THE INFLUENCE OF IMPACTORS ON THE CHEMICAL COMPOSITION OF EARTH AND MARS

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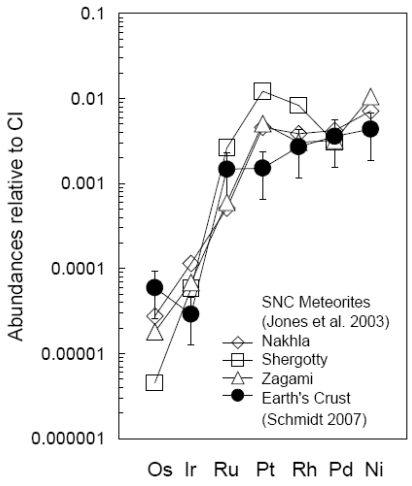
A key issue for understanding the origin and the influence of impactors on the chemical composition of planets is the knowledge of the relative abundances of highly siderophile elements (HSE: Os, Ir, Ru, Pt, Rh, Pd) in the Earth's primitive upper mantle (PUM) and the continental upper crust (UCC). The past twelve years we have measured HSE in many mantle suites of the Earth by neutron activation. Estimates of Rh/Ir, Ru/Ir, Pd/Ir, and Pt/Os derived from PUM indicates modestly suprachondritic compositions [1]. The Os, Ir, Ru, Pt, and Pd pattern on PUM perfectly match the IVA iron meteorite Charlotte recently measured by Walker et al. [2]. The question raises if HSE in PUM are added to the accreting Earth by a late bombardment of iron meteorites or some unsampled inner solar system materials from formation regions closer to the sun (Mercury-Venus region), as it is supposed for enstatite chondrites and not sampled through meteorite collections?

The HSE and Ni systematics of the UCC closely resembles IIIAB iron meteorites (many impact craters on Earth are produced by this type of iron meteorite projectiles, e.g. [3] and references therein), pallasites, and the evolved suite of Martian meteorites (Fig. 1), possibly representing the elemental pattern of the Martian crust [4]. Probably Martian crust and Earth crust preserves an imprint of similar materials. About 160 impacting asteroids (M-type objects?) with radii of 10 km would yield the total abundances of HSE and Ni in the UCC [5]. In fact the first meteorite of any type ever identified on another planet by NASA's Mars Exploration Rover Opportunity was an iron meteorite.



References: [1] Schmidt G. 2004. *Meteoritics & Planetary Science* 39:1995-2007. [2] Walker R. J. et al. 2005. *LPSC XXXVI*, 1313. [3] Schmidt G. et al. 1997. *Geochim.Cosmochim.Acta* 61, 2977. [4] Jones J. H. et al. 2003. *Chemical Geology* 196, 21-41. [5] Schmidt G. *Meteoritics & Planetary Science*, submitted.