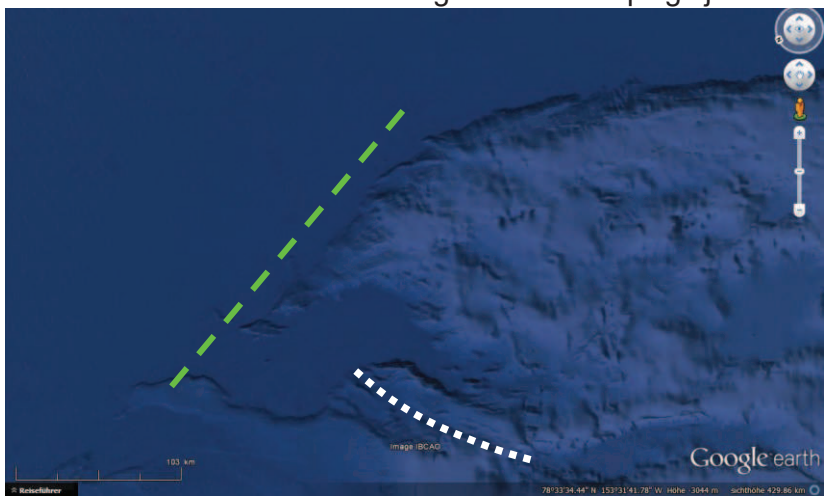
Some of the mountains of the Brook Range are covered by bizarre shaped layers of lava. Probably a result of flood lava outflow from the crater.



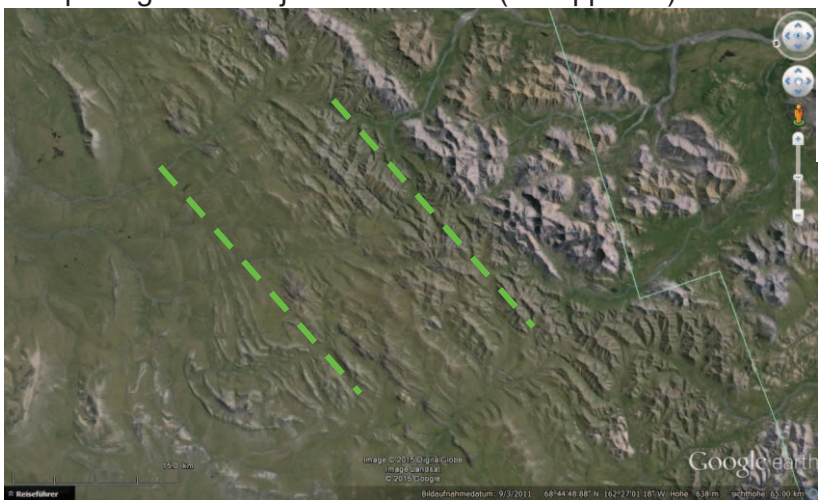




Detail 1 : Remaining section of crater-wall visible. Structures on the crater floor indicate the angle of the escaping ejecta

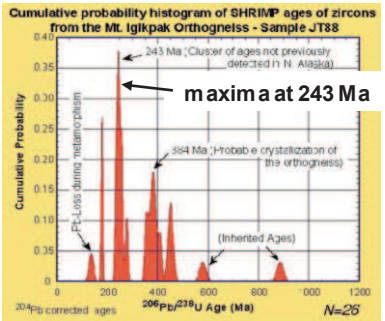


Detail 2 : This section of the Brooks Range also indicates the escape angle of the ejecta. It's similar (but opposite) to Detail 1



Evidence for the Age of the Impact

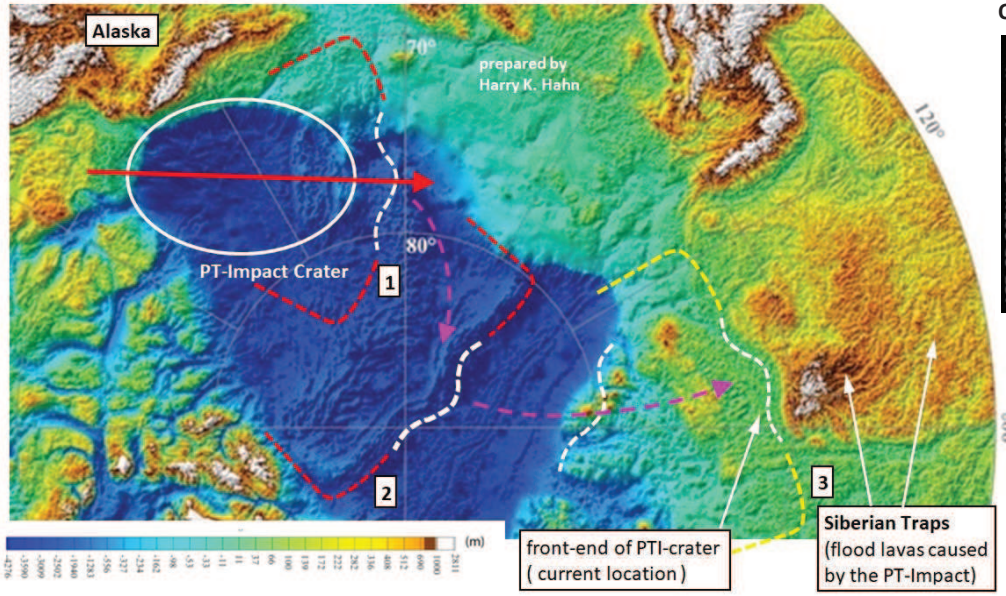
see : Zircon Analysis of Rocks from the Brooks Range (from Jaime Toro, Dep. Geology, WV) : With SHRIMP-RG analyzed rims and cores of 15 zircon crystals indicate 206Pb/238U ages range from 137 to 887 Ma with **histogram maximas at 243 & 384 Ma.**



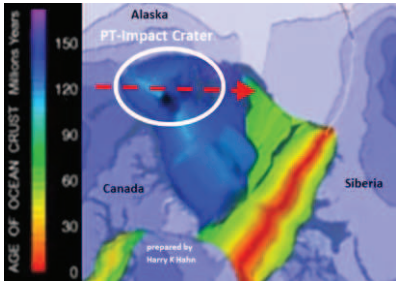
Large-scale structures caused by the PT – Impact , visible on different Maps

Polar-Projection of PT-Impact Area – Topographic Map

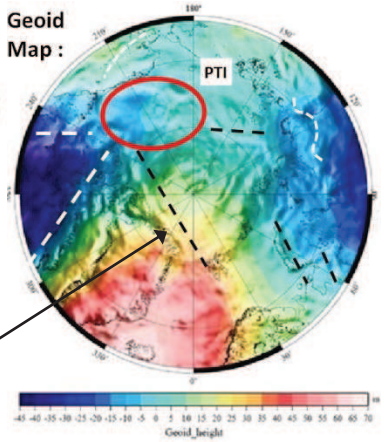
→ the motion of the front-end of the PTI-crater over time is indicated



Ocean-Floor Age Map of PT-Impact Area

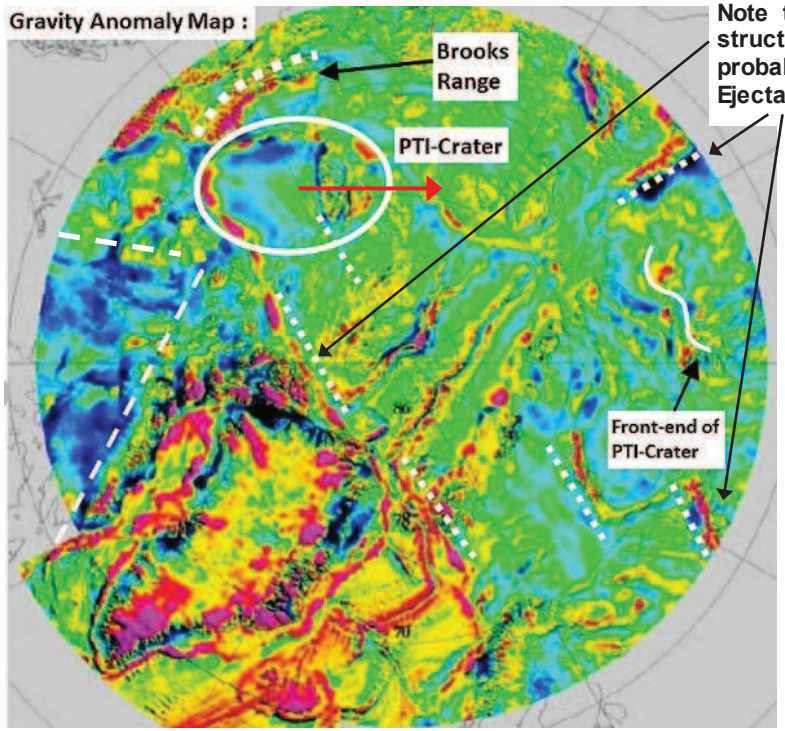


Geoid Map :



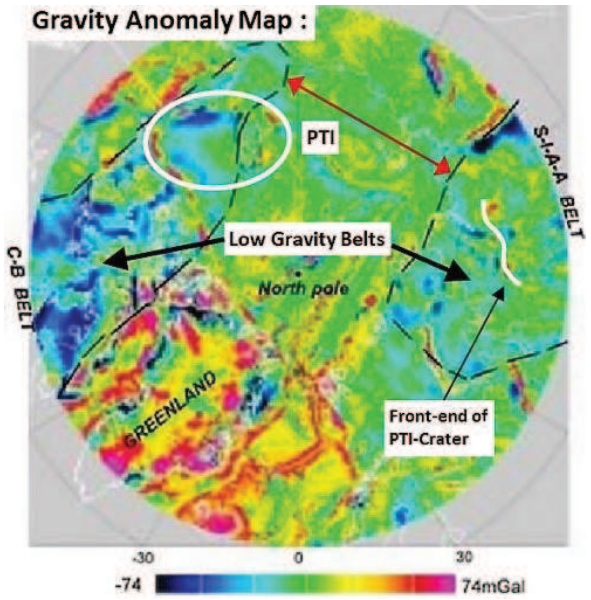
Gravity Anomaly- and Geoid Maps also indicate the PT-Impact

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 ≤ 5° (see trajectory-**d** at the image below) with a relative slow velocity of less than 5 km/s .

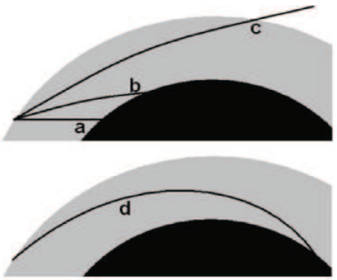
The impactor which caused the P/T-Impact Crater on Earth probably also was a small moonlet, which was caught be Earth's gravity and was orbiting around Earth, before its orbit tidally decayed in Earth's atmosphere, and it finally **impacted at a shallow angle of ≤ 7° with an impact velocity of probably 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 PT_3-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.

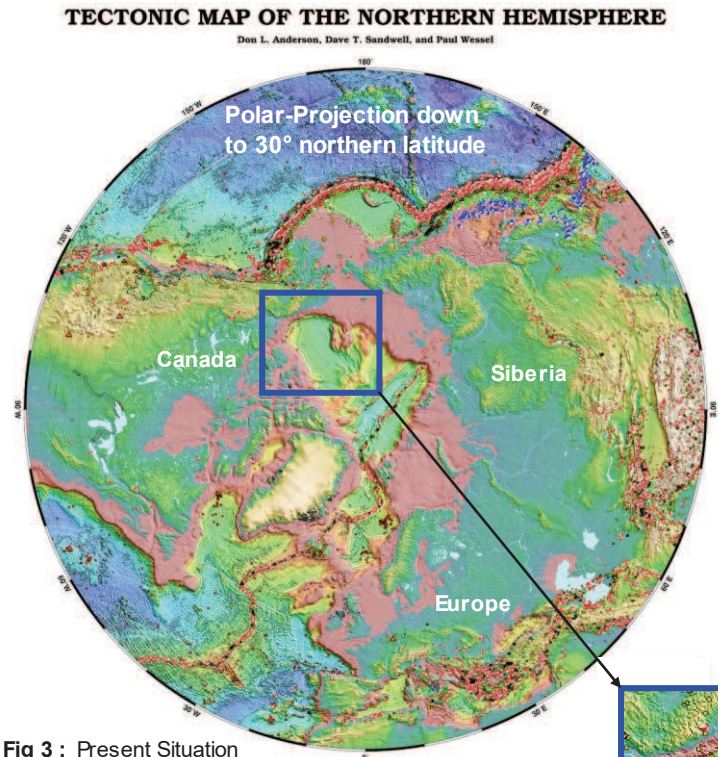
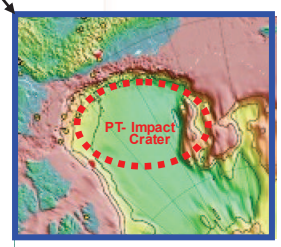


Fig 3 : Present Situation



Detail of Impact Site

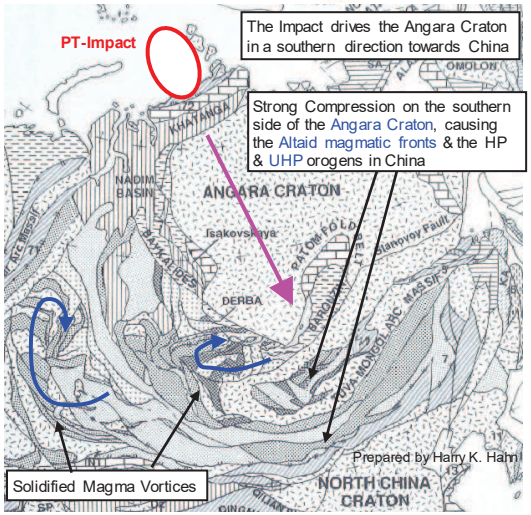
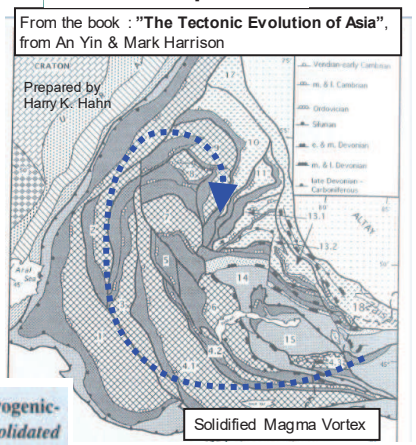


Figure 21.6. Paleotectonic map of Asia showing the primary orogenic-collage components mentioned in the text. *Precambrian consolidated*



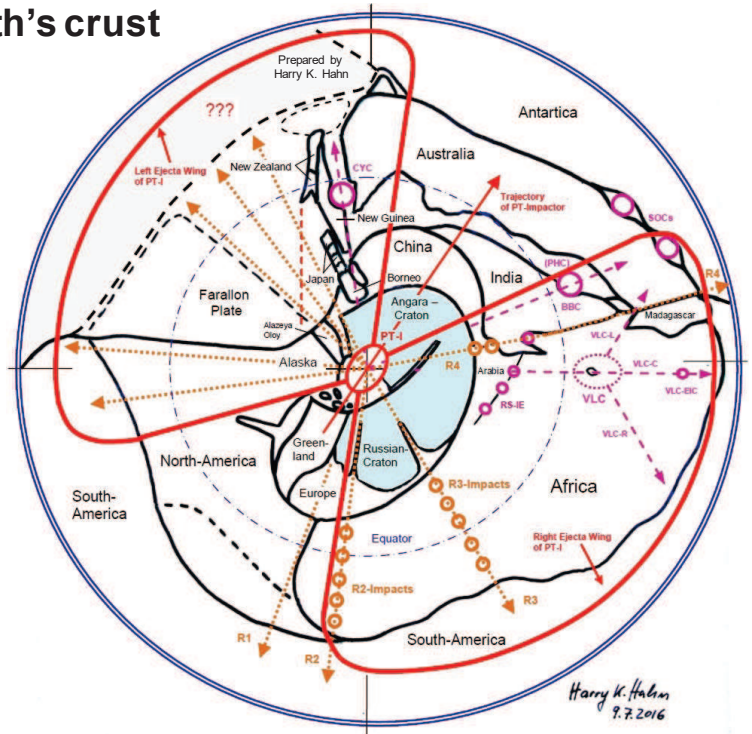


Fig 1 : Polar-Projection of Earth's complete surface area at the time of Impact centred on the PT-Impact Crater. **Earth diameter : ~6500-7500 km**

Fig 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 !!

