Temporal HSE variation and core formation in Vesta

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Because of their strong affinity for iron, the highly siderophile elements (HSE: Os, Ir, Ru, Pt, Pd, Re) partitioned into the metallic cores of telluric planets and smaller planetesimals during early differentiation, leaving behind silicate mantles depleted in those elements. The extent of the depletion is dependent on the silicate-metal pressure equilibration and the respective oxygen and sulphur fugacities. HSE can also be replenished in the mantle after core formation by impacts bringing exotic components. For the asteroid 4-Vesta, it has been proposed that diogenites did not experience post-core formation re-enrichment [1], while brecciated polymict and monomict eucrites and howardites show various degrees of exotic material contribution [2]. In addition, [3] suggested that while the low abundances of HSE in HED meteorites are consistent with highly efficient core segregation at low-pressure, their relative abundances may also reflect late chondritic HSE addition.

Recently, a suite of both cumulative and basaltic unbrecciated eucrites has precisely been dated using the Al-Mg chronometer for their crystallization ages, but also (model) differentiation ages [4], hence providing a detailed chronology for the silicate differentiation of Vesta. A systematic age discrepancy was observed between basaltic and cumulative eucrites that can be interpreted as the ongoing crystallization of the vestan crust contemporaneously to a vestan magma ocean. Here, we will present HSE data for the same basaltic and cumulative eucrites, to determine if any temporal variation can be observed in the HSE content and signature of the samples despite possible late-stage exogenic imprints. We aim here to determine the opening and closure time of the core formation of the asteroid.

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