[EE] Evening Poster | S (Solid Earth Sciences) | S-IT Science of the Earth's Interior & Tectonophysics

[S-IT18]Planetary cores: Structure, formation, and evolution

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Mon. May 21, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)

There are fundamental links between the formation and evolution of planets and their satellites to that of their cores. Defining the physical and chemical properties of the cores of these terrestrial bodies are fundamental for understanding their internal structures and thermal profile. Recent advances in experimental and theoretical studies provide new insights and applications to the Earth's cores and other terrestrial bodies. Future exploration missions will obtain data on the internal structure of terrestrial planets (e.g., Mars and Mercury) and planet-satellite systems. We anticipate presentations on recent advances on the physical and chemical properties of cores and discussions regarding the latest views of their formation and evolution. We welcome contributions from mineral/rock physics, geophysics, geochemistry, geodynamics, and planetary science.

[SIT18-P05]Stratification of the Earth's core by SiO_2 crystallization

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Keywords:core, stratification, secular variation, seismic wavespeeds

The topmost ~300 km of the Earth's core features slightly lower wavespeeds than the one dimensional radial earth model PREM. One way this could arise is if this lower speed layer represents a crystallization boundary inside the core, similar to the cloud base in the atmosphere where water-saturated air condenses out water. In the case of the Earth's core, saturation in Si+O could crystallize SiO_2 that rises upward to the CMB and leaves the core due to SiO_2 being even less dense than the base of the Earth's present mantle. This mechanism addresses a criticism of stable core stratification arising from study of the secular variation of the Earth's magnetic field, which seems to require radial fluid motions that strict stratification forbids. Motion of core liquid through a saturation front, which changes its composition, temperature and wavespeeds, facilitates patterns of secular variation attributable to radial motion. We explore this scenario by finding SiO_2 saturation parameters consistent with experimental partitioning of Si and O in metal, and derive the temperature and core compositions compatible with the observed wavespeed profile in the outer core.