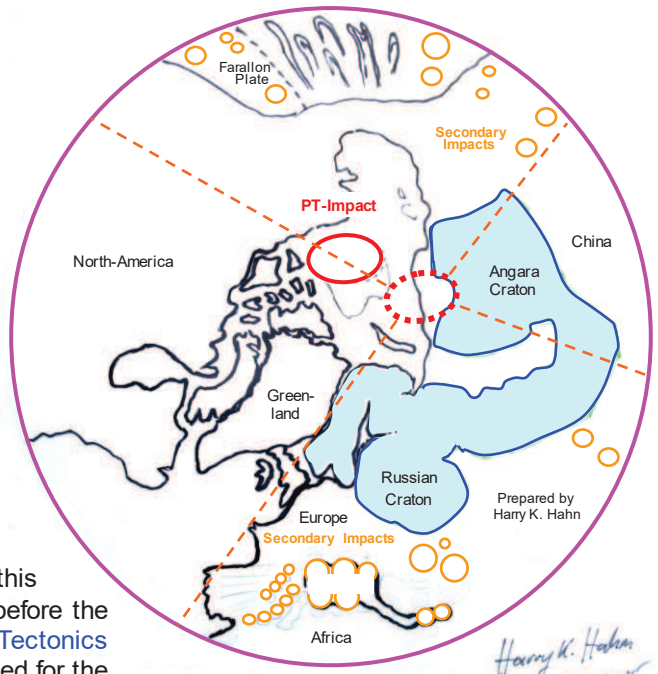
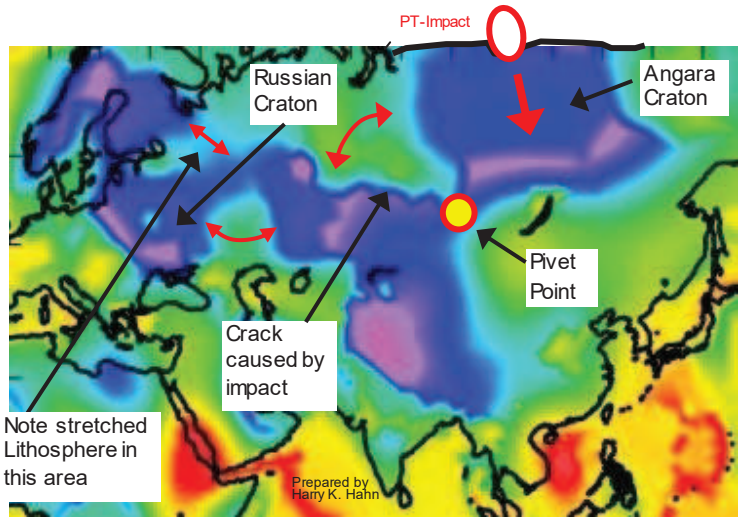


Fig 2 : Polar-Projection down to 30° N ~100 Ma ago, Ø **Earth : ~ 10000 km**

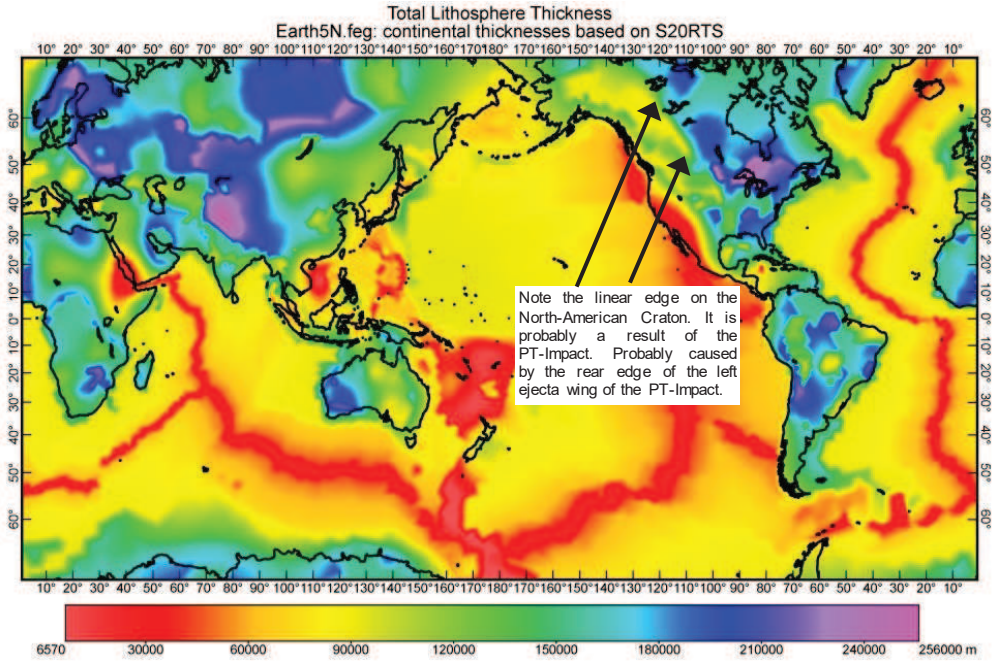
The tectonic evolution after the PT – Impact Event

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 PT_2-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 !)



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



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 PT_3-Impact event can roughly be divided into three phases which I will describe in the following :

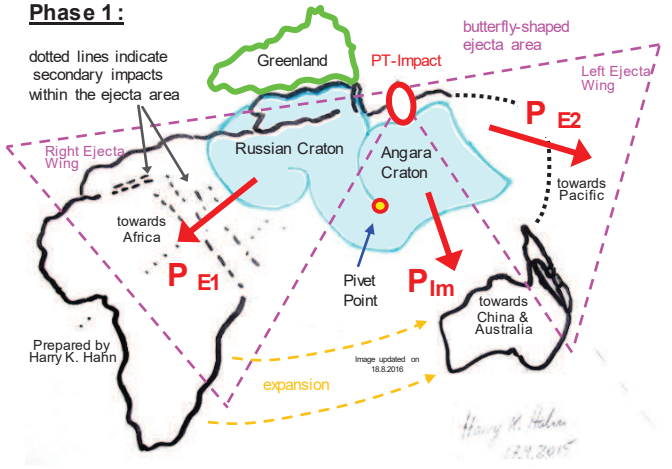
Phase 1 : The impact produced three main impulses which were induced into the surrounding Lithosphere. The impulse P_{IM} from the Impactor itself and the two Ejecta-Impulses P_{E1} and P_{E2} which all accelerated different areas of Eart's crust (lithosphere). The following formula can be applied :

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

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.

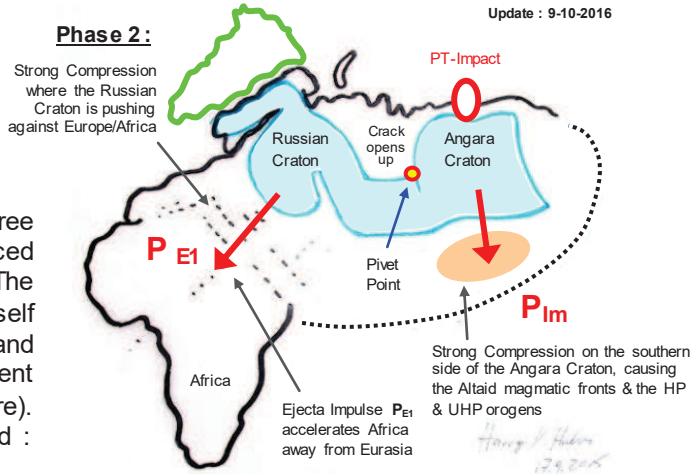
Phase 3 : The further tectonics is more complex , because of complex interaction between different areas of Earth's crust. The begin of phase 3 is roughly described in the image on the right-hand side.

Phase 1 :

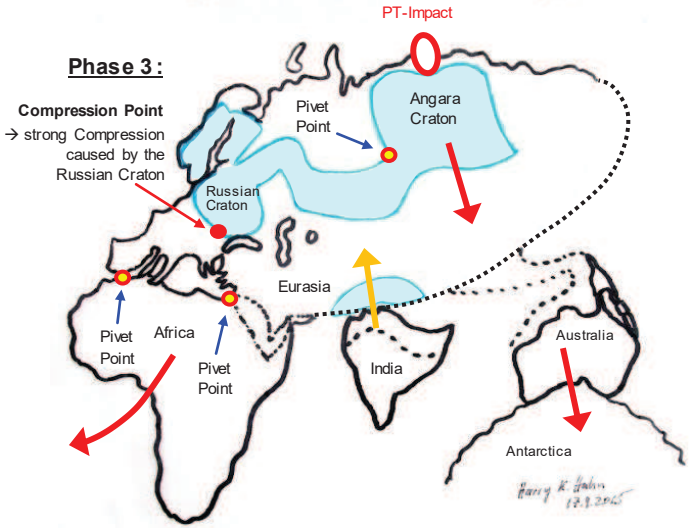


Update : 9-10-2016

Phase 2 :



Phase 3 :

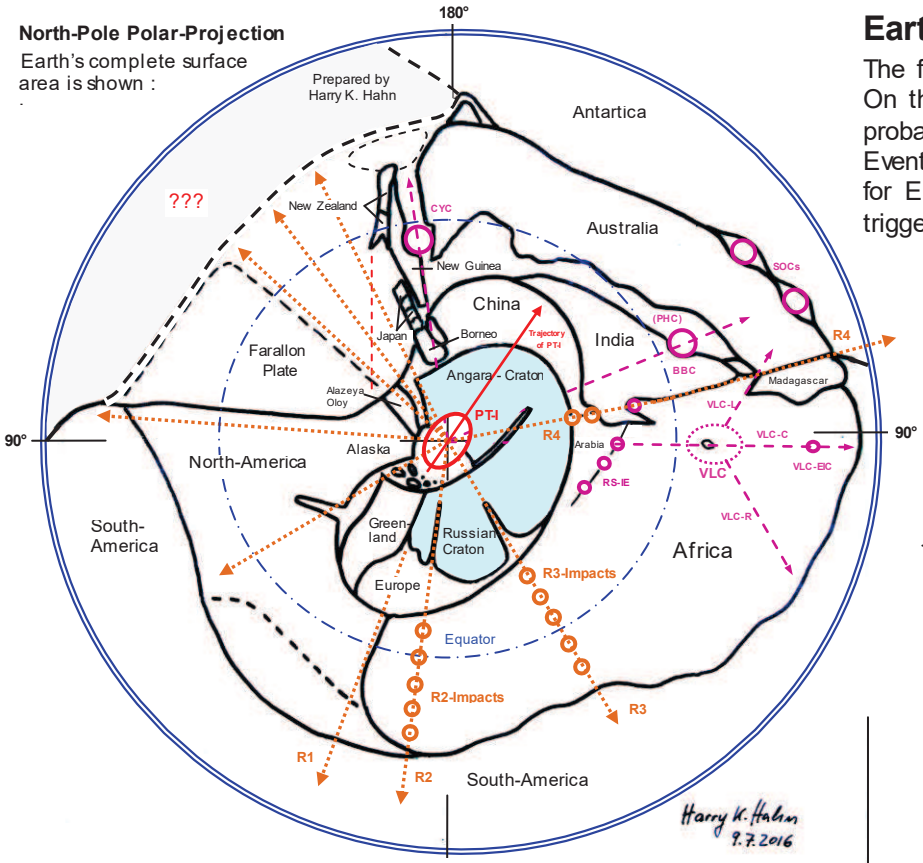


Earth at the time of the PT-Impact Event

Prepared by Harry K. Hahn

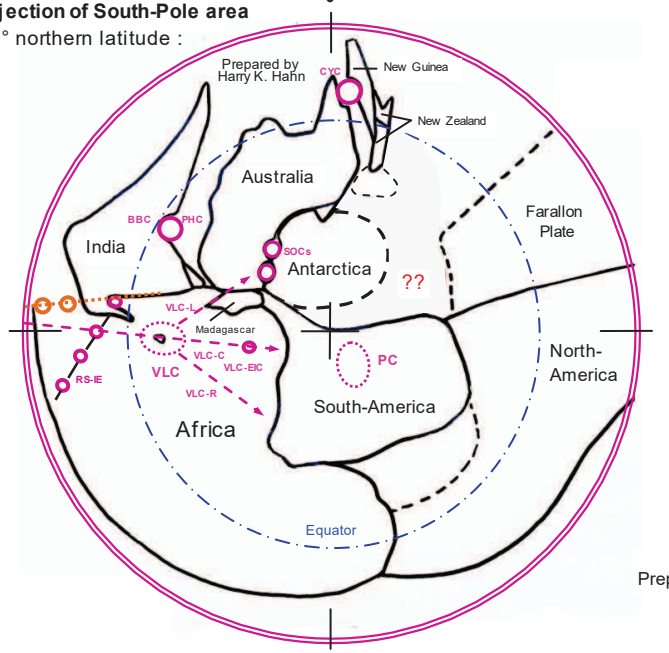
The following maps show how our planet Earth probably looked at the time of the Permian-Triassic (PT)-Impact On these maps, the arrangement of Earth's continents at PTI-time is based on impact structures which in all probability were caused by the PT-Impact Event (especially the CYC-, the BBC/PHC- and 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**

