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# Origin and timing of nitrogen delivery to the angrite parent body

Deligny*, C., Füri, E., Deloule, E., *CRPG, 15 rue Notre-Dame des Pauvres, 54500 Vandoeuvre-les-Nancy. E-mail: cecile.deligny@univ-lorraine.fr

D'Orbigny and Sahara 99555 are two of the oldest volcanic angrites, with ages of 4563.51±0.8 and 4564.07±0.43 Ma respectively [1]. They are derived from the angrite parent body, which accreted ~1.5 Myrs after CAIs inside Jupiter's orbit [2,3]. We measured, for the first time, the N content and $^{15}N/^{14}N$ ratio of glass inclusions, interstitial glasses, and silicate minerals by *in-situ* high-resolution secondary ion mass spectrometry [4]. The new data allow us to better constrain the source(s) and timing of volatile delivery to the planet-forming region. Glass in D'Orbigny contains up to 655±189 ppm N with isotopic ratios ($\delta^{15}N$) from 0.6±29.7 to 1068±174 ‰. The most primitive melt, trapped in Mg-rich olivines in D'Orbigny, shows a $\delta^{15}N$ value similar to that of the terrestrial mantle or CM chondrites [5]. The $\delta^{15}N$ signature of the more evolved melt in D'Orbigny is consistent with a contribution from a $^{15}N$-enriched endmember, possibly of cometary origin [5]. Given the very old age of the two angrites, volatile-rich material must have been delivered from the outer Solar System to the terrestrial planet-forming region within the first ~4 Myrs after CAI formation.

[1] Tissot, F.L. et al. (2017) *GCA*, 213, 593-617. [2] Kleine, T. et al. (2012) *GCA*, 84, 186-203. [3] Warren, P.H. (2011) *EPSL*, 311(1-2), 93-100. [4] Füri, E. et al. (2018) *Chem. Geol.*, 493, 327-337. [5] Alexander, C.M.O.D. (2017) *Phil. Trans. R. Soc. A375*: 20150384.

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