Ordered Motions in the Universe

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Abstract

There is hardly any mention in the broad literature of our observed knowledge about the ordered global motions taking place in our Galaxy and beyond, which require powerful re-ejections of the matter that steadily falls in from outside, at their innermost centers. These re-ejections can only be achieved by nuclear-burning of the strongly compressed hydrogen inside their central accretion disks. SMBHs cannot do it.

1 Ordered Galactic Infall

Figure 1 sketches, semi-logarithmically, the large-scale motions of matter in our Galaxy, observed since more than 35 years, whose accuracy has increased only slightly with time. Besides, a slow overall infall towards its center caused by gravity – centered at Sgr A* – is expected, in particular via spiral-in motion through the Milky Way disk, at an infall mass rate of $\lesssim M_{\text{sun}}/\text{yr}$. Our Solar System is located in this disk, and takes part in its spiral-in motion, on an infall timescale of order $\sim 10^{10}$ yr. At the end of this time, it will reach the center, will be squeezed, and nuclear burnt near Sgr A*, and subsequently blown out radially towards infinity, in the shape of expelled nuclear ashes.

Present mainstream thinking is different: Started by Donald Lynden-Bell in 1969, and continued by Martin Rees, Günther Hasinger, Reinhard Genzel, and dozens of other observers until today, they assume that Sgr A* is a Supermassive Black Hole, =: SMBH, which swallows all the infalling matter; even though this is inconsistent already with its comparatively small mass – of order $10^{6.6} M_{\text{sun}}$ – for a present mass infall rate of order M_{sun}/yr, and even more so according to figure 2 below, for a typical cosmic mass infall rate ever since its beginning.

It is likewise inconsistent with the fact that we do receive radiation every now and then from Sgr A*, often only via seconds-short bursts at IR frequencies, often at X-rays, often probably also at hard gamma-rays, cf. Fig.3. Why then are all the very centers of quasars invisible, reviving the present-day conjecture of all mainstream astrophysicists that "very likely, these galactic centers contain BHs". Note that whereas stars of all kinds are surrounded by almost vacuum,

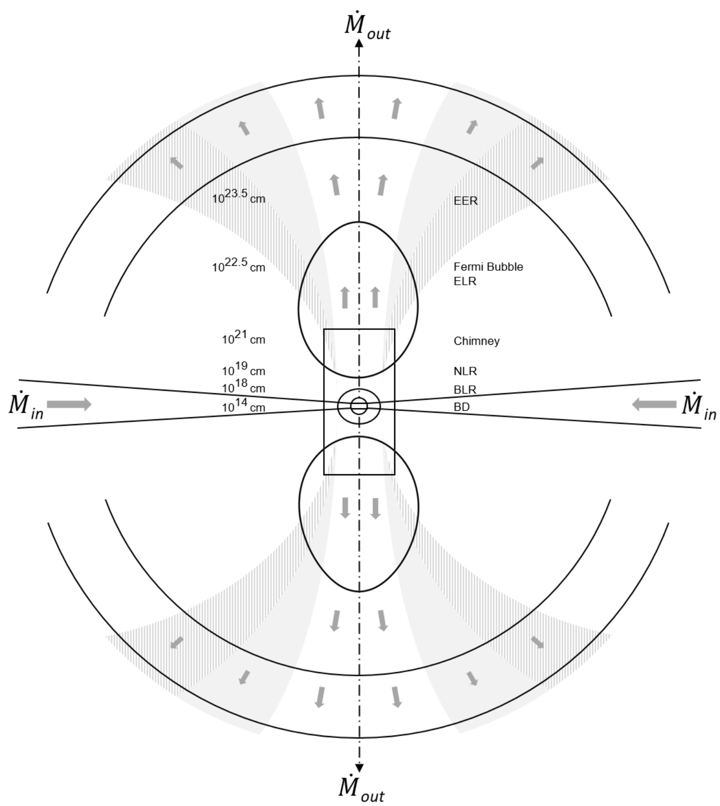

Figure 1: Sketch of our Galactic Circulation, at semi-logarithmic scales: starting at its center – at Sgr A*, identified with the BD – the explosive ejection of its nuclear ashes happens radial, and fastest, inside its almost spherical BLR, of radius 10^{18} cm – see Fig.4 – then slightly more broadened through its (somewhat more elliptical) NLR, of extent 10^{19} cm – see Fig.5 – then more vertically, through its chimneys region, or ELR, of height 10^3 lyr, and Fermi-bubble region, of height $\lesssim 10^{4.5}$ lyr, out to its surrounding EER region: observed as almost spherical "Lyman alpha forest", and "metal-line shells", of even larger radii, both of them surrounding our Galaxy (and other galaxies), where we can trace their past outflow today.