North-Pole Polar-Projection
Earth's complete surface area is shown :



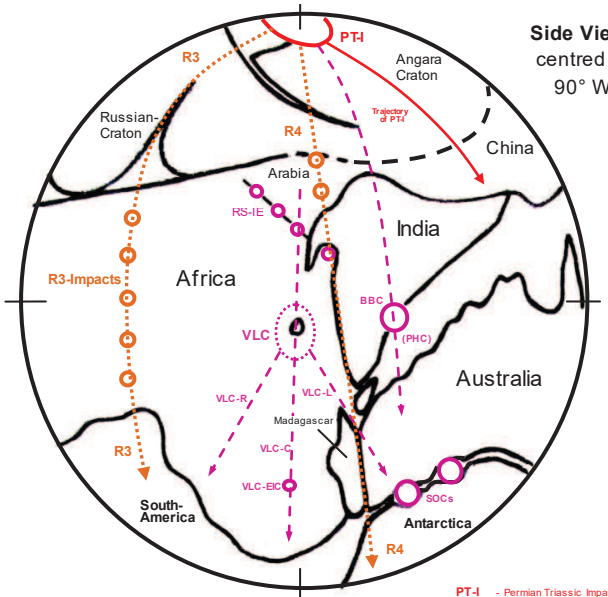
Harry K. Hahn 9.7.2016

Polar-Projection of South-Pole area
up to ~ 45° northern latitude :



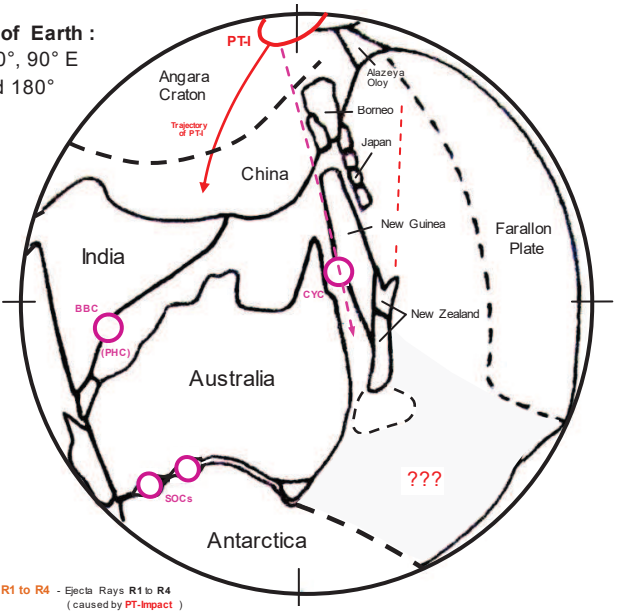
Prepared by Harry K. Hahn

Update : 9-10-2016



90° E

Side Views of Earth :
centred on 0°, 90° E
90° W and 180°

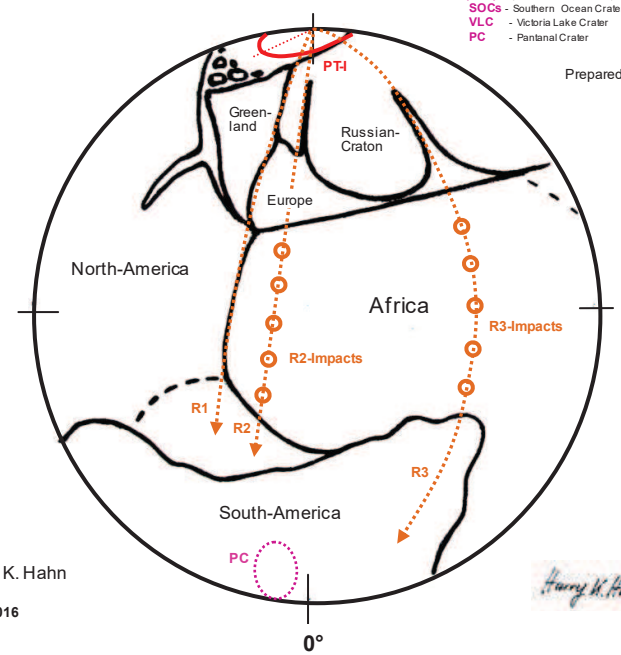


180°

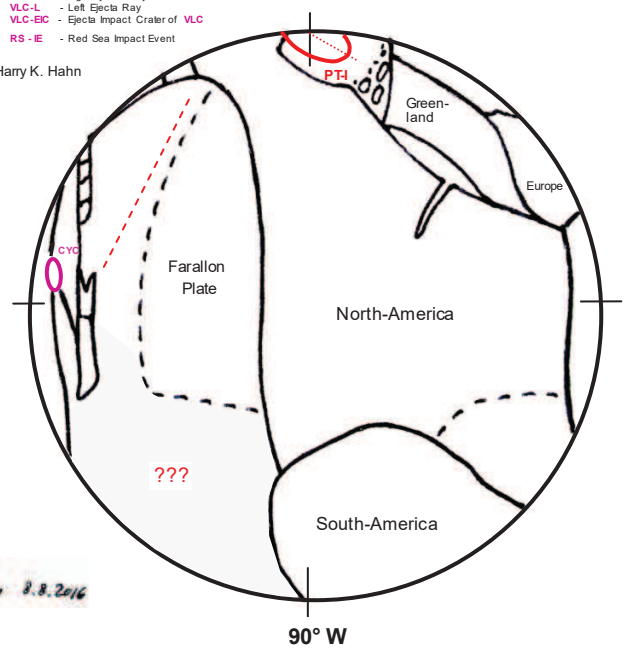
PT-I - Permian Triassic Impact
CYC - Cape York Crater
BBC - Bengal Bay Crater
(PHC) - (Port Hedland Crater)
SOCs - Southern Ocean Craters
VLC - Victoria Lake Crater
PC - Pantanal Crater

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



0°



90° W

Harry K. Hahn 8.8.2016

The evolution of the Pacific Plate & the Pacific Ocean caused by the P/T-Impact

The evolution (or better the creation) of the Pacific Plate and the Pacific Ocean is closely related to the **PT**-Impact Event. Planet Earth was considerably smaller before the Permian Triassic$_2$ **Impact** (→ around 6500 – 7500 km in diameter), and the hypothetical Panthallasian Ocean never existed in the extension mentioned in geological literature ! To cut a long story short :

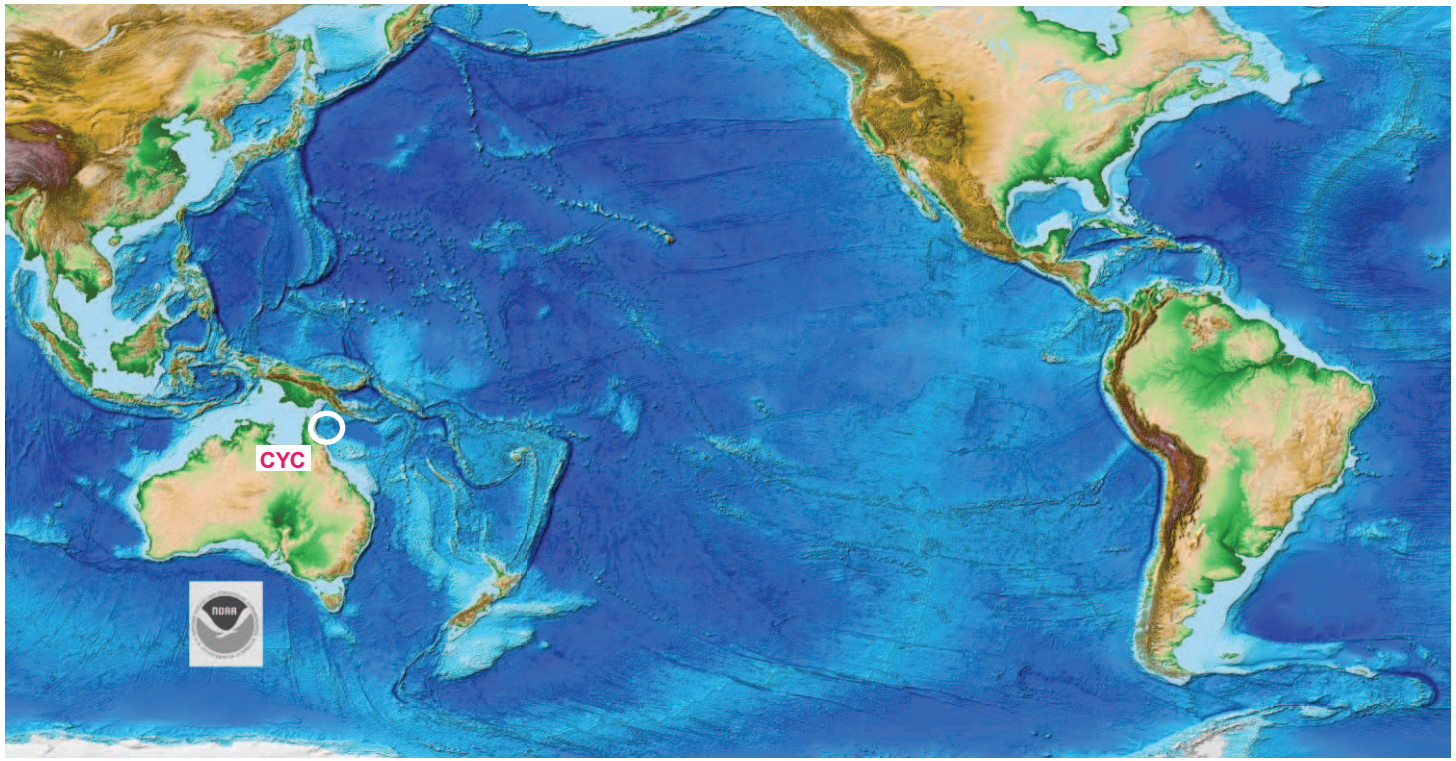
→ **"The creation of the Pacific Plate & the Pacific Ocean was triggered by the PT-Impact Event !"**

"Earth's dichotomy, and the creation of all major oceans on Earth, including the sea water contained in these oceans, is a longterm result of the Permian-Triassic (PT_3)-Impact ! "

The large secondary impact crater CYC (Ø 300 km), near Cape York peninsula in NE-Australia (→ caused by the PT-Impact), **also played a major role in the evolution of the Pacific Plate.** ⟶

And the traces produced by the Cape York impact crater (**CYC**) , especially the later gigantic magma eruptions originating from this impact crater, can be used as evidence to confirm this statement !

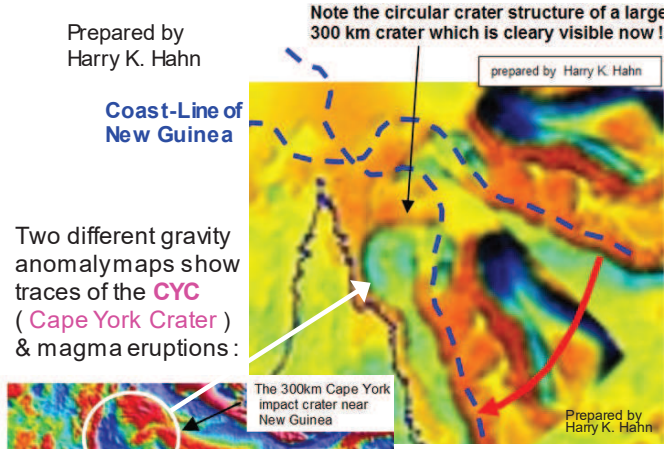
In the following I want to show and explain some key-areas of the pacific ocean floor which contain the hard evidence to confirm these statements :



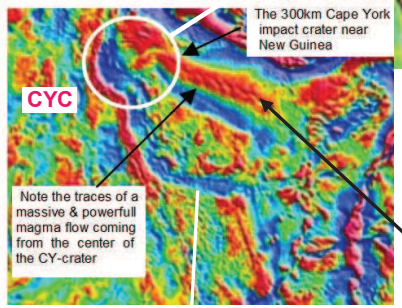
This map from NOAA is an important key-map to understand the tectonic evolution of the Pacific Plate !

It contains all the traces which are required for a precise analysis of the evolution of the Pacific Plate !

Prepared by
Harry K. Hahn

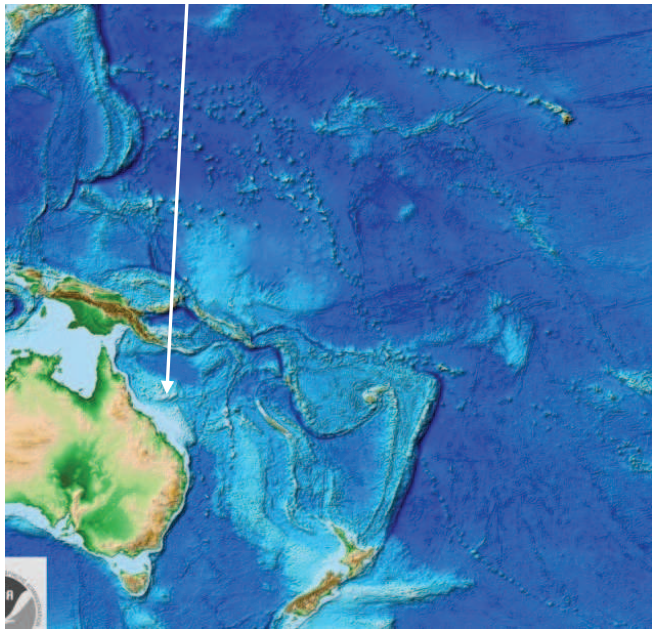


Two different gravity anomalymaps show traces of the **CYC** (Cape York Crater) & magma eruptions :



The > Ø 300 km Cape York Crater

This Impact Crater was responsible for **extreme magma eruptions** over **> 200 Ma** !!

