



Bounds on metal-silicate equilibration conditions during core formation

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Much of the Earth was built by high-energy impacts of planetesimals and embryos, many of these impactors already differentiated, with metallic cores of their own. Geochemical data provide critical information on the timing of accretion and the prevailing physical conditions. The comparison between the inferred core/mantle partitioning with the experimentally determined partitioning behavior of a number of siderophile elements can be used to place constraints on the conditions (pressure, temperature, oxygen fugacity) under which the metal and silicates equilibrated before separating to form the core and mantle. The main limitation of this approach is that the interpretation of the geochemical data in terms of equilibration conditions is non-unique. This is an ill-posed inverse problem, and the inversion is usually carried out by making a number of assumptions to close the problem and make it (artificially) well-posed. Here, we take another approach and derive exact bounds on the distribution of conditions of equilibration during Earth's formation and core mantle differentiation.