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Chemical characterisation of weathered micrometeorites collected from sediment traps in Disko Bay, Greenland

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Micrometeorites comprise the majority of extraterrestrial material arriving to Earth today, representing dust produced in the Solar System by asteroid collisions and by ejection from comets. Micrometeorites recently accreted to Earth have been collected from various environments, including sediment traps in cold deserts, for example in the Transantarctic and Sør Rondane mountains, Antarctica[1-2]. Less attention has been dedicated to Arctic cold deserts despite favourable environmental conditions for micrometeorite preservation. We report micrometeorites extracted from two 500g sediment samples, collected from two sediment traps in the Disko bay region of western Greenland during a 2023 field campaign; previously, five micrometeorites extracted from 800g of sediment from the adjacent Nuussuaq peninsula were reported[3].

Greenland sediment samples were washed and sieved wet with distilled water into six size fractions. The magnetic portion of each size fraction was separated, from which micrometeorites were picked using a binocular microscope, and their major element compositions were characterised using μXRF. Next, micrometeorites were mounted for imaging and major element content measurements using SEM-EDS. 11 micrometeorites were recovered from the first sample, including three S-type, six I-type, and two G-type cosmic spherules. The high proportion of I and G-type versus S-type spherules compared to other modern micrometeorite collections, spherule morphologies, and compositions showing Mn content of 0.3-0.4wt% indicate terrestrial weathering[4]. Micrometeorite extraction from the second sample is currently underway. Measurement of major and trace element contents and triple oxygen isotopic compositions using EMPA and SIMS on pristine particles for parent body identification and atmospheric entry effect characterisation is planned.

Results of petrographic and geochemical analyses of micrometeorites recovered from Greenland sediment traps will be presented and compared against collections from Antarctic sediment traps. Micrometeorites reported here greatly enlarge the current sediment trap-derived Arctic micrometeorite collection, building up a novel dataset and allowing for comparison against other micrometeorite collections.

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