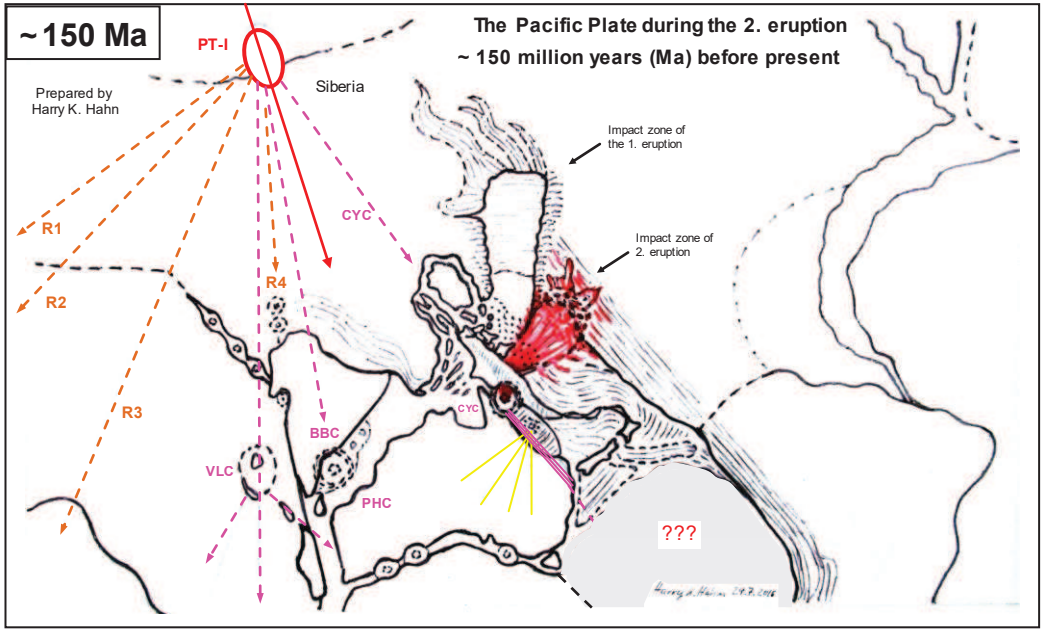


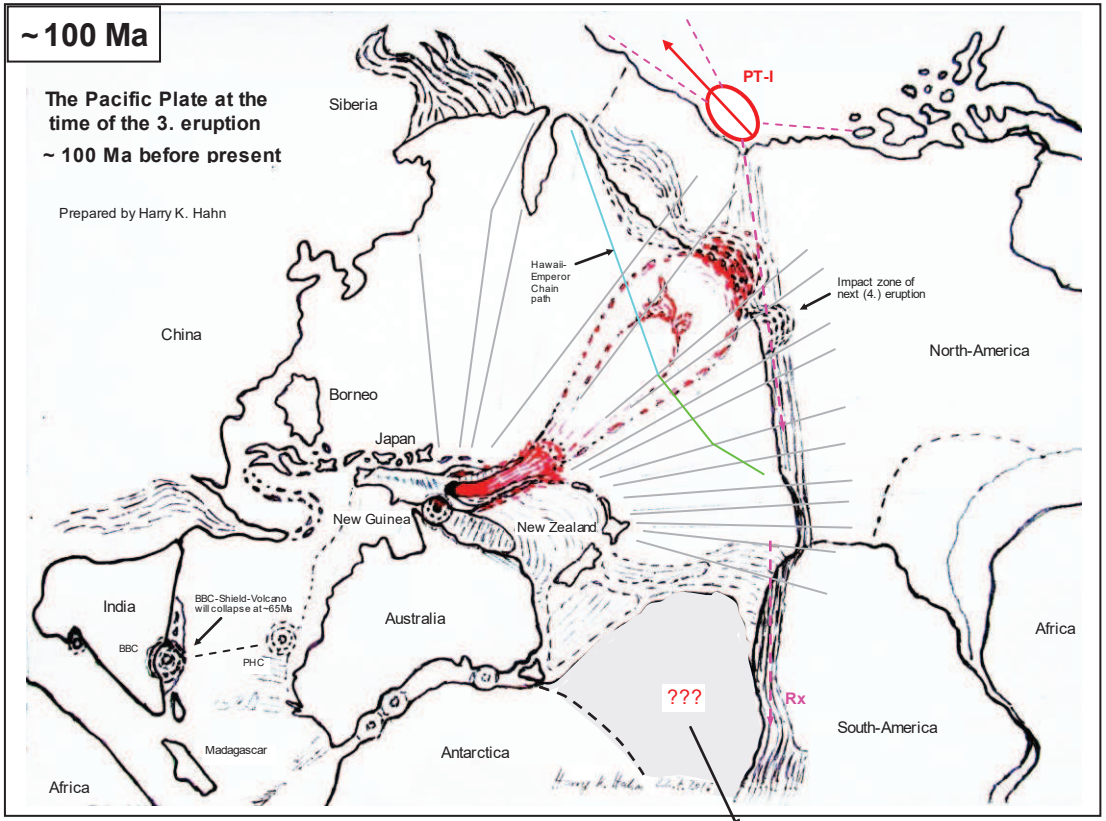
→ **And this is the key-area which must be analysed in much more detail than my preliminary analysis !**

It will describe the interdependencies of certain areas of the "Pacific Plate" and their evolution with high precision !

The evolution of the Pacific Plate & Pacific Ocean, in the aftermath of the PT-Impact Event :

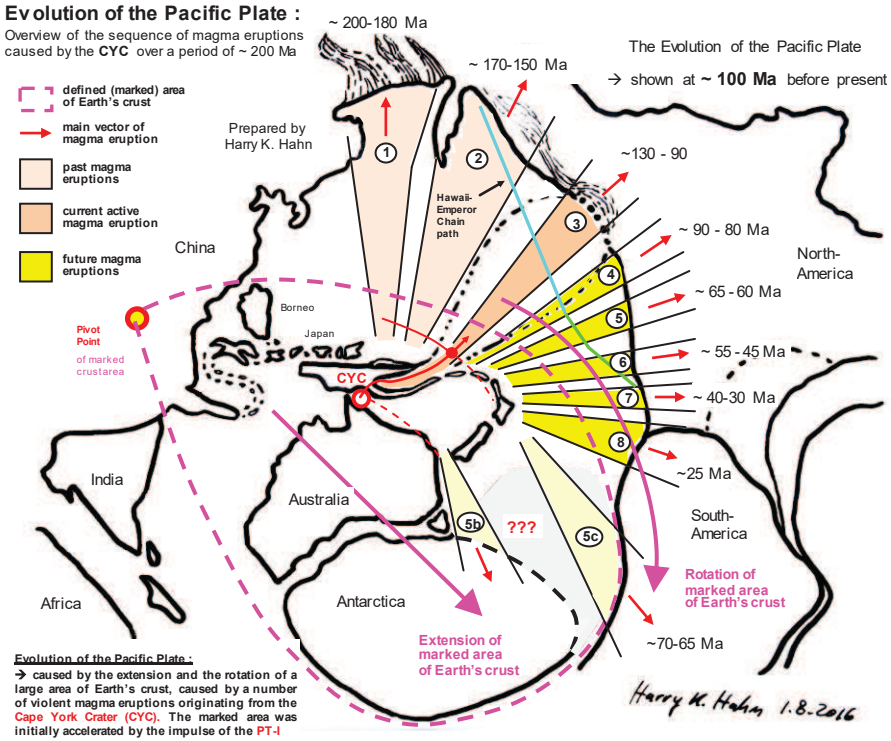
The Impact impulse of the **PT-Impact Event** caused an acceleration of Australia & Antarctica towards SE. Together with many fractures in Earth's crust, caused by very large secondary impacts (e.g. by BBC, CYC & VLC), and together with powerful temporary magma eruptions of the Cape York Crater, the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





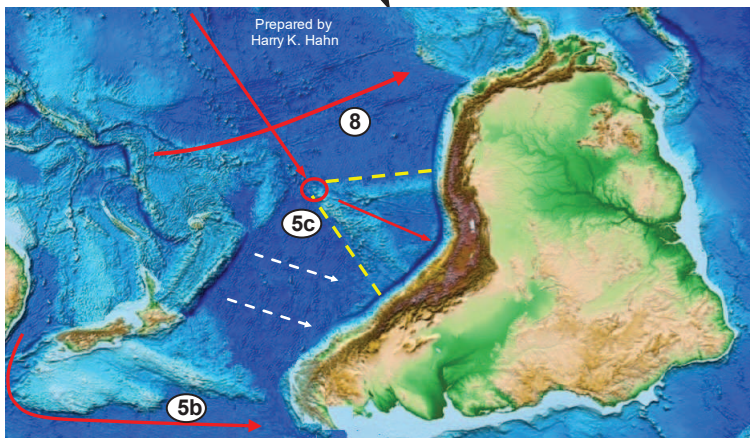
Evolution of the Pacific Plate :

Overview of the sequence of magma eruptions caused by the **CYC** over a period of ~ 200 Ma



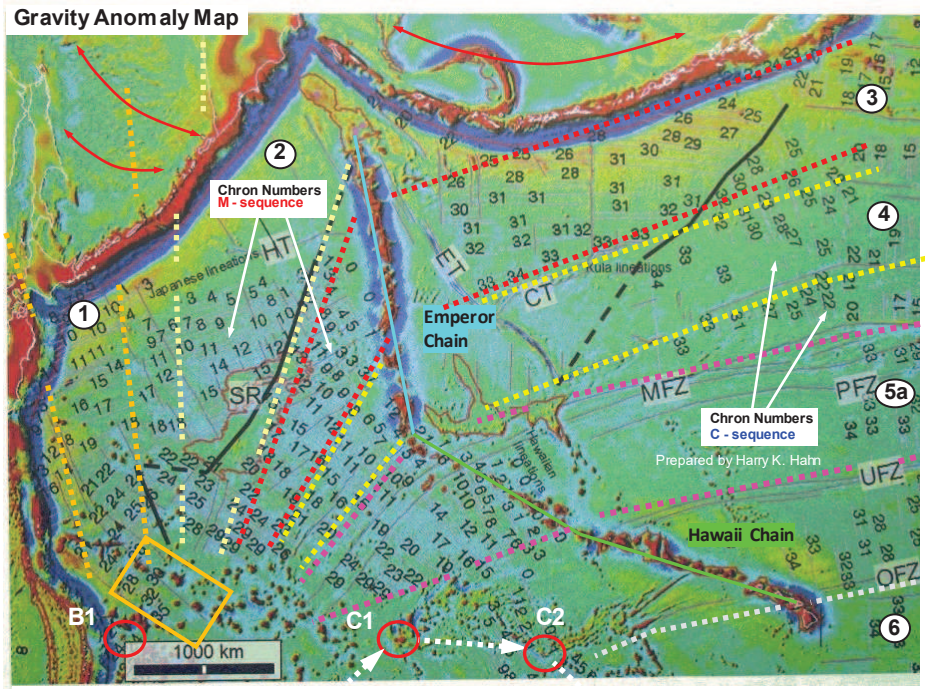
Evolution of the Pacific Plate :
→ caused by the extension and the rotation of a large area of Earth's crust, caused by a number of violent magma eruptions originating from the Cape York Crater (CYC). The marked area was initially accelerated by the impulse of the PT-I

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 Earths mantle and formed a channel which connected to the Pacific-LLSVP (caused by ejecta of the PTI), 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 :



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 arOFZ-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;

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.

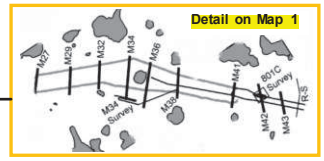
The lines indicate the approximate paths (directions) of the different magma fronts relative to their source areas, and relative to their final locations on the continental plates (→ final locations = collision zones with the continental plate, starting points = CYC magma chamber at time of event)

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 :

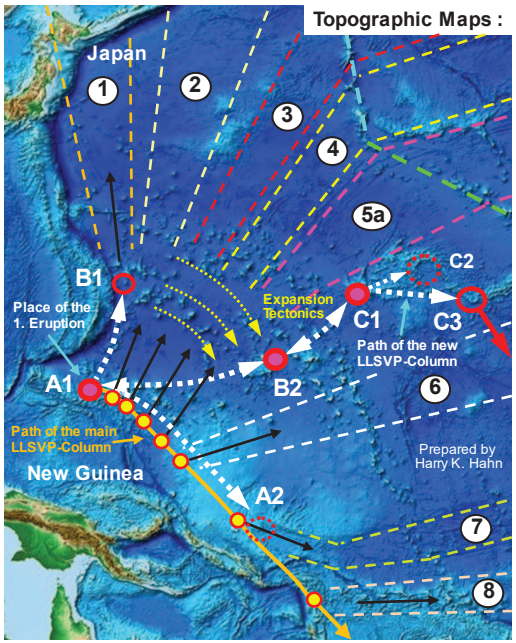
Origin of the Pacific Jurassic quiet zone :

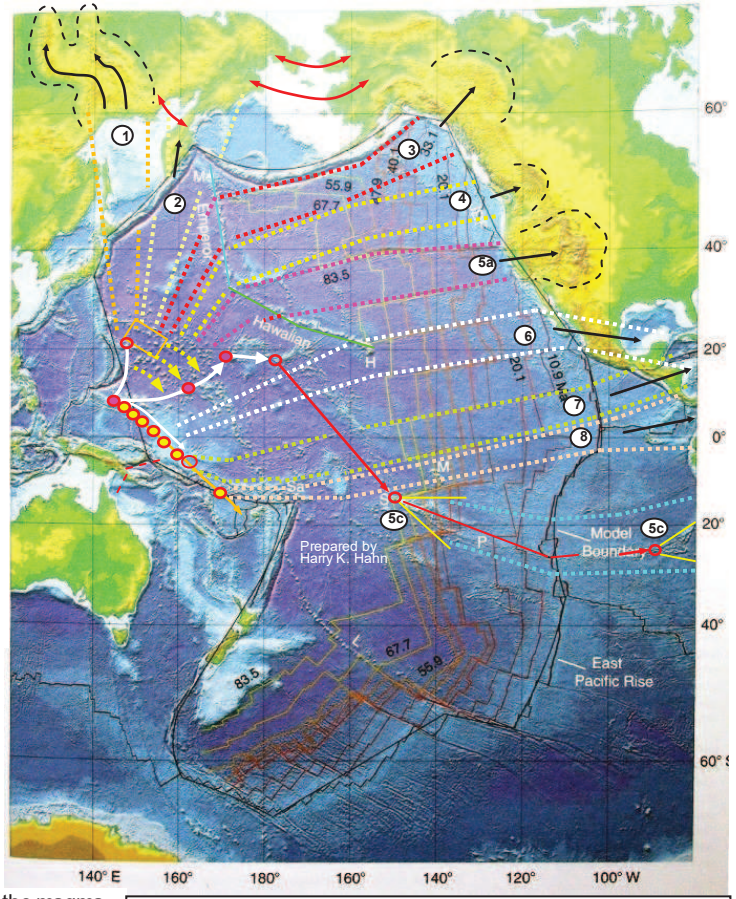
Magnetic Lineations M 35 – M 44



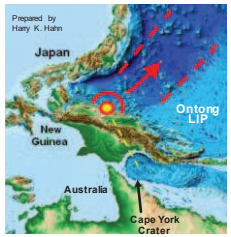
Chron Numbers of Magnetic Lineations in North-Pacific