likewise all stellar-mass disks, all nebulae, jets, and stellar explosions, and are therefore well visible, the centers of massive disks are heavy and opaque – so-called "burning disks", := BDs – which can even have their nuclear detonations screened by heavy plasma layers – like by blankets of huge opacity – because they find themselves at the bottom of a deep galactic potential well. Only their rare, powerful flares have so far been recorded. They radiate by blowing transient holes into their covering blankets. They are the rare, most powerful nuclear explosions in the Universe which can even reverse galactic contractions

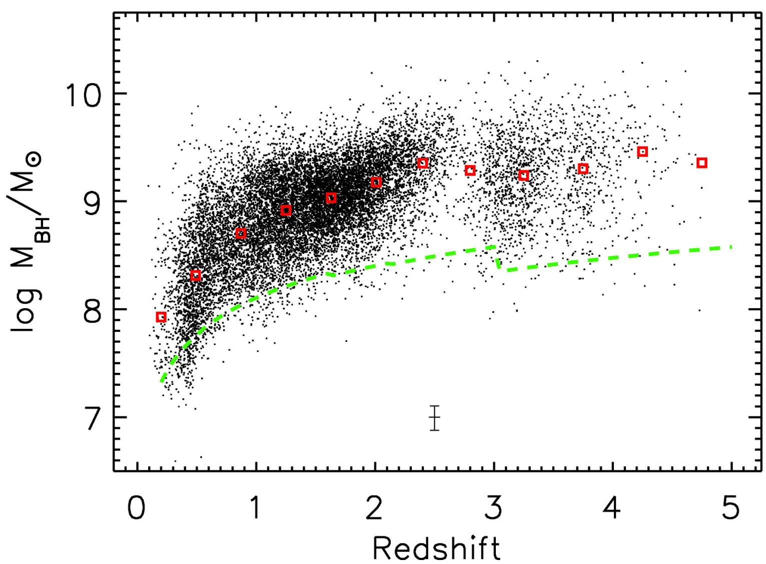

Figure 2: The SDSS plot, by Kormendy & Bender, 2011. In my understanding, M_{BH} stands for the (unresolved) core masses

steadily, so that we live in a regular, almost steady-state galaxy, inside an almost steady-state Universe.

Note also that no pulsars are observed from within the innermost 20 pc of Sgr A*, even though some thousand of them are expected [Kundt, 2017]: it's a high-pressure, stormy central region, which prevents neutron stars from blowing

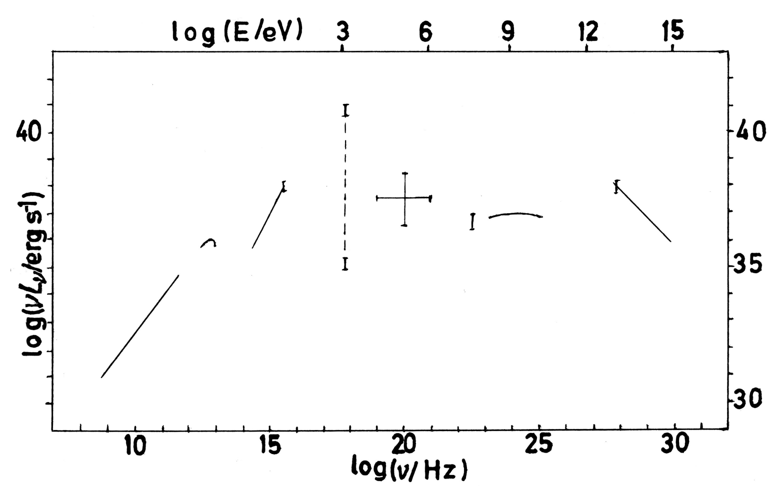

Figure 3: A rough emission spectrum of Sgr A*, from [Kundt, 2020]

windzones, and therefore from emitting pulses.

