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Chips off the old block: enstatite chondrites as samples of proto-Earth.

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Enstatite chondrites (EC) have a remarkable isotopic similarity to Earth, e.g. [1] but are chemically dissimilar to Earth and inner Solar system samples. Assuming a common origin, the chemical difference could be explained by re-equilibration with a gas from which O-rich solids of approximately CI composition were removed [2,3]. Charging of nebular gas by elements lost from accreting protoplanets may explain enrichment in volatiles, e.g. Na [4]. Because the (few) established EC ages precede the Moon-forming impact and post-impact Earth is isotopically similar to EC, Theia must have been similar too [5]. It also follows that input from the outer Solar System following EC formation at ≤ 10 Myr was negligible as well. We propose that: (i) protoplanets grew from an isotopically uniform inner Solar System reservoir; (b) this was isolated from the outer Solar System by Jupiter; (c) variation in $\Delta^{17}\text{O}$ was produced by differential retention of ^{16}O -poor water in planetesimals as they were heated by ^{26}Al . Bodies that accreted quickly (e.g. Mars) retained more water with higher $\Delta^{17}\text{O}$; (d) EC retained their Earth-like (but not Earth-identical) O-isotopic signatures because the residual gas was oxygen-depleted.

References: [1] Dauphas, N. et al. 2014 EPSL 407, 96. [2] Hutson, M. & Ruzicka, A. 2000, MEPS 35, 601. [3] Gaidos, E. 2015 ApJ 804, 40. [4] Gaidos, E. 2014, MetSoc

+ 77, 5091. [5] Herwartz, D. et al. 2014 Science 344, 1146. +

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