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





Source Area
Path of Source Area
Eruption Path
Eruption No.
Drift-off copies of source area 1
A2, B1-2, C1-C3 :
Chronological order (age) of the "Drift-off-copies" of source area 1 (A1)

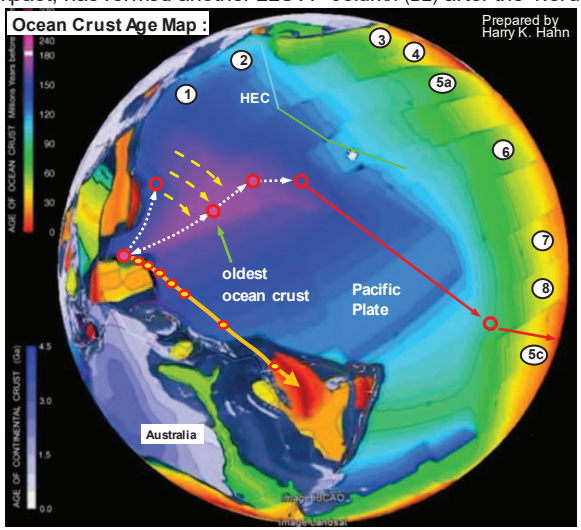


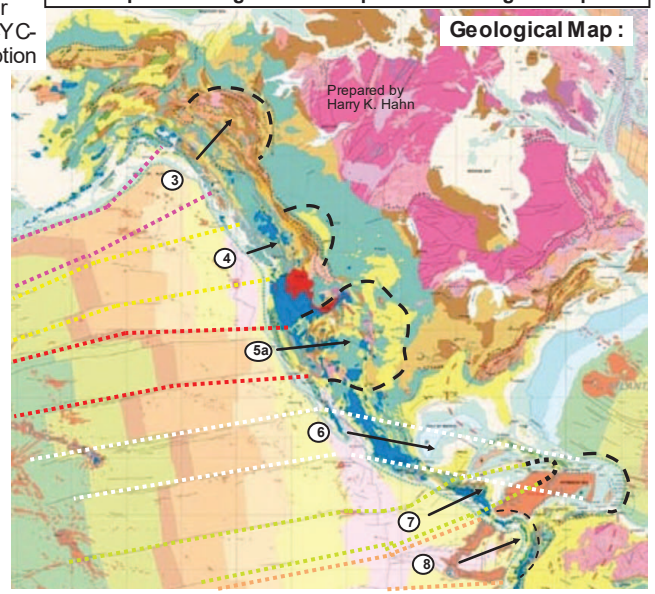
The small map on the right shows the situation around the **3.** or **4.** magma eruption

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

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





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 !

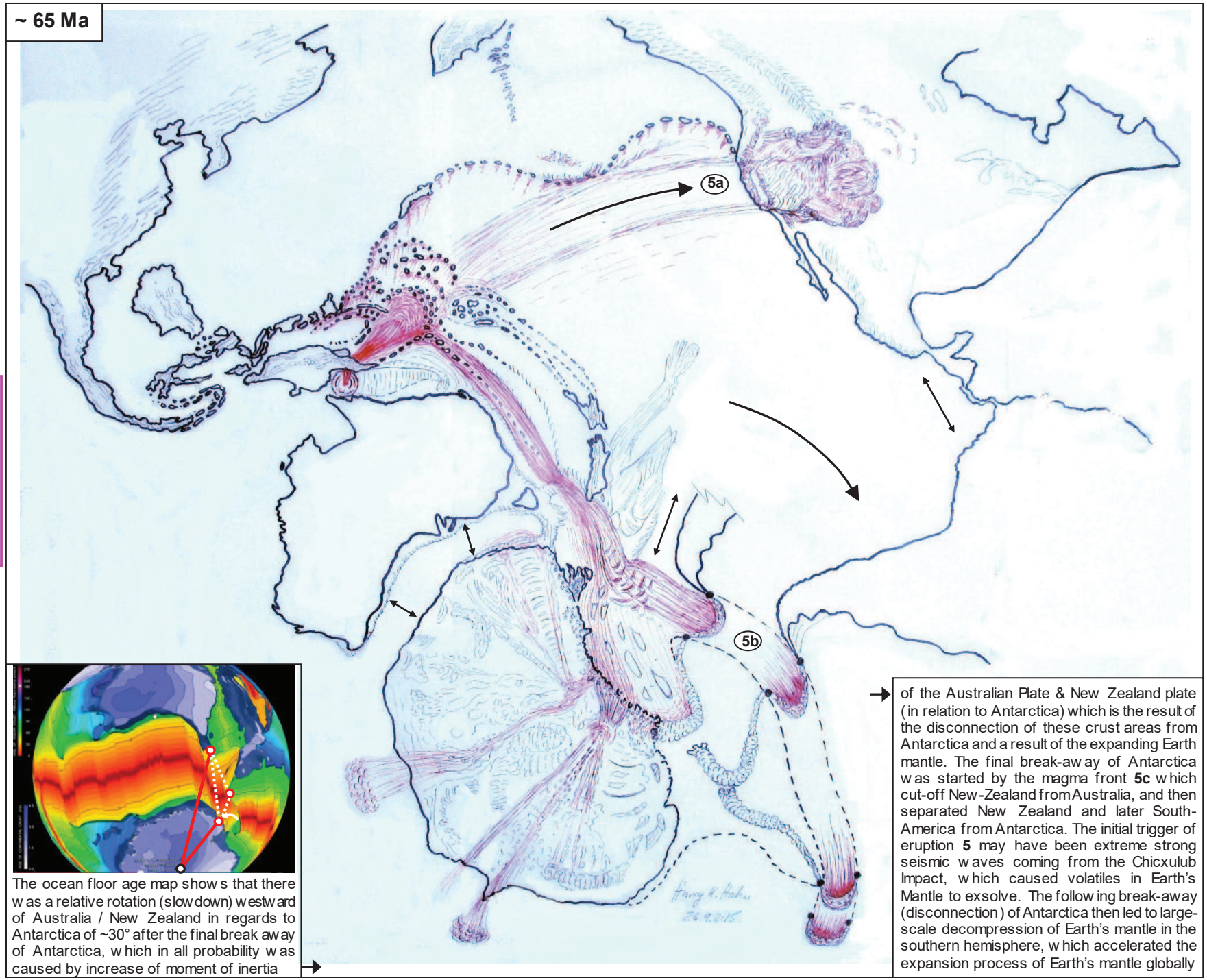
And so it gives some insight in this distant event which is important for the understanding of the evolution of the Pacific Plate.
It also shows how Antarctica was involved in the event

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



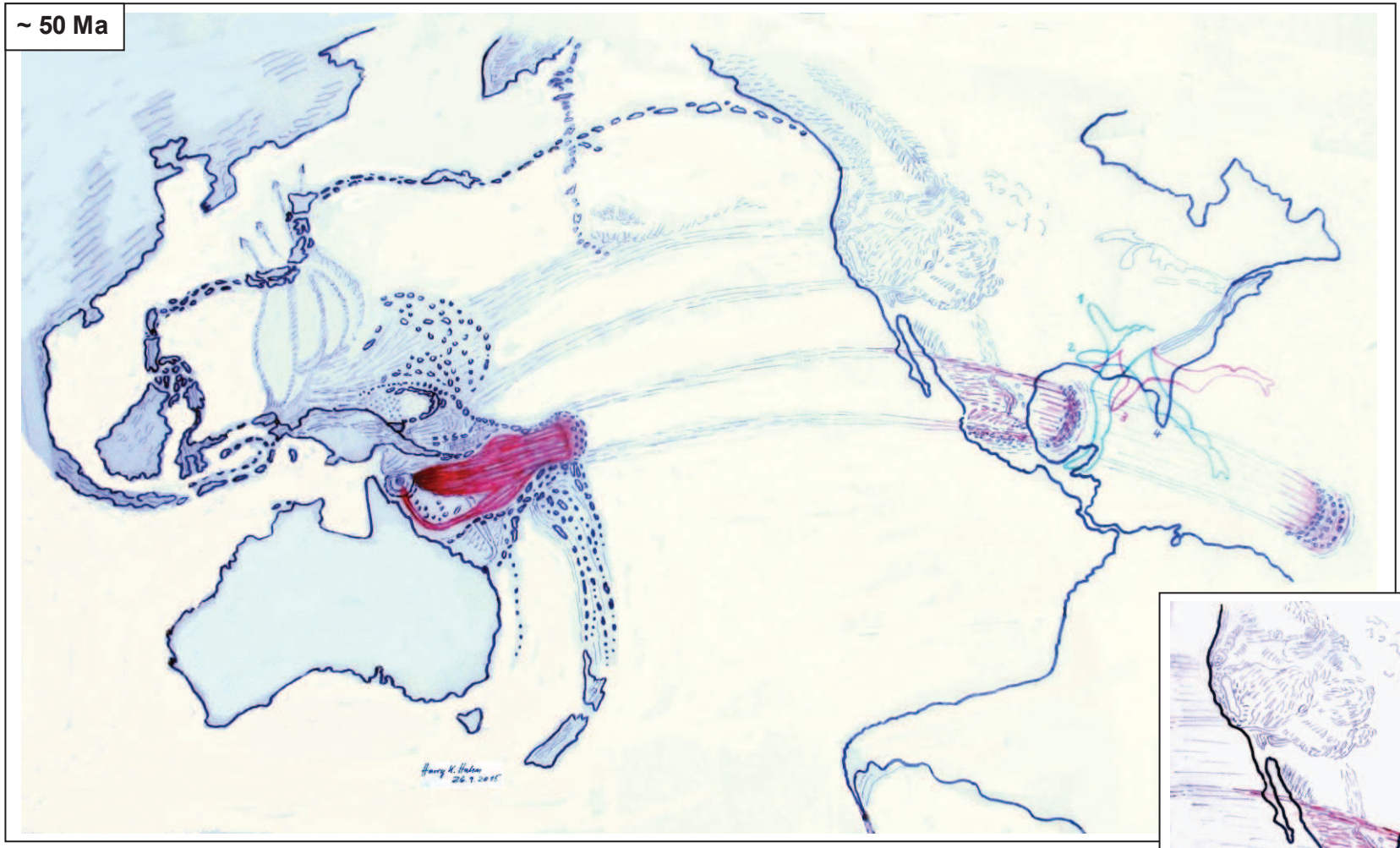
The ocean floor age map shows that there was a relative rotation (slowdown) westward of Australia / New Zealand in regards to Antarctica of ~30° after the final break away of Antarctica, which in all probability was caused by increase of moment of inertia

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

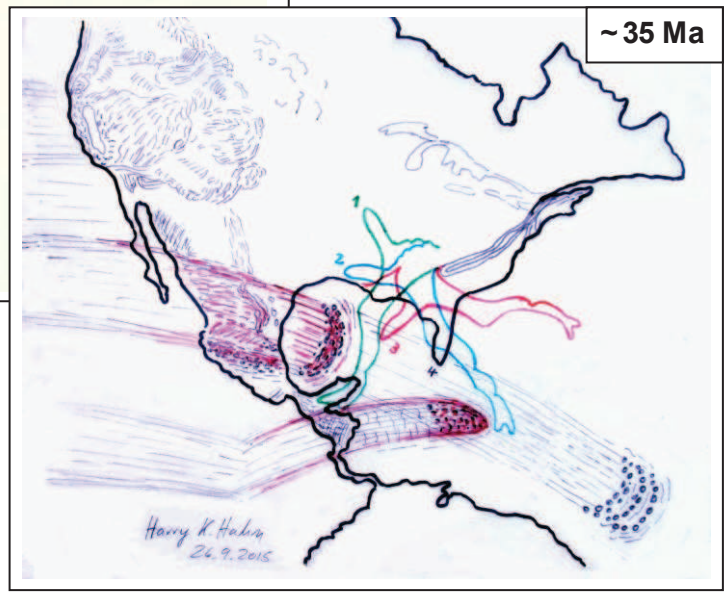
The sixth magma eruption from the Cape York Crater :

Prepared by Harry K. Hahn

This sixth magma eruption from the Cape York Cater wasn't as strong as the fifth eruption, but it still was a violent event which considerably influenced the shape of the North-American Continent. The sixth magma eruption happened around 10-20 million years after the fifth eruption. Probably around 55-45 Ma ago. Since the last eruption Australia has moved further to the South, as a result of the impact impulse of the **PT**-Impact. In contrast Japan and a chain of smaller crust fragments have moved further to the North. The anti-clockwise rotation of New Guinea, Borneo and the Philippines around the impact- and eruption zone continued, and they also drifted further away from this area, as a result of the Impact Impulse of the Cape York Impact and the first five magma eruptions of the Cape York Crater



When the magma front, caused by this eruption, later collided with the North-American Plate, it pulled out a stripe-like crust fragment and bended this fragment on it's path westward where it eventually collided with the continental plate and formed the Appalachians. (step 1 to 4 as indicated on the map below)

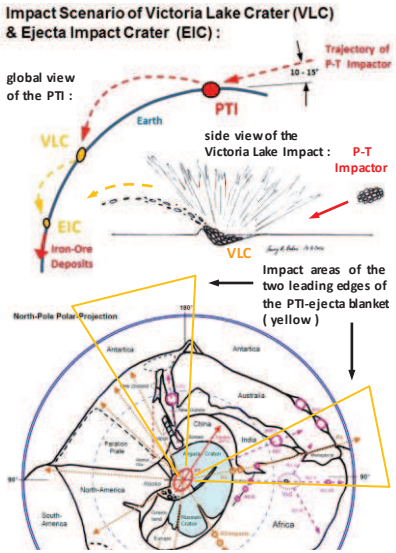


The seventh magma eruption :

The magma front of the seventh magma eruption, which happened around 30-40 Ma ago (→ 10-20 Ma after the sixth eruption), eventually crossed Middle-America and moved further eastward into the Caribbean Sea. The tip of this magma front is now located near Haiti. Since the fifth eruption which initiated the final break-away of South-America from Antartica and from New Zealand, the expansion tectonics process in the south-pacific area accelerated.

