Nickel isotopic dichotomy between carbonaceous and non-carbonaceous iron meteorites

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Nucleosynthetic isotope anomalies provide valuable information about the provenance of meteorites and hence insights into the formation and early evolution of the solar nebula. Recent studies have shown that mass-independent anomlies for Cr, Ti, W, and Mo isotopes show a dichotomy between meteorites derived from either a "carbonaceous" (CC) or "non-carbonaceous" (NC) reservoir [1-4]. This distinction has been explained by prolonged spatial separation resulting from the growth of Jupiter [3], and has been used to constrain the growth rate of Jupiter [4]. The isotopic difference between the NC and CC groups has been attributed to the addition of a presolar component enriched in neutron-rich isotopes to the CC reservoir [3,4]. If this is correct, then CC irons should be characterized by ^{62}Ni and ^{64}Ni excesses over the NC irons. Previous studies have shown that such excesses exist for IVB irons, which belong to the CC group, relative to IIAB, IIIAB, and IVA irons, all of which belong to the NC group [5-8]. However, it is unknown as to whether the ^{62}Ni and ^{64}Ni excesses observed in the IVB irons are ubiquitously present in *all* CC irons. To address this issue, we investigate iron meteorite groups that have not yet been explored for Ni, *i.e.* IIC, IID, IIIE, IIF, and IIIF. Of these irons, all but the IIIE belong to the CC group of meteorites [3,4]. Hereby, we test the consistency of the dichotomy hypothesis which will allow for a better understanding of the nucleosynthetic source environment and subsequent distribution in the solar system. This is paramount for using these data to constrain the early dynamical evolution of the solar system, the growth of Jupiter, and the processes leading to the observed dichotomy between NC and CC meteorites.

Our first data show that CC irons (*e.g.*, IIC, IID, IIIF) exhibit an enrichment in neutron-rich Ni isotopes over NC irons (*e.g.*, IVA, IIIE). This is consistent with the Mo isotope signatures of these irons and confirms the presence of two genetically distinct reservoirs in the early solar system.

[1] Warren (2011) *EPSL* **311**, 93-100. [2] Burkhardt *et al.* (2001) *EPSL* **454**, 293-303. [3] Budde *et al.* (2016) *EPSL* **454**, 293-303. [4] Kruijer *et al.* (2017) *LPSC 2017 abstract.* [5] Steele *et al.* (2011) *Geochim. Cosmochim. Acta*, **75** 7906–7925. [6] Steele *et al.* (2012) *Astrophys. J.,* **758,** 59–80. [7] Tang and Dauphas (2012) *EPSL* **359-360**, 248–263. [8] Tang and Dauphas (2014) *EPSL* **390**, 264–274.