But strong, galactic nuclear detonations are quite consistent with Hasinger's detections of ejected Fe K alpha lines from Sgr A* - also from other galactic centers - signposts of extreme nuclear burning, confirming above interpretation; SMBHs would behave differently, [Kundt, 2015]. See also: [Kundt & Fischer, 1989], and Kundt [1978 - 2020].

2 Ordered Galactic Outflow

New in the preceding section has been the insight that the centers of massive galaxies are almost invisible, but can nevertheless be described by regular solutions of Einstein's GRT - BDs - which pressurise their surroundings. This fact was first noticed by Suzy Collin-Souffrin [1993], who found the relationship $\dot{M}_{out} \sim \dot{M}_{in}$ for the mass rate entering our Galactic center through its BD, and subsequently leaving it through its broad-line-region =: BLR, of radius of order lightyear = 10^{18} cm, see Fig.4. Remarkably, a storm issuing from Sgr A* blows the atmospheres of all (8) inner-most bright stars radially outward.

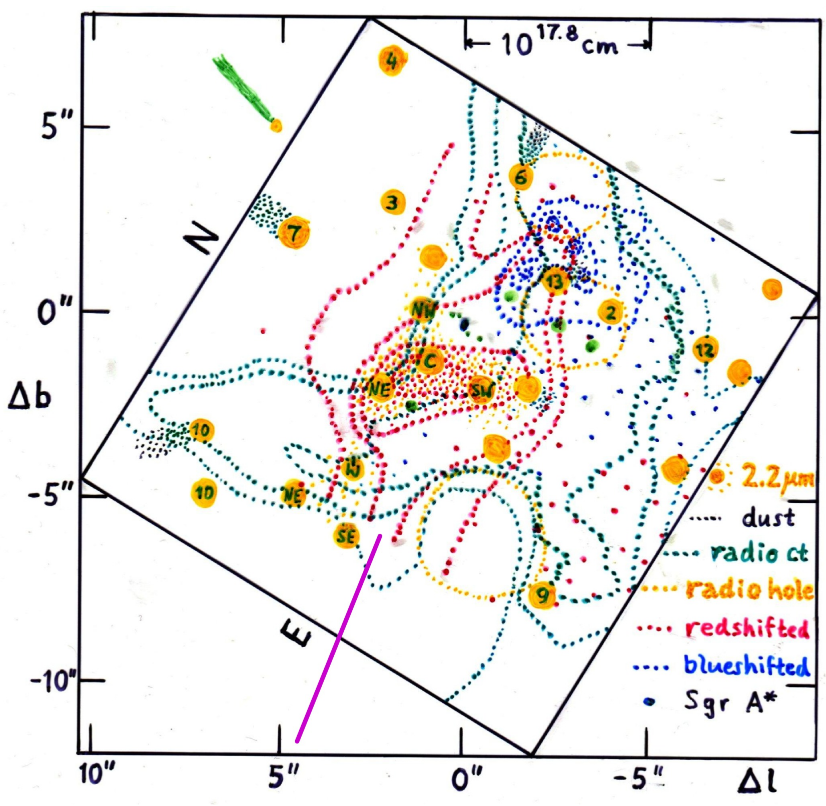

Figure 4: the BLR of our Galaxy, from [Kundt, 2017]

This innermost, radial storm field through the BLR can be traced outward through the (slightly ellipsoidal) envelopping narrow-line-region occupied by Sgr A East, of size 10 lyr, see Fig.5, and further into chimney-shaped outflow regions, of heights $\lesssim 10^3$ lyr, also called EERs (:= 'Extended Emission Regions'), see Kundt [2017, 2019], then further into egg-shaped FERMI bubbles, of heights $\lesssim 10^{4.5}$ lyr, and finally into more spherical escape regions – also called 'Emission-Line Regions', =: ELRs, of even larger radii, envelopping our Galaxy, and already noticed back in 1985, in collaboration with Marita Krause [Kundt & Krause, 1985], cf. Fig.1 . This gigantic Galactic outflow region has been blown, we claim, by a central BD of thickness some 10^{12} cm, and radius some 10^{14} cm, sitting at the center of the BLR, which has as yet not been resolved by our best telescopes.