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

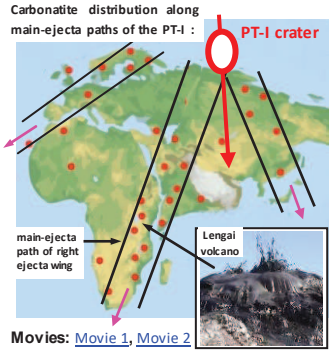
There is strong indication that the **Permian-Triassic Impact (PT-I)** and the ejecta rays which were caused by this enormous impact are responsible for the formation of the two main **LLSVPs** (Large low-shear-velocity provinces) inside Earth's mantle. These two large structures, which are characterized 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.



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 PTI-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 PTI-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

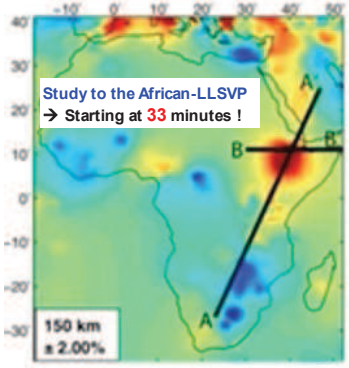


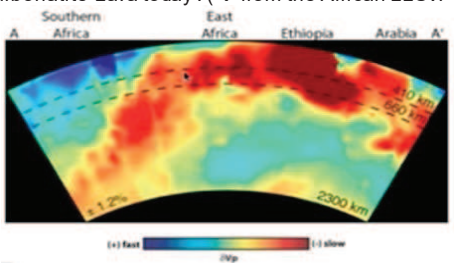
Movies: Movie 1, Movie 2

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 PTI 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 PTI-impact, or PTI-ejecta descenting 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 PTI 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 PTI-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**

The two maps on the top right side show that 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 PTI 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 PTI which descented to the CMB in this area.

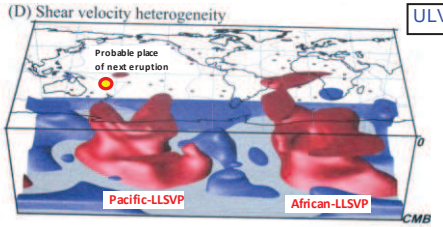
Note: it seems that the Cape York Impact produced a permanent channel in the mantle which connects the Pacific-LLSVP/ULVZ with the surface. Through this channel in the mantle ≥8 violent magma eruptions occurred over the last ~200 Ma causing a number of big **LIP's** on the Pacific Plate (e.g. the **Ontong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

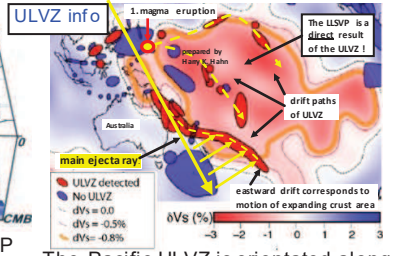
It seems the Pacific LLSVP is due for an eruption soon ! The solid upward pointing column at the top-end of the LLSVP, near the **Fiji's** may indicate the coming eruption (& mass extinction !). The vertical expansion rate of this column must be measured !!!

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 PTI !!!

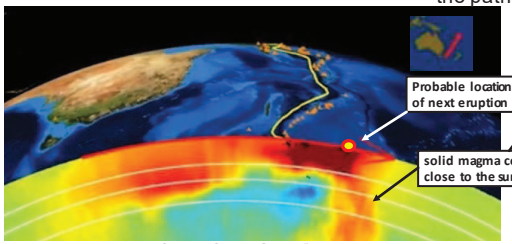
Therefore a revised model for **Earth's mantle** is required, which must consider a much higher share of volatiles, e.g. H_2O & CO_2 within the mantle material

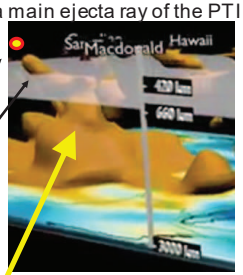


A 3-D view of the Pacific- & African LLSVP and the probable location of the next eruption



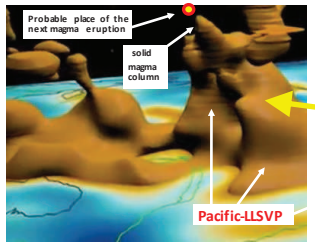
The Pacific-ULVZ is orientated along the path of a main ejecta ray of the PTI



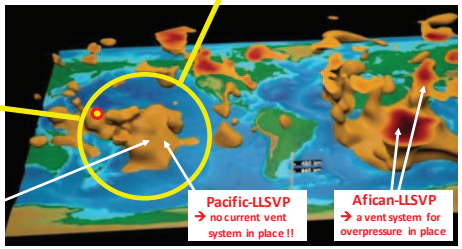


3D-Model No. 1 of Pacific LLSVP → see : 3D-Animation 1

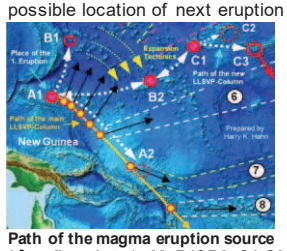
3D-Model No. 2 of Pacific LLSVP → see : 3D-Animation 2



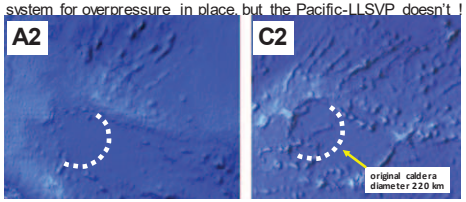
3D-view of Pacific-LLSVP with the possible location of next eruption



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



Path of the magma eruption source (→ yellow dots). A2, B1&B2, C1-C3 represent drift-off-copies & remains of the first magma-eruption-zone A1

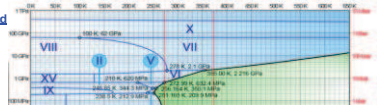


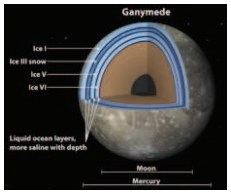
These two different ocean floor areas A2 & C2 which are thousands of km apart represent the same structure !!

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 H_2O, 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. H_2O may also be stored in materials like **Ringwoodite** etc.

Ringwoodite in Diamond

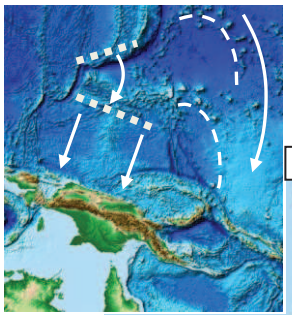




The magma eruptions No. 5 to 8 of the Cape York Crater shown in more detail :

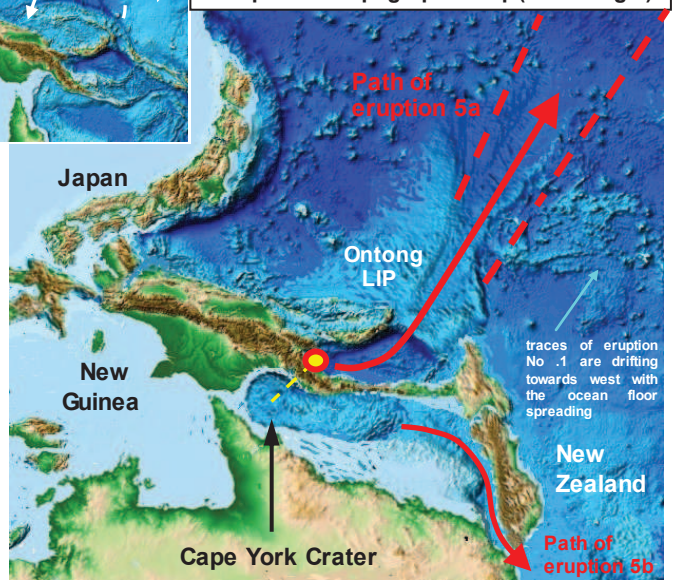
Starting Point of magma eruption No. 5 :

original Map: New Guinea position today



The white markings on the left map indicate the shift & rotation of New Guinea from its original position caused by the impact impulse of the PTI-ejecta & the magma eruptions. The manipulated map below shows the situation around 60 Ma ago. New Guinea was located further north near Japan

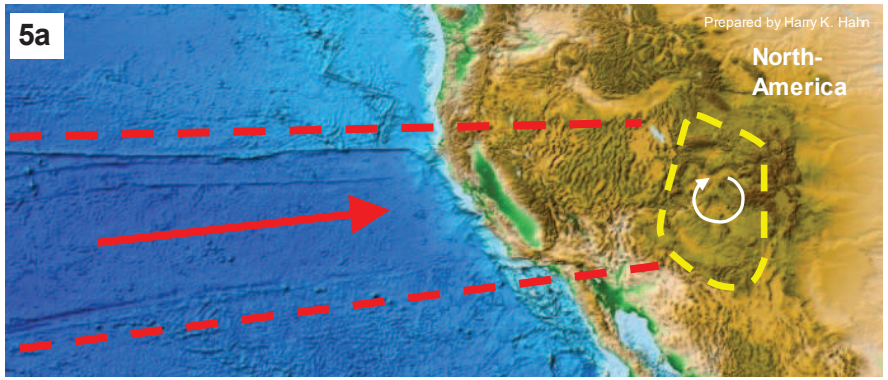
Manipulated Topographic Map (~60 Ma ago) :

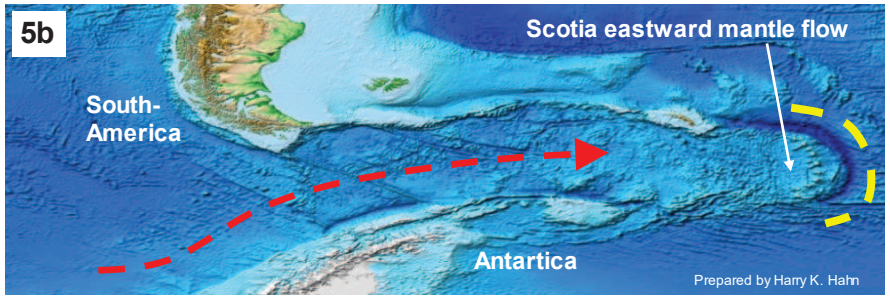


The collision zones of magma eruption No. 5 : (~ 65-60 Ma)

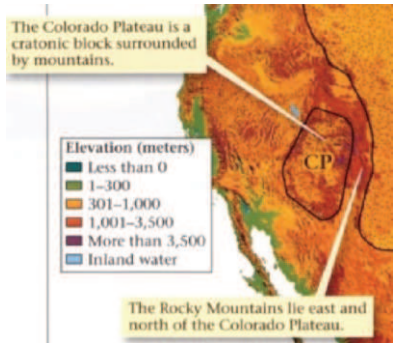
Prepared by Harry K. Hahn

The main front of eruption No. 5 collided with the westside of North-America





Another magma front (5b) produced by the strong magma eruption No. 5 of the Cape York Crater eventually separated (split-up) South-America from Antartica and thereby accelerated the expansion of the Pacific Plate in its southern section.



The Colorado Plateau is part of this magma front which was driven deep into the North-American Plate by magma eruption No. 5. The Rocky Mountains and the Basin & Range Province are a result of the collision of this powerful magma front with the North-American Plate. The Rocky Mountains formed in front of it, and the Basin & Range Province formed behind it. Note that the Colorado Craton also seems to rotate slowly clockwise on its path towards east !

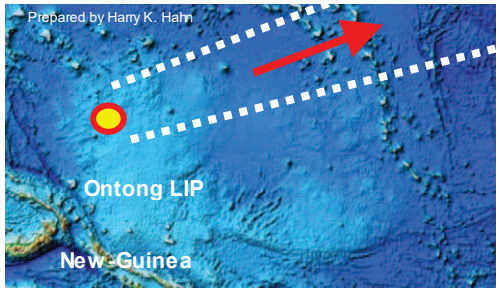
The trigger for this magma eruption No. 5 of the CY-Crater may have been the Chicxulub Impact which caused earthquakes > 12 RS.

The collision of Magma Front No. 5 may also explain the descent of the Farallon Plate under the North-American Plate.

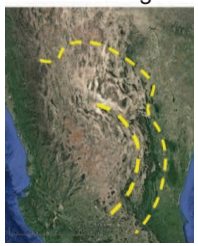
Starting Point of eruption No. 6

The starting point of magma eruption No. 6 is located in the large **Ontong LIP** area.

Note the similarity of size and shape of magma front No. 6 (→ see current location) and the central mountain range in Mexico.



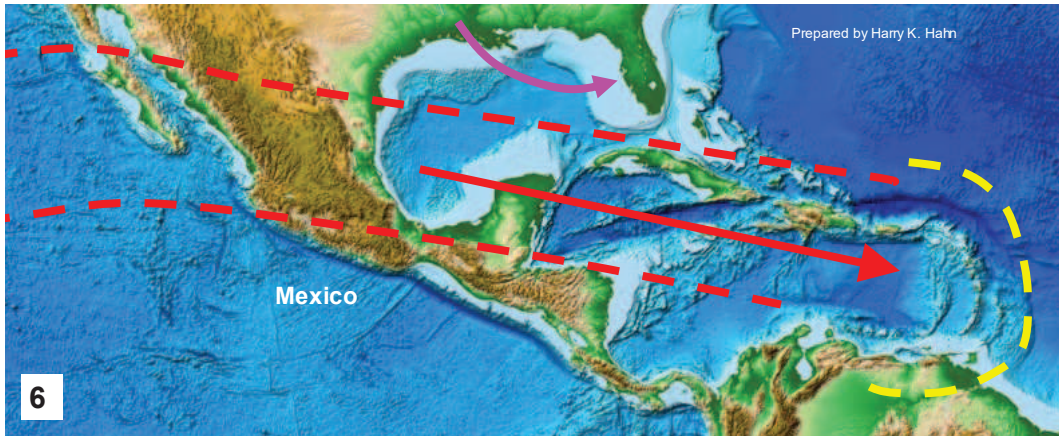
satellite images



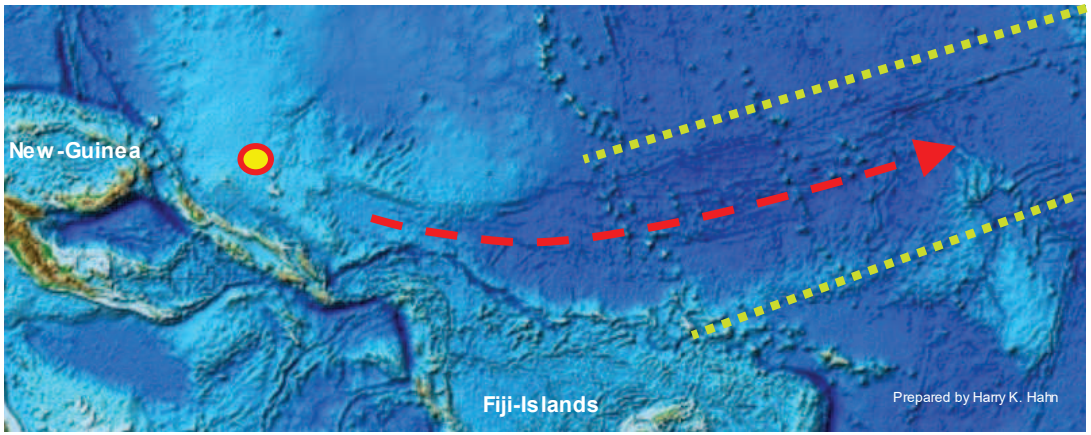
The result of magma eruption No. 6 : (~ 55-45 Ma)

The magma front of eruption No. 6 crossed Mexico, then moved further through the Golf of Mexico to its current location near the coast of Venezuela.

