# Chemical/isotopic tracing of late stages of planetary accretion

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Earth and the other terrestrial bodies were constructed from compositionally and likely genetically diverse materials. Final stages of planetary accretion may have been especially instrumental with respect to the addition of volatiles, such as water and organics, so it is important to characterize, and possibly constrain the origin(s) of these final building blocks. The highly siderophile elements (HSE) are particularly valuable for assessing the chemical and isotopic fingerprints imparted by late stages of planetary accretion. This stems from their likely very low abundances in mantles following core formation, yet high abundances in potential late-stage impactors. Estimates for HSE abundances and $^{187}Os/^{188}Os$ for Earth's primitive mantle (PM) converge on a composition characterized by slightly supra-chondritic Ru/Ir, Pd/Ir, and $^{187}Os/^{188}Os$ at the upper end of the range defined by chondrites. The Earth's mantle is also characterized by a distinctive Ru isotopic composition, compared to most chondrites, and is representative of what may be an unusual nucleosynthetic mix. The HSE in the dominant material involved in late accretion to Earth does not well match known chondritic groups, however, the HSE in the PM are most similar to enstatite chondrites. This may indicate that late accreted materials were relatively volatile-free. The putative *ca.* 3.9 Ga late heavy bombardment (LHB) occurred long after late accretion to Earth largely terminated, yet the dominant HSE signature present in Apollo 17 impact melt rocks, presumably injected by the LHB, has a similar composition to the PM. This may indicate longevity for the category of impactor controlling the HSE budgets of the terrestrial mantle and the lunar crust.