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Triple oxygen isotope evidence for dominant carbonaceous chondritic provenance in the Disko Bay (Greenland) micrometeorite collection

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Micrometeorites (20-2000 μm) constitute the majority of extraterrestrial material accreting to Earth [1], providing direct samples of small Solar System bodies. Antarctic ice and high-altitude sediment traps have yielded extensive micrometeorite collections thought to reliably reflect the population of accreting cosmic dust [2-3]. The newly established Disko Bay collection, sampling sediment traps on the Nuussuaq peninsula and Disko Island (Greenland), represents the first systematic Arctic sedimentary micrometeorite collection and currently numbers >200 cosmic spherules.

Disko Bay micrometeorites were extracted from five samples across three sediment traps by wet sieving of sediment, magnetic separation, and optical picking; classification was based on SEM-EDS images and spectra of polished sections. Compared to Antarctic collections, Disko Bay micrometeorites are generally smaller (all particles <300 μm) and exhibit more extensive weathering [3]. Etched rims indicating partial dissolution are ubiquitous, suggesting significant post-depositional alteration. Unmelted, scoriaceous, and glassy types are absent, whereas weathering-resistant I-type spherules are overrepresented (>20%).

We present the first SIMS bulk triple oxygen isotope data ($\delta^{18}O$, $\Delta^{17}O$) for 15 representative pristine Disko Bay micrometeorites. Seven S-type spherules (62-141 μm) have carbonaceous chondritic (CC) affinities. Three S-types plot on the terrestrial fractionation line (TFL) considering measurement uncertainties, and one falls among ^{16}O-poor micrometeorites not yet linked to known meteorite classes [4]. One I-type falls within uncertainty of the TFL and the other lies below it, consistent with CC parentage. Two Cr-rich spherules fall within uncertainty of the TFL and are ^{18}O-poor (-0.8 to -1.5‰ $\delta^{18}O$).

Despite advanced alteration and collection bias toward weathering-resistant types, the predominance of CC-parentage among S-types mirrors observations from Antarctic collections, supporting a dominant carbonaceous contribution to the present-day micrometeorite flux [4-5]. These isotopic constraints establish the Disko Bay collection as a robust Arctic complement to Antarctic collections, providing geographic consistency to the CC dominance in the modern cosmic dust population.

References: **[1]** Folco and Cordier (2015), *Planetary Mineralogy*. **[2]** Rojas *et al.* (2021), *Earth Planet. Sci. Lett.*, 560:116794. **[3]** Goderis *et al.* (2020), *Geochim. Cosmochim. Acta*, 270:112–143. **[4]** Suavet *et al.* (2010), *Earth Planet. Sci. Lett.*, 293:3:313–320. **[5]** Cordier and Folco (2014), *Geochim. Cosmochim. Acta*, 146:18–26.