On its way it ripped out Florida and a long area of the north coast of the Golf of Mexico and rotated (bended) this stripe-like fragment of Earth's crust to the western side of the North-American Plate, where it formed the Appalachians when it collided there with the continental plate.

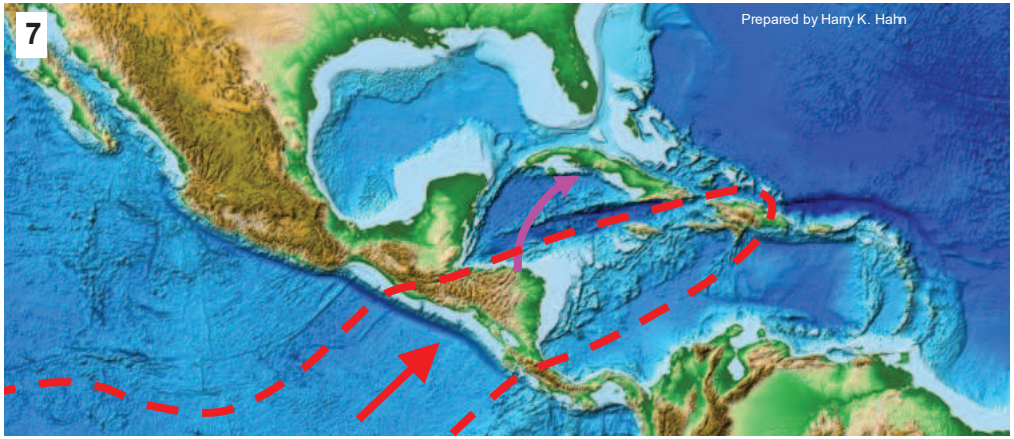


Starting point of magma eruption No. 7 :

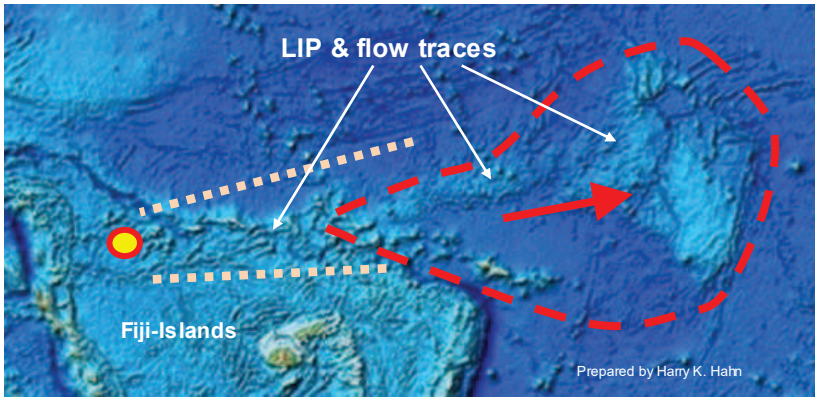


The result of the magma eruption No. 7 (~30-40 Ma) :

Magma eruption No. 7 crossed Middle-America and moved deep into the Caribbean Sea.



Starting point & flow traces of magma eruption No. 8 :

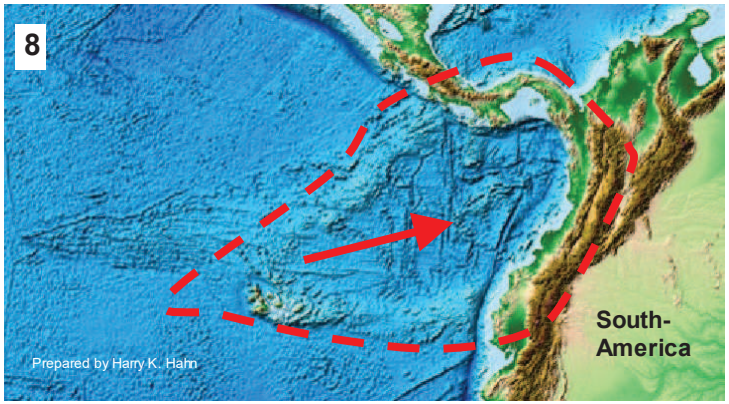


Note that the size and shape of the LIP, which is located in the path of the magma eruption No. 8, is very similar to the shape and size of the assumed collision zone of the magma front No. 8 with the South-American Plate ! The location of the initial magma eruption was ~ 1000 km NW of the Fidschi-Islands.

The collision zone of magma front No. 8 : (~ 25 Ma)

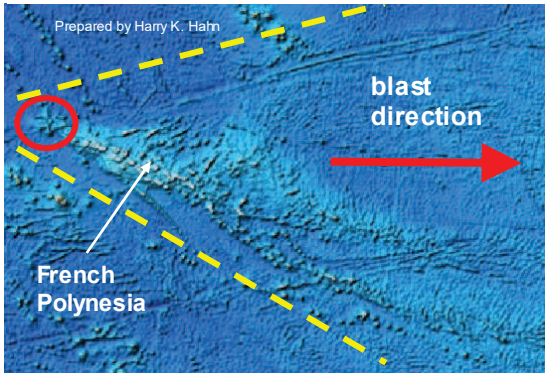
The collision zone of magma front No. 8 matches the LIP which is located close to the starting point of this magma Eruption.

Therefore there is a high probability that the deformation on the South-American Plate indicated in this image is a direct result of this LIP (→ eruption No. 8)



The starting point of magma eruption No. 5c :

French Polynesia is a result of a LLSVP caused by the 1. CYC-eruption & reactivated at the 5. eruption



The shape of French Polynesia and the flat-topped volcanos (→ tops were blasted away !), are an indication of the later CYC-magma eruptions (blasts) → No. 6 to 8.

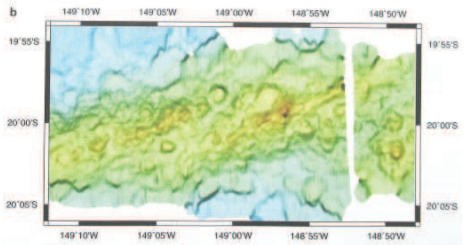
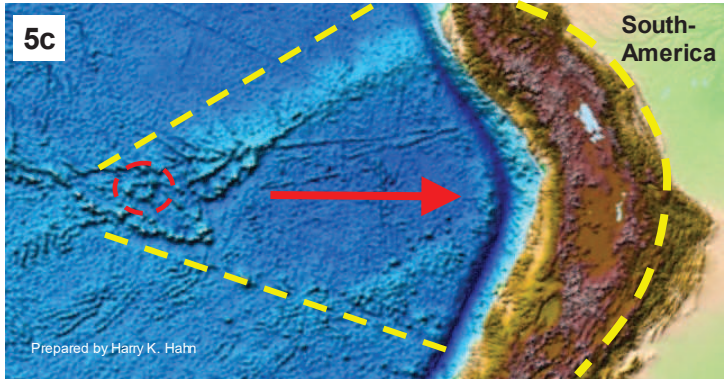


Fig. 1.12. a Bathymetry of a segment of the Va'a Tau Piti Ridges near Tahiti (Clouard et al. 2003). These volcanic ridges are clearly constructed by the superposition of many small, flat-topped volcanic cones. The Simrad EM12D, Hydrosweep DS and SeaBeam multibeam bathymetry is shown using a 100 m grid interval and shading by slope magnitude. b Detail of volcanic morphology of ridges in region shown by box in a

The collision zone of magma eruption No. 5c : (~ 65-60 Ma)

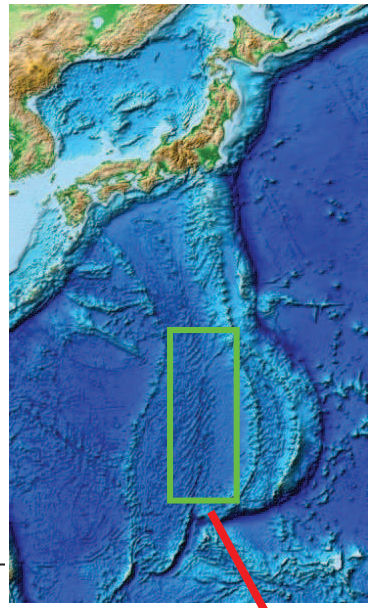
Magma eruption No. 5c is a special case, because it didn't come from the same source area as the other eruptions. The first CYC-Crater eruption caused a LLSVP which first drifted west and later south-west, where it then produced an eruption at the time of the 5. eruption period.

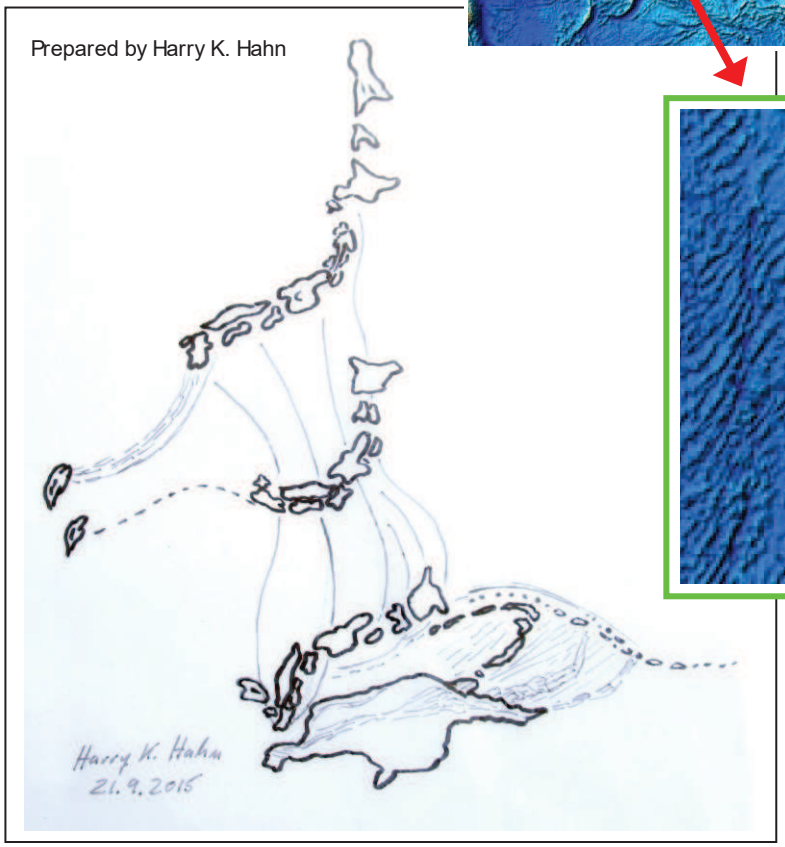


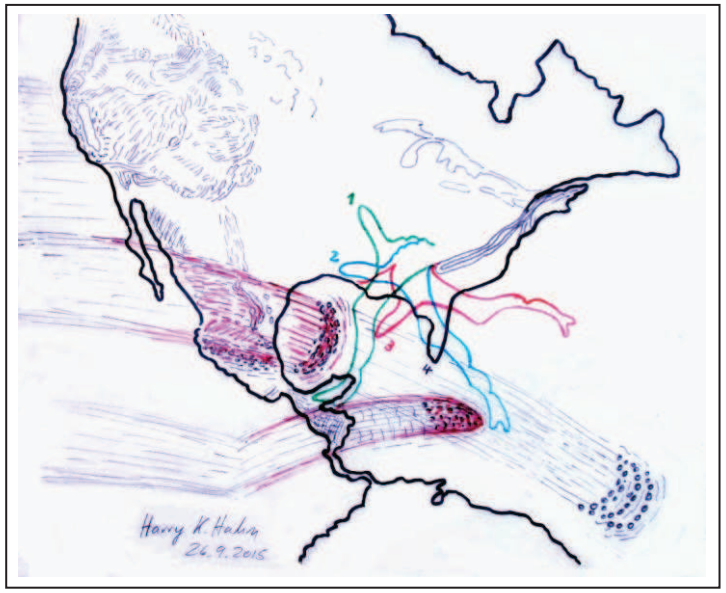
The following images explain the motion of the crust fragments which formed Japan and the Appalachians

Note the traces which were left on the oceanic crust, on which Japan “slipped” to its present position. These traces give detailed information about the orientations (the exact angle positions) of some of the fragments of Japan, during the successive “Slip-Events”

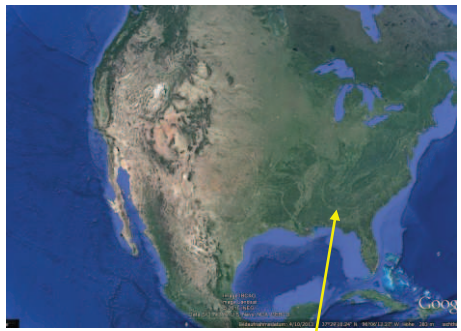
The image below shows the motion of the crust fragments which formed Japan, which originate on the north-coast of New Guinea. This motion was triggered by the magma eruptions (1 to 5) of the Cape York-Crater







