Geophysical Research Abstracts
Vol. 16, EGU2014-1300-1, 2014
EGU General Assembly 2014

New Indivisible Planetary Science Paradigm: Consequence of Questioning Popular Paradigms

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Progress in science involves replacing less precise understanding with more precise understanding. In science and in science education one should always question popular ideas; ask “What’s wrong with this picture?” Finding limitations, conflicts or circumstances that require special ad hoc consideration sometimes is the key to making important discoveries. For example, from thermodynamic considerations, I found that the ‘standard model of solar system formation’ leads to insufficiently massive planetary cores. That understanding led me to discover a new indivisible planetary science paradigm.

Massive-core planets formed by condensing and raining-out from within giant gaseous protoplanets at high pressures and high temperatures, accumulating heterogeneously on the basis of volatility with liquid core-formation preceding mantle-formation; the interior states of oxidation resemble that of the Abee enstatite chondrite. Core-composition was established during condensation based upon the relative solubilities of elements, including uranium, in liquid iron in equilibrium with an atmosphere of solar composition at high pressures and high temperatures. Uranium settled to the central region and formed planetary nuclear fission reactors, producing heat and planetary magnetic fields.

Earth’s complete condensation included a $\sim$300 Earth-mass gigantic gas/ice shell that compressed the rocky kernel to about 66% of Earth’s present diameter. T-Tauri eruptions, associated with the thermonuclear ignition of the Sun, stripped the gases away from the Earth and the inner planets. The T-Tauri outbursts stripped a portion of Mercury’s incompletely condensed protoplanet and transported it to the region between Mars and Jupiter where it fused with in-falling oxidized condensate from the outer regions of the Solar System, forming the parent matter of ordinary chondrite meteorites, the main-Belt asteroids, and veneer for the inner planets, especially Mars.

With its massive gas/ice shell removed, pressure began to build in the compressed rocky kernel of Earth and eventually the rigid crust began to crack. The major energy source for planetary decompression and for heat emplacement at the base of the crust is the stored energy of protoplanetary compression. In response to decompression-driven volume increases, cracks form to increase surface area and fold-mountain ranges form to accommodate changes in curvature.

One of the most profound mysteries of modern planetary science is this: As the terrestrial planets are more-or-less of common chondritic composition, how does one account for the marked differences in their surface dynamics? Differences among the inner planets are principally due to the degree of compression experienced. Planetocentric georeactor nuclear fission, responsible for magnetic field generation and concomitant heat production, is applicable to compressed and non-compressed planets and large moons.

The internal composition of Mercury is calculated based upon an analogy with the deep-Earth mass ratio relationships. The origin and implication of Mercurian hydrogen geysers is described. Besides Earth, only Venus appears to have sustained protoplanetary compression; the degree of which might eventually be estimated from understanding Venetian surface geology. A basis is provided for understanding that Mars essentially lacks a ‘geothermal gradient’ which implies potentially greater subsurface water reservoir capacity than previously expected. Resources at NuclearPlanet.com .