LOST METEORITES OF ANTARCTICA PROJECT: CLASSIFICATIONS TO DATE

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Introduction: The Lost Meteorites of Antarctica Project [1,2] retrieved ~120 postulated meteorites from two expeditions to the Outer Recovery (OUT) Icefields and Hutchison (HUT) Icefields, named meteorite dense collection zones, in blue icefields located south of the Shackleton Mountain Range in austral summer 2019 and 2020 [1,2]. A goal of the Lost Meteorites project is to investigate the statistics for different meteorite groups in this previously unsearched part of Antarctica and to understand if there is a sampling bias for stony and iron/stony-iron meteorite types [3]. Thirty-one meteorites collected by the project have been classified to date [4].

Methods: Details of the curation procedures are described in [5]. Magnetic susceptibility and electrical conductivity were measured and are discussed in [6,7]. Chips were prepared into polished blocks and/or thin sections and analysed by SEM at the University of Manchester (UoM). All mineral analyses were by EPMA at the UoM and University of Bristol. Oxygen isotope analysis was conducted at the Open University by laser fluorination of ~2 mg of a larger homogenized sample, reported as per mil deviation from the standard VSMOW [8].

Results: Of the classifications so far, four are achondrites, including a eucrite, an aubrite and two mesosiderites [9], and 27 are chondrites. One of these chondrites is a carbonaceous CM-anomalous chondrite and 26 are ordinary chondrites (OC), including 14 H, 10 L and 2 LL chondrites [4]. All but one of the ordinary chondrites are petrologic types 4, 5 and 6. Outer Recovery Icefields 18016, a 9.5 gram round part-stone with 70% fusion crust (Figs. 1A and 1B), is the most unaltered ordinary chondrite in the collection so far: it has been classified as an L3 based on mineral chemistry. The sample has a magnetic susceptibility of 4.72. A polished section (Fig. 1C) contains abundant well-defined chondrules of different textural types, with pyroxene $En_{89.9\pm6.2}$ $Fs_{9.5\pm6.1}$ $Wo_{0.7\pm0.5}$ (N=14) and olivine $Fa_{21.8\pm6.2}$ (N=25). Olivine and pyroxene compositions suggest that the subtype is between 3.5 and 3.8.

Figure 1. *Ordinary chondrite OUT 18016, an L3 chondrite found on the blue ice surface at Outer Recovery Icefields ice field 3 (west icefield). (A) Field photo (B) Lab photo (C) False colour X-ray element map of a polished section, where Fe=red, Mg=green, Si=blue.*

Discussion: Antarctic studies show that field areas with smaller meteorite populations (<1000) have an overabundance of unusual meteorite types, whereas those where >1000 meteorites were collected converge at ~90% OC [10]. Our classifications so far have a similar OC abundance. Statistics of previous Antarctic collections show 0.83% are eucrites, 0.09% are aubrites and 0.13% are mesosiderites [4]. Our recovery of an aubrite and two mesosiderites from ~120 samples is higher than these values. This may be partly a result of observing a small sample population from only two different collection areas [10].

Samples can be requested from the Meteorite Curator at the Natural History Museum (NHM), London.

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