Processes, materials and time scales of the late Earth accretion

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To understand and model post giant impact Earth's evolution, entirely different isotopic systematics should be applied in order to highlight processes and materials from different points of view. (i) Refractory siderophile elements: PGE and $^{182}Hf \rightarrow {}^{182}W$ recorded contribution of chondrite materials in the mantle and shed light on the time scales of core formation [1]. (ii) Refractory lithophile elements: $^{147}Sm \rightarrow {}^{143}Nd$ and $^{146}Sm \rightarrow {}^{142}Nd$ duo gives the time and scale of early differentiation of the silicate Earth [2]; (iii) Volatile elements, noble gases, trace sources and time-dependant fluxes of volatiles (and their carriers) into and from the mantle [3,4].

Carriers of these elements include: enriched early crust, regolith of chondritic composition on the surface of this crust along with solar wind irradiated materials. The base of thick early crust would have been gravitationally unstable and it would drip down into the mantle along with the regolith on its surface. A fraction of this sunken cake could be mixed with mantle material, another fraction could survive mixing and be preserved as the deep reservoir(s), separated from mantle convection. Transport modelling allows these fluxes, masses of the reservoirs involved and respective time scales to be constrained [4].

[1] Walker (2016) *Geochem. Persp.* **5**, 1-145. [2] Caro (2011) *Annu. Rev. EPSi.* **39**, 31-58. [3] Caracausi (2016) *Nature* **533**, 82-85. [4] Tolstikhin et al. (2014) *Geochim. Cosmochim. Acta* **136**, 229-246.