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Iodine and Xenon in the first basalts

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Eucrites are basaltic meteorites thought to have formed on differentiated parent bodies. The majority are thought to come from the asteroid 4 Vesta [1], the only surviving member of the original population. Some are anomalous, exhibiting different oxygen isotope ratios [2].

Xenon isotopes, which we study using RELAX [3], allow the timing of processes in the early solar system to be constrained through production by the short-lived radioisotopes ^{129}I and ^{244}Pu. Anomalous eucrites Ibitira and Bunburra Rockhole exhibit higher initial ^{129}I/^{244}Pu ratios than mainstream eucrites Béréba and Juvinas. I-Xe analyses demonstrate that this reflects earlier closure to xenon loss rather than a higher abundance of volatiles. The identification that basalts from these parents closed earlier than those from Vesta suggests smaller parent bodies that ceased being geologically active earlier in solar system history. It is possible that Vesta is unique in having survived relatively intact from this era because it was larger than its siblings.

[1] McCord T.B. et al. (1970) *Science* 168, 1455. [2] Scott E.R.D et al. (2009) *GCA* 73, 5835-5853. [3] Crowther S.A. et al. (2008) *JJAS* 23, 921-1044.

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