NEW MICROMETEORITE COLLECTION SITE DISCOVERED AT WIDERŒFJELLET, ANTARCTICA. M. S. Huber, C. Ventura Bordenca, S. Goderis, V. Debaillie, and P. Claeyss. Vrije Universiteit Brussel, Earth System Science, Dept. of Chemistry, BE-1050 Brussels, Belgium, Ghent University, Dept. of Analytical Chemistry, Krijgsraan 281 – S12, BE-9000 Gent, Belgium, Laboratoire G-Time, Université Libre de Bruxelles, Brussels, Belgium.

Introduction: The highest flux of extraterrestrial material entering Earth's atmosphere, approximately 40,000 tons per year [1], arrives in the form of sub-mm particles of dust, which are found as unmelted micrometeorites or melted cosmic spherules. Such particles have been collected in areas of low sedimentation, such as deep-sea sediments [i.e., 2] or by melting large volumes of ice [i.e., 3]. More recently, large accumulations of micrometeorites have been recovered in pits, joints and fractures of glacially eroded granitic nunataks (~2600 m a.s.l.) in the northern Victoria Land Transantarctic Mountains [4]. In this abstract, we report on a new collection site in a different Antarctic quadrant with excellent preservation of micrometeorites and cosmic spherules.

Samples: Preliminary investigations of 2 locations at the Widerœfjellet site, situated in the Sør Rondane Mountains of Queen Maud Land at S72°8'41", E23°16'41" (Fig. 1), have revealed a high density of cosmic spherules.

![Fig. 1. Map of the Sør Rondane Mountains of Antarctica, showing the location of the sampled outcrops with respect to the Belgian Antarctic research station, Princess Elisabeth.](image)

Sediment was collected in December 2012 at the top of the Widerœfjellet Mountain after initial study of the region based on satellite images and geological maps of the region. Investigations at two other sites (near Yukidori-Toride and Vikinghøgda) did not yield equal amounts of extraterrestrial material. At Widerœfjellet, two sediment exposures within the surrounding granitic lithologies were taken, with total weights of a few kilograms. Subsequently, the sediment was slowly defrosted at the Antarctic research station.

Results: Two samples with initial weights of 850 g and 783 g were split into two sub-samples of approximately equal weight to preserve reference samples for later study. The sediment was then processed by washing and sieving to separate various size fractions. The sediment was divided into 65 µm, 65-150 µm, 150-400 µm, 400-800 µm, 800-1500 µm, and > 1500 µm splits. Preliminary results reveal the presence of approximately 150 cosmic spherules and micrometeorites in 90 g of sediment for the 400-800 µm size fraction. One hundred cosmic spherules and micrometeorites have been identified in another 50 g of the 150-400 µm size fraction. The larger size fractions were of interest for preliminary investigations owing to reports from similar Antarctic sites that show unusually good preservation of micrometeorites of large sizes [4].

![Fig. 2. Backscatter electron (BSE) image of an elongate micrometeorite featuring an Fe-Ni rich pellet on the right hand side of the spherule. Two distinct compositions of olivine have been discovered from electron dispersive spectroscopy, as well as some pyroxene.](image)
equipped with an electron dispersive spectroscope. The analysis only provides detailed information about the surface of grains, including a demonstration that the melted cosmic spherules are composed primarily of olivine to pyroxene (Fig. 2). Some unusual morphologies have been detected that are promising for further study, such as dumbbell-shaped micrometeorites (Fig. 3) and a partially melted cosmic spherule that has the ejection and melting of the spherule frozen in place (Fig. 4).

The remainder of the sediment from each of the size fractions is under study to allow for statistics of each category to be determined. Further analysis of the recovered micrometeorites and cosmic spherules is planned, including analysis by laser ablation inductively coupled plasma mass spectrometry, tomographic analysis of particular micrometeorites, and sectioning of samples to allow for chemical analysis of the interiors of the samples once all possible non-destructive analyses have been completed.

The investigation of the Widerøefjellet Antarctic spherules may be placed as a contribution for better understanding the extraterrestrial flux of dust-sized particles entering Earth’s atmosphere and their chemical and mineralogical properties as well as for the implementation of worldwide micrometeorite collections.


Within the set of recovered material, the vast majority are melted cosmic spherules, including eight non-magnetic forsterite-rich spherules. All of the classes of cosmic spherules described by [5] have been identified amongst the cosmic spherules. The abundance of melted cosmic spherules is consistent with the mathematical models [i.e., 6], that predict melting of larger dust particles. The recovery of such a high number of cosmic spherules (approximately 2 cosmic spherules and micrometeorites per g) indicates that the Widerøefjellet site is comparable to other reported Antarctic concentration sites [4].

Recovered micrometeorites and cosmic spherules were analyzed with a Scanning Electron Microscope.