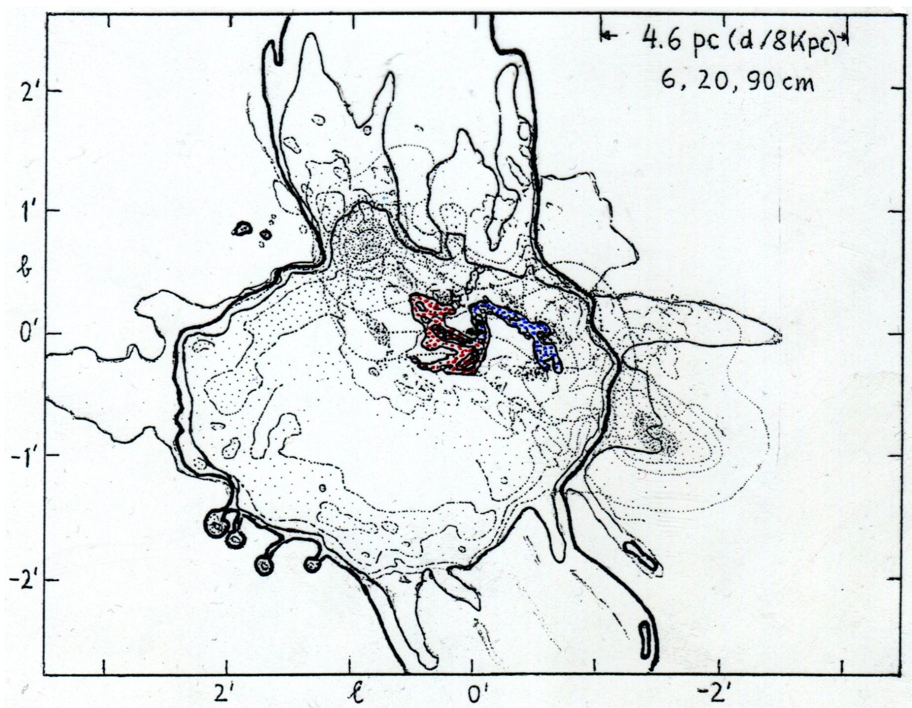

Figure 5: the NLR of our Galaxy, from [Kundt, 2017]

But clearly, even if SMBHs existed, they could not explain the well-observed 4-momentum-balance of this galaxy-sized outflow of nuclear ashes, which has even been supported by Hasinger's detection of a rapid escape of maximally ionized iron from our Galactic center, the ashes of extreme nuclear burning; which is nowadays concentrated in its outermost metal-line shells (mentioned in Fig.1), whilst the initially comoving hydrogen is now concentrated in the 'Lyman-alpha forests' surrounding the same galaxies, see [Kundt & Krause, 1985].

3 A Million further galaxies

In this last section on ordered motions in the Universe, let us take a look at all the other sufficiently resolved galaxies in the sky; do they behave similarly to our's? Already the $\gtrsim 1998$ plot of the Sloan Digital Sky Survey (=:SDSS) reveals a rather uniform behaviour, as a function of redshift z, and the later – and more complete – compilations by Kormendy & Bender[2011], and by the Messenger [No.175, 2019] – strengthen this impression, see figure 2 : The core masses of the youngest galaxies in them, with $z \sim 6$, – and therefore probably the smallest ones – stay just below $10^{10} M_{\text{sun}}$, the maximum possible mass that can reach the center of a rotating disk, for which the Kepler velocity in the innermost disk reaches the speed of light c; all the later – and older – galaxies have core masses shrinking from (the initial) $10^{10} M_{\text{sun}}$ to (the present) $\sim 10^7 M_{\text{sun}}$, and smaller. So all of them appear to be young enough to still shed their disks for the first time, containing plenty of hydrogen. We live in a young Universe!

And like in our own Galaxy, all these more distant, younger galaxies manage to prevent their core masses from growing, i.e. to re-eject slightly more matter than enters their cores, statistically; the average trend is re-ejection. Isn't that a deep lesson by the SDSS plot, to take home?! Our Universe contains similar galaxies to our's right from its beginning!

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