

Micrometeorite accumulation in the Sør Rondane Mountains of East Antarctica

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Micrometeorites are dust-sized (i.e., 10 to 2000 μm in size) extraterrestrial particles that survive atmospheric entry and reach Earth's surface [1]. While micrometeorites have previously been recovered from at least two localities (Vikingshøgda and Widerøefjellet) in the Sør Rondane Mountains [2], the current study reports on the recovery of several 10,000s of micrometeorites during the 2017-2018 BELAM (Belgian Antarctic Meteorites) field expedition. This work also focuses on the distribution of this extraterrestrial material in the area surrounding the Belgian Princess Elisabeth Station (71°57'00"S; 23°20'49"E), up to 40 km in the south to south-east direction. Three types of micrometeorite accumulation were targeted on the glacially eroded tops of the Vengen, Walnumfjellet, Widerøefjellet, Svindland and Smalegga mountain ridges and summits. The first type consisted of seven samples of soils and weathering products that may have been exposed for extended periods of times (up to several Myr), similar to the samples collected in the Atacama Desert [2]. The second type comprised five samples taken in wind catchment areas, such as the base of large boulders or in cracks. Finally, the lee-side of three lateral and supraglacial moraines were also sampled, totaling eleven samples. In all cases, the sampled material, weighing approximately 80 kg, consisted of moderately sorted fine-grained rock detritus.

Preliminary results indicate that the distribution of micrometeorites varies according to the type of trap, with glacial moraines exhibiting the lowest concentrations, followed by wind-catchment areas, while the soils near the tops of glacially eroded mountain summits contain the highest concentrations. Samples exposed to the Antarctic Plateau, on the southern border of the Sør Rondane Mountains, exhibit concentrations one order of magnitude higher than those selected in moraines. Similar to the Larkman Nunatak micrometeorite collection [4], the micrometeorite accumulation mechanism in moraine and wind-catchment areas appears to be strongly controlled by wind. Conversely, the accumulation mechanism in exposed soil samples is largely governed by direct infall of extraterrestrial particles, as evidenced by the presence of large micrometeorites ($>400 \mu\text{m}$ in size). Despite accumulation over extended periods of time, the state of preservation also appears strongly bound to the local conditions, which may differ on the meter to hectometer-scale. This expanded Sør Rondane Mountains micrometeorite collection, comprising various types of sampling sites, may serve as the basis for a better understanding of micrometeorite distribution patterns in Antarctica.

References

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