

Terrestrial and lunar constraints on the composition of the late veneer: primitive, but slightly different from chondrites?

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Osmium isotopic data, highly siderophile element (HSE) and S-Se-Te concentration data on fertile peridotites from the earth's mantle and recent experimental studies on metal-silicate partitioning are broadly consistent with late addition of chondritic material to the earth's mantle. HSE/S ratios and CI chondrite like S/Se and Se/Te of the bulk silicate earth (BSE) suggest that the late veneer was rich in volatiles and similar to CM carbonaceous chondrites. However, ratios of Ru and Pd relative to other HSE in the BSE are in fact suprachondritic and Os isotopic data and Rh/Ir show values similar to ordinary or enstatite chondrites, rather than carbonaceous chondrites. In order to explain these 'minor' discrepancies, the following testable hypotheses have been proposed: (1) The earth's mantle contains residual amounts of Ru and Pd from metal-silicate segregation that were mixed with late accreted material. (2) The late veneer was predominantly comprised of carbonaceous chondrite like material with a minor proportion of differentiated metal. (3) The late veneer had a volatile element composition similar to carbonaceous chondrites, but slightly different refractory HSE ratios, owing to fractionation processes in the solar nebula. We will discuss evidence from lunar data that may favor (3).