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Modelling of a magma ocean on asteroid 4 Vesta.

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The Dawn mission confirms predictions that the asteroid 4 Vesta is differentiated in an iron rich core, a silicate mantle and a basaltic crust and supports its identification as the parent body of the howardite-eucrite-diogenite (HED) meteorites. The occurrence of basalts on the surface distinguishes Vesta from primordial planetesimals like 21 Lutetia, which retained its primordial surface material (and may still be partially differentiated[1]). In the present study numerical calculations of the thermo-chemical evolution of the asteroid 4 Vesta have been performed. We have improved the thermo-chemical evolution model of [2], which includes accretion, compaction, associated changes of the material properties, melting, advective heat transport and differentiation by porous flow, by considering convection and thus effective cooling in a magma ocean to analyse its formation and evolution on Vesta. In contrast to previous models we obtain a superficial magma ocean on Vesta if partitioning of ^{26}Al into the melt is considered, whereas negelction of partitioning leads to an internal magma ocean.

[1] Neumann, W. et al. (2012) EPSC Abstracts, Vol. 7 EPSC2012-178. [2] Neumann, W. et al. (2012) A&A 543, A141.

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