Core-mantle interaction evidence from SiO_2 dispersal in Earth's lower mantle

*George Helffrich[1], Maxim Ballmer[1,2], Kei Hirose[1,3]

1. Earth-Life Science Institute, Tokyo Institute of Technology, 2. Institute of Geophysics, ETH Zurich, 3. Department of Earth and Planetary Science, University of Tokyo

As the Earth accreted and progressively grew its core, Si and O probably dissolved into the metal and were kept there for some time. As the core subsequently cooled, SiO_2 would have been expelled due to oversaturation, a process that could continue today. On account of SiO_2's low density with respect to the lowermost mantle, we examine the process of SiO_2 accumulation at the core-mantle boundary (CMB) and its incorporation into the mantle by buoyant rise. Diapirs formed by the viscous Rayleigh-Taylor instability in the SiO_2 collected at the CMB would cause them to be swept into the mantle as inclusions of 100 m - 10 km diameter today, using estimates of SiO_2 viscosity in the lower mantle. Under early Earth conditions of rapid heat loss after core formation, smaller, ~1 km diameter diapirs could have risen independently of mantle flow to a level of neutral buoyancy in the lower mantle, trapping them there. SiO_2 presence could account for small-scale scattering in the lower mantle due to the bodies' large velocity contrast with peridotite.

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