Understanding lunar siderophile element depletion in homogeneous accretion scenario

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The overabundance of the siderophile elements in the terrestrial planetary mantles has been the cause of significant debate [1]. This is of particular significance because siderophile elements are dominantly governed by metal–silicate segregation during planetary differentiation. In this study, we model the concentration of siderophile elements in the Earth-Moon formation scenario where the composition of accreting material is constant with time. The fractionation (short-lived compared to accreted timescale) occurs between both solid and liquid phases of silicate and metal. This fractionation lead to decrease in the concentration of metal in the mantle with time. Fractionation is then followed by metal silicate seggregation, core formation and extensive mixing of different materials within the mantle We modelled the behaviour of one moderately siderophile element (W) and three highly siderophile elements (Au, Ir, and Re) using earlier partition coefficient data. As the partition coefficient plays an important role in governing the fractionation of siderophile elements [2], we iteratively model the change in concentration of these elements by incorporating the effect of temperature and pressure in the partition coeficient values. The role of late accretion is assessed by varying initial mass fluxes in the homogeneous accretion scenario. Our initial results well corroborate the observed abundance and the models presented earlier [3, 4].

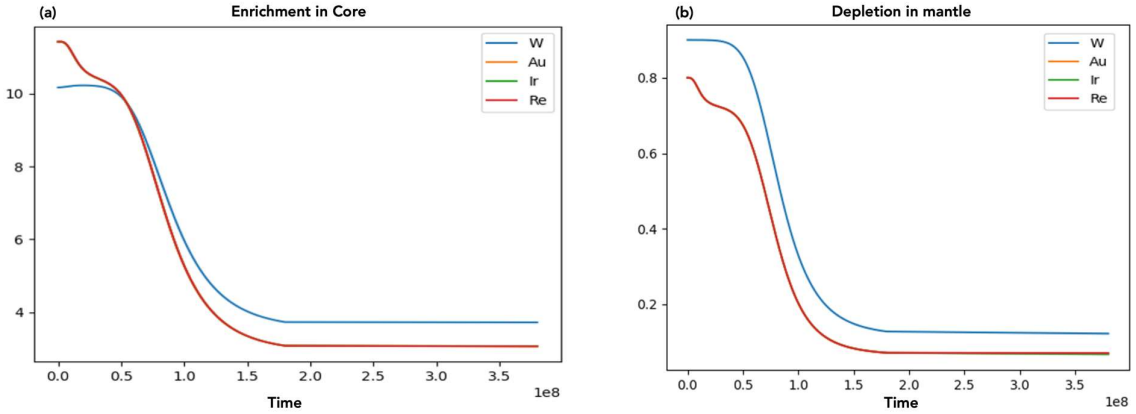

Figure 1: Core (a) and Mantle (b) concentration relative to the initial value(normalised with CI and Al) for W, Re, Ir and Au elements.

References

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