

Striking analogies between tectonic features of Moon and Earth: SPA Basin – Indian Ocean, Mare Orientale – Congo craton

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Earth and its satellite both are well studied topographically and gravimetrically. It turned out that at both bodies there are solitary unique planetary scale objects origins of which puzzles scientists. Geophysicists know about existence of a unique depression in the geoid form on the Indian Ocean equator deep –112 m but its origin is mysterious. According to prevailing since some time the plate tectonics the basin of the Indian Ocean was formed as a result of moving apart core blocks around a triple junction of the middle-ocean ridges. Such interpretation of the present tectonics contradicts to a real disposition of different ages planetary geologic blocks around the Indian minimum [1] and does not explain its profound nature. The minimum occurs at the axis “b” of three main Earth’s moments of inertia and thus is a fundamental part of its rotation figure [2].

Lunar Basins and Mare, as it is known, are traditionally considered as traces of impacts of giant cosmic bodies during an earlier bombardment (3 to 4 b. y. ago). Even their regular symmetric disposition on the surface is neglected [3]. However, serious difficulties recently arise in concordance of their supposed ages with ages of “impact” breccias and relations between them. But the supporters of impacts stand firm on their opinion and do not accept alternatives. The South Polar-Aitken basin is considered as the largest impact basin in the Solar system; its depth is about 8 km with the total lunar relief range about 20 km.

The comparative wave planetology [3-4 & others] could help in solution of the question. It turns out that both considered planetary structures occupy analogous positions in a wave structure of their bodies (Fig. 1, 2). They are deeply subsided sectors (πR -structures) on their respective uplifted continental highland segments-hemispheres ($2\pi R$ -structures) [5]. Similarity of the lunar and Earth’s deepest geoid minima (the SPA Basin and the Indian Ocean basin) is proven by their even relative sizes, similar tectonic settings and dense mantles (Fig. 1, 2) [5-7]. Such regular their arrangement on two globes makes dubious their interpretation according to the hypotheses of plate tectonics and impacts [5, 6].

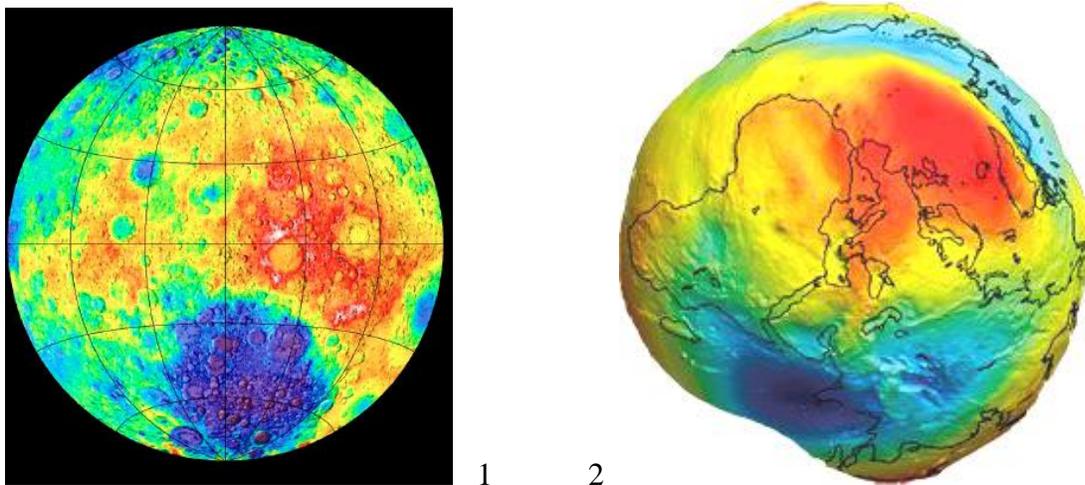
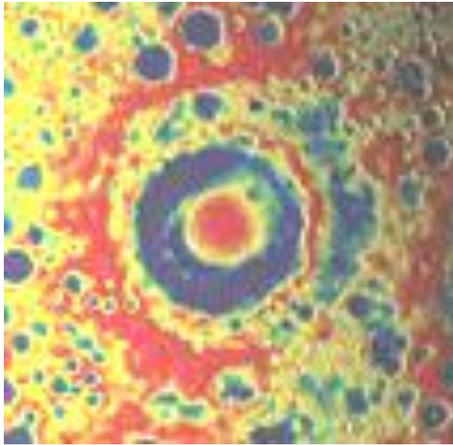


Fig. 1. Lunar geoid. Center-down (dark blue) – SPA basin (moontopogeoidusgs_farside.jpg).

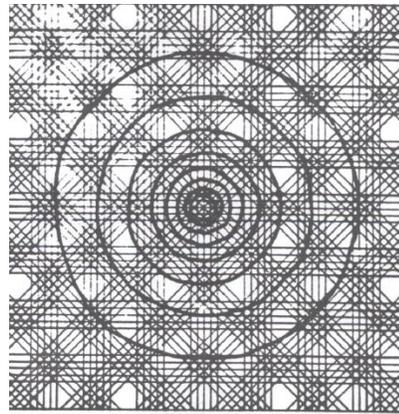
Fig. 2. Earth’s geoid. Center-down (dark blue) – Indian minimum (832e4f812d1e.jpg).

Fig. 3. Lunar concentric gravity in Mare Orientale area. Red-high, blue-low (Science, 2013, v. 339, # 6120, book-jacket).

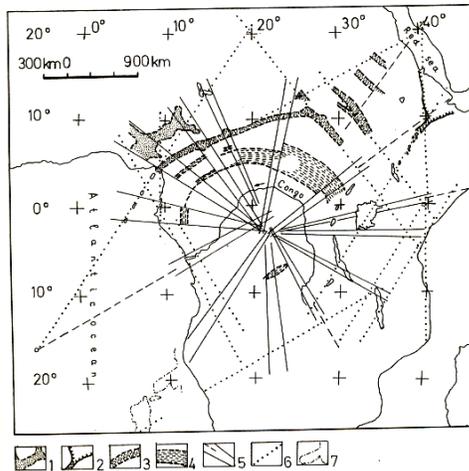
Fig. 4. Congolese superstructure: 1. Benoue trough, 2. Afar depression, 3. Rifts in the craton frame, 4. Archean greenschist belts, 5. Radial weakness zones, 6. Tangential weakness zones, 7. Walvis ridge



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5



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Fig. 5. Graphic representation of crossing waves (+ up, - down) producing chains and grids of round forms (craters) and multi-ring structure (better seen from some distance).

Resemblance between the Mare Orientale and the Congo craton superstructure (Fig. 3, 4) is in their relative sizes (both have $\pi R/4$ dimensions) and nearly perfect concentric structures. The centers are well expressed in topography, gravity field (the lunar case, Fig. 3 [8]), in geological construction (the terrestrial case, Fig. 4). Spacing between concentric zones in both cases increases outward with the factor $\sqrt{2}$ (a model in Fig. 5) [9]. Mare Orientale has enigmatic collars of the crater-beads. They not only surround the Basin but are revealed also inside of this large concentric structure. This multi-ring construction consists of intercalating mountainous and plain belts revealed

by topography. But the more profound GRAIL gravity shows that many of the belts are composed of uniform crater-beads (they are better seen on the positive gravity “red” areas and somewhat worse on the negative “blue” areas, Fig.3). This fine structure is better explained by the wave interference, a graphic model of which is in Fig. 5. The considered striking similarities between fundamental tectonic features of both cosmic bodies require thorough examination for unveiling true tectonic histories and origin of this “double planet”.

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