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Dense basalts as a universal "remedy" regulating angular momentum problems of slowing rotation celestial bodies: the Moon, Earth, Venus.?

G. Kochemasov
IGEM of the Russian Academy of Sciences, Moscow, Russia (kochem@igem.ru)

Copious basaltic effusions are known in geologic histories of planets of terrestrial group and the Moon. Heavenly bodies of different sizes, compositions, densities and orbits show comparable trends in magmatic activity effusing heavy (dense) basaltic material onto their older surfaces at various times of their geologic history. As was discussed in [1], warping of spheres of rotating celestial bodies caused by their movements in keplerian non-round elliptical orbits with inevitable appearance of inertia-gravity forces is enough by itself to "ignite" chemical (density) differentiation in mantle. This splitting of mantle material with production of light rich in Si, Al, alkalies material and heavy (dense) rich in Mg, Fe, Ti material is necessary to send them (these materials) to built tectonic blocks with differing elevations, differing planetary radii. Uplifting blocks –highlands are composed of lighter materials and subsided blocks – lowlands of denser materials. This serves to equilibrate angular momenta of different levels blocks. Darker basaltic lowlands – typical picture of terrestrial planets and the Moon landscapes. Some basalt material is deposited also on lighter highlands but its composition is different from this of lowland basalts. The former is somewhat less dense than the latter (KREEP's of the Moon, alkali basalts and andesites of Earth, alkali- Mg-basalts of Venus, more feldspathic and more magnesian basalts of Mars). There is also another reason to cause copious basaltic effusions on planets and the Moon. Loosing angular momentum due to slowing rotations forces to send dense basaltic material onto high crustal level to compensate momentum loss. Venus is probably the best example: thoroughly outgassed with massive and rapidly rotating taking momentum atmosphere it is forced to rotate slowly; slowing rotation of the solid venusian body starts massive basaltic effusions covering a significant portion of its surface to compensate momentum loss. Retreating from Earth Moon and thus

slowing its rotation also sends dense basaltic material to higher crustal level by the same reason. But this happened much earlier in geologic history and was not so profuse as at Venus (masses of these two bodies are much different). Massive Earth also slows its rotation probably compensating an increasing momentum of the widening Earth-Moon system. This slowing leads to the same "remedy": periodical effusions of flood basalts on oceanic floors and continents. Planetary basaltic magmatism is not only somewhat chemically different at the Moon, Earth and Venus but changes its chemistry with time. Thus, at Moon and Earth the earlier magmatism was more magnesian, and the later one more ferruginous [2]. It means that with time effusing masses become denser what helps more effectively to fulfill task of keeping angular momentum at later stages when melting basalts in cooling mantle is more restricted.

References: [1] Kochemasov G. G. (2006) Wave Warping as a Reason (Impetus) of Density(Chemistry) Differentiation of Planets at Very Early Stages of Their Formation // In Workshop on Early Planetary Differentiation: a Multi-Planetary and Multi-Disciplinary Perspective, p. 61. LPI Contribution No. 1335, Lunar and Planetary Institute, Houston; **[2]** Sharkov E., Bogatikov O. (2006) Tectonomagmatic evolution of the Earth and the Moon: comparative study // 36^{th} COSPAR Scientific Assembly, Beijing, China, 16-23 July 2006, Abstr. COSPAR2006-A-00734, CD-ROM.