Enstatite chondrites Earth-like for stable Nd ratios

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Constraining the extent of isotopic heterogeneity in the inner solar system is key to our understanding of accretion and early history of the terrestrial planets. The existence of a large isotopic reservoir in the inner protoplanetary disk including Earth, the Moon-forming impactor and enstatite chondrites (EC) has been proposed [1]. The correlation between Mo and Nd in bulk meteorites was recently used to argue that such a reservoir does not exist as the Mo isotopic composition of enstatite chondrites is resolvable from both Earth and ordinary chondrites [2]. However, unlike Mo, the Nd ratios show more variability as well as significant overlap with the terrestrial isotopic composition. [3] and [4] identified variations in measured $^{142}Nd/^{144}Nd$ in EC relating to petrologic grade, and [4] proposed that EL3 and EL6 may sample different parent bodies, with only EL3s matching Earth. However, [3] and [4] collected data in static mode on TIMS, which has been shown to be vulnerable to systematic biases between labs [5].

Here we present Nd isotopic analyses from both equilibrated and unequilibrated enstatite chondrites collected using a multi-static 3-line scheme [6]. Our data for EC are consistent with [2-4] in showing that EC are resolvable from Earth in both their measured $^{142}Nd/^{144}Nd$ ratios and initial ratios corrected to a common $^{147}Sm/^{144}Nd$ ratio. Like [4] we show that the averages of all EC for the stable $^{145}Nd/^{144}Nd$, $^{148}Nd/^{144}Nd$, and $^{150}Nd/^{144}Nd$ ratios cannot be resolved from terrestrial samples. In detail we do not observe any statistically significant differences between petrological types nor EH vs EL groups for all Nd isotopes.

While more high-precision data would be required to confirm the possibility of different EL parent bodies [4], the residual offset in $\mu^{142}Nd$ between Earth and EC still needs to be explained prior to any confirmation of a large isotopic reservoir for Nd in the inner solar system.

[1] Dauphas and Schauble (2016) *Annu. Rev. Earth Planet Sci.*, **44** 709-783. [2] Render et al. (2017) *GPL.* **3** 170-178 [3] Gannoun et al. (2011) *PNAS* **108** 7693-7697 [4] Boyet et al. (2018) *EPSL* **488,** 68-78 [5] Brandon et al. (2009) *GCA* **73** 6421-6445 [6] Caro et al. (2006) *GCA* **70** 164-191