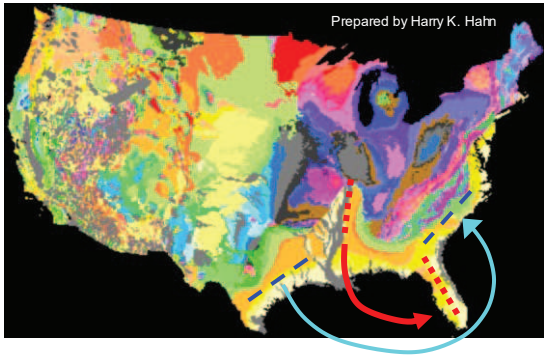
Prepared by Harry K. Hahn

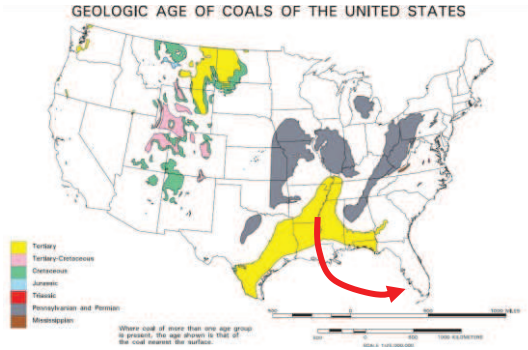


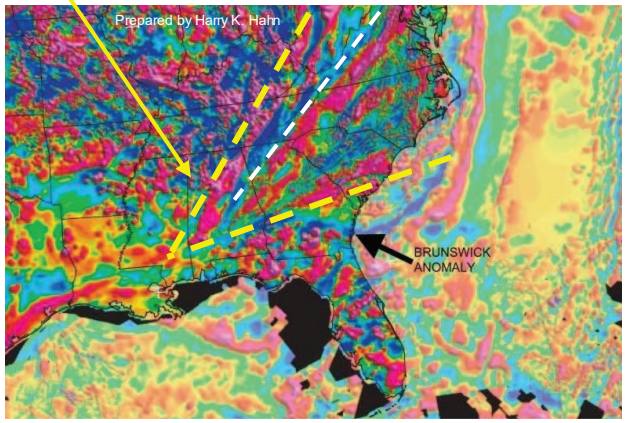
These maps all indicate the motion of the crust fragment which has formed the Appalachians.
The Google satellite image clearly shows the 180° bend of this crust fragment.

And the geological map and the coal-age map on the lefthand side nicely show where Florida and a long section of coast area of the Gulf of Mexico have been located before the magma eruption No. 6 of the Cape York Crater took place.

Please note how nicely Florida fits into the Mississippi-river-area. My drawing illustrates the motion. And the magnetic anomaly map below shows the apex of the bend an the folding as such.







Features on the ocean-floor age map that provide proof for the magma eruptions of the Cape York Crater

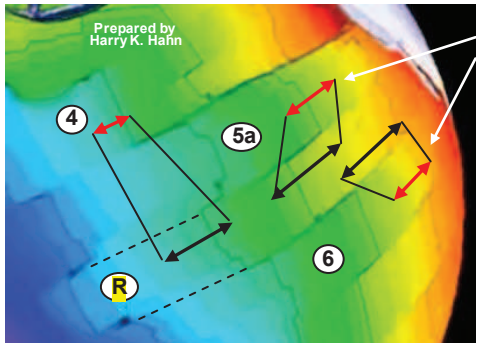
There are features and marks visible on the ocean-floor map which provide proof for the above described magma eruptions of the Cape York Crater.

These magma eruptions caused shearbreaks in the oceanfloor through the strong impulse which these eruptions induced in the ocean-floor when the magma material was ejected on it, and decelerated on it, through friction (towards east).

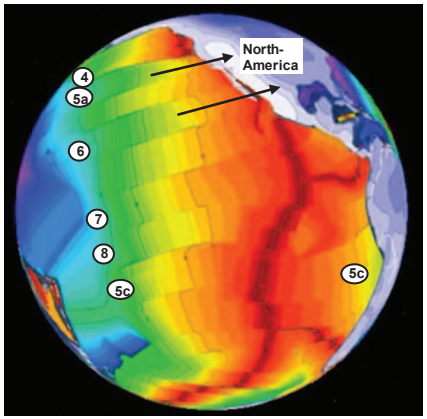
The ocean-floor shear-cracked over a long distance, mainly in the direction in which the magma material was ejected to. For the magma eruptions No. 5 to 8, were the magma was ejected towards east, this is indicated by a considerable shift and expansion of the corresponding "ocean-floor-stripes" towards East.

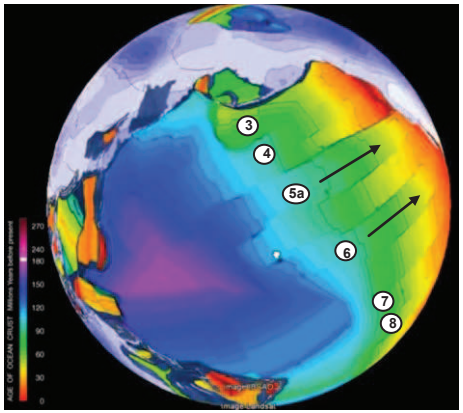
The widths of the ocean-floor-stripes, which are ~1200-1600 km, give information about the widths of the "magma fronts" which were ejected on the ocean floor.

The stripes with the greatest shift towards east, visible on the ocean-floor-age map, were effected by the most severe magma eruptions. These are in particular the stripes marked with **5a & 6**. These two stripes experienced particular strong acceleration by the magma material (magma fronts) , towards east.
One important feature, which is a strong indication for the described scenario of the magma eruptions towards east, is the compression of certain sections of these stripes, in particular on the stripes **5a & 6.** Compared with a reference stripe **"R"** , the marked sections (red) are clearly compressed !
The compressed sections on the stripes roughly indicated the time of the eruption, because the magma decelerated on this "new" crust area before it fused to the NA-continent.
However also other information must be used to find the exact times of the eruptions. For example the age of the erupted magma etc.



The marked areas on the stripes 4, 5a & 6 (red arrows) indicate compressed areas, if compared with reference stripe **"R"** which probably was not effected by an eruption



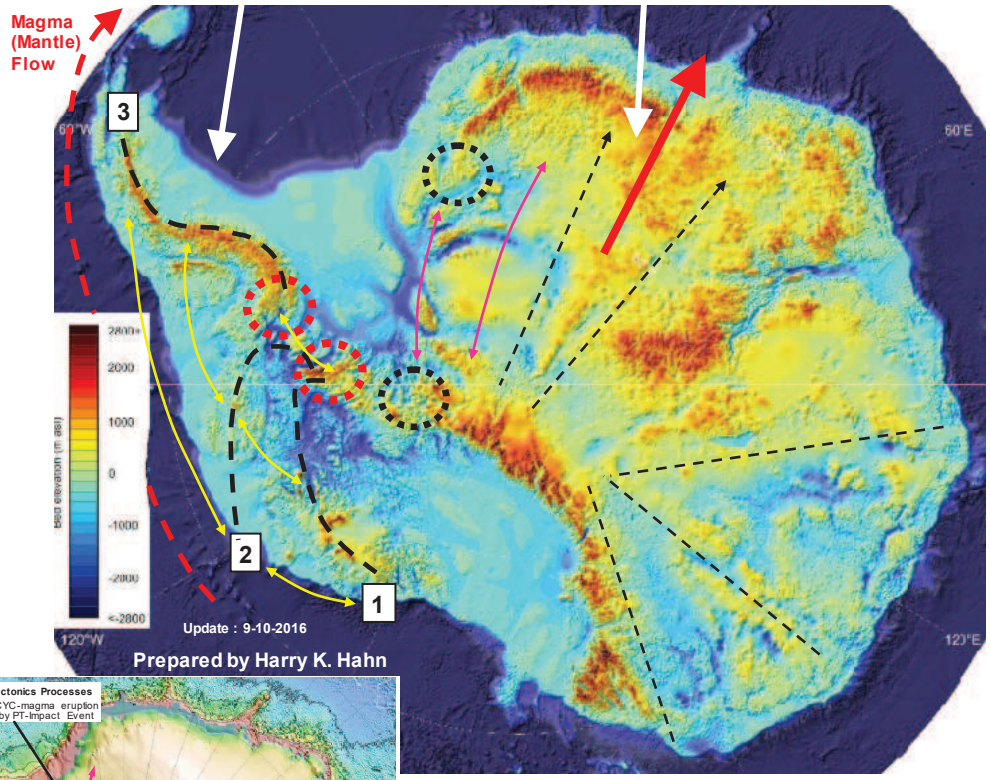


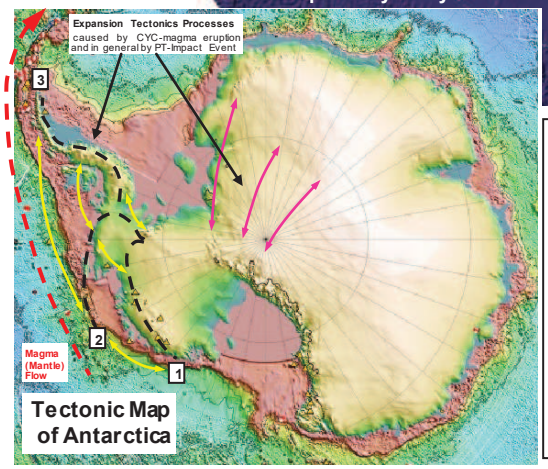
The Topographic Map of Antarctica provides further proof for the strong magma eruption No. 5 of the CY-Crater :

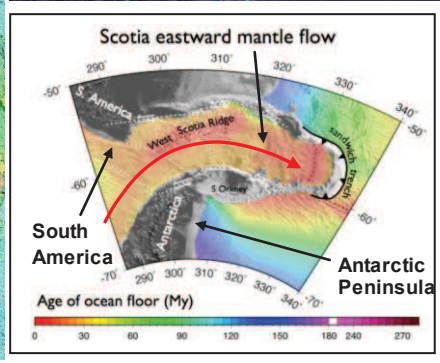
The following map shows where the southern magma flow (5b) from the 5.magma eruption of the CY-Crater first crossed Antartica (red arrow). The main flow then changed direction and flowed along the curved coastline of Antarctica on the left side of the map. The mountain range of the Antarctic Peninsula was deformed and shifted to different locations by the magma (lithospheric) flow (see black dotted lines). Note the "root" of the range (red circle) !

The motion of the Antarctic Peninsula caused by the magma eruption (→ 3 different positions indicated)

Magma flow from the magma eruption No. 5 of the CY-Crater



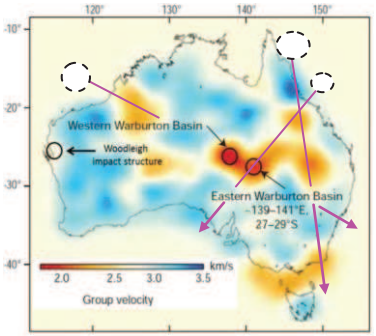




This map shows the present location of the southern front of the magma flow (or lithospheric flow), 5b, of the eruption No. 5 of the CY-Crater.

Epilogue

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 Ø 100-200km each)

Weblinks :

News Article 1 , News Article 2

East-Warburton Basin

Eromanga Basin

(Woodleigh 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 of the tectonic processes which took place on Earth 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 diciplines 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 these 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 ø 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 ø 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 astro-physical 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 drive 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 should'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 action with intelligence is required !

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

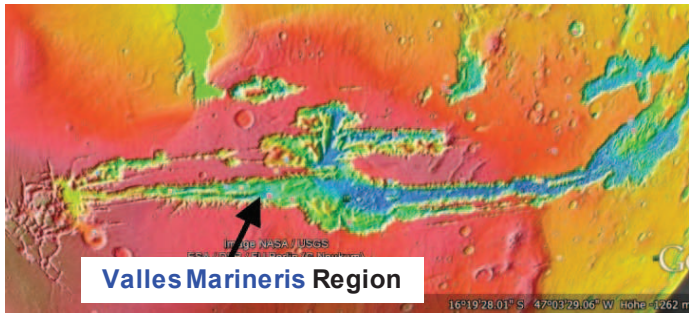
→ see Weblink : "**To the deflection of asteroids in the diameter range of 5 to 200 Km**"

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 !

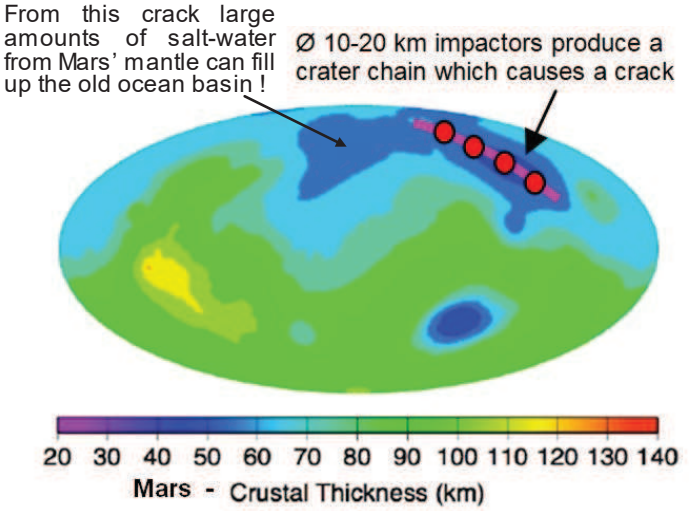
An action plan for Terra-Forming on Mars :

With a controlled impact series of probably 3 to 4 impactors in the Ø 10-20 km range a large crack in the crust of Mars could be produced.

In order to achieve this crack with the smallest possible impactor diameter & energy expense, the optimum area for the intented 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 produce a small ocean and a thicker atmosphere on Mars, 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 Jupiters moon Ganymede.



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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-Jurrassic Rifting : Continental Breakup and the Origin of the...**
Chapter : **Eastern North American quarz tholeiites..** , J.H. Puffer...
www.books.google.de → Search : → type in : **Ti quartz tholeiite**

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 thirth image !)

2.) **The Sagittarius Impact as an Architect of Spirality and Outer Rings in the Milky Way**
→ https://www.youtube.com/watch?v=pig-uqRehNM&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=qfujsDMl0jU
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
→ Ajoint 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=PrIk6dKcdoU
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.
→ http://expansion.geologist-1011.net/

6.) **Microscopic structure of water at elevated pressures and temperatures**
C.J.Sahle & others → http://www.pnas.org/content/110/16/6301.full.pdf

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**
M.Ushioda ...; → http://www.earth-planets-space.com/content/pdf/1880-5981-66-127.pdf

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