

# Origin of the late veneer inferred from Ru isotope systematics

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Elevated abundances of the highly siderophile elements (HSE) in the Earth's mantle are commonly explained by the addition of a chondritic late veneer after cessation of core formation [1]. Although relative HSE abundances and Os isotope compositions of samples derived from the Earth's mantle are similar to those of chondrites [e.g. 2-4], the source and type of the late accreted material has proven difficult to identify. We show that different types of chondrites and iron meteorites all exhibit a deficit in *s*-process Ru isotopes relative to the Earth's mantle, demonstrating that the late veneer cannot derive from known meteorite sources. Moreover, the meteorites show correlated Mo and Ru isotope anomalies consistent with coupled deficits in *s*-process Mo and Ru nuclides. This cosmic Mo-Ru correlation [5] passes through the terrestrial composition, indicating that the late veneer derives from the same type of material as the bulk Earth. This is difficult to reconcile with models in which the late accreted material is derived from exotic sources located at greater heliocentric distances, as has been suggested in some recent dynamical models of terrestrial planet formation [6].

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