

MINIMETEORITES FROM THE TRANSANTARCTIC MOUNTAINS.

L. Folco¹ and P. Rochette². ¹MNA, Siena, Italy. E-mail: folco@unisi.it. ²CEREGE, Aix en Provence, France.

Meteorites and micrometeorites are typically >1 cm and <1 mm in size, respectively, and are commonly believed to sample different parent bodies [1]. Here, we report the discovery of a large number of meteoritic particles with sizes ranging from 0.8 mm to 5 mm in the Transantarctic Mountain (TAM) micrometeorite traps [2]. We propose to name them minimeteorites. Minimeteorites will allow the study of the transition between micrometeorites and macroscopic meteorites for the first time, thereby bridging the gap between these two research fields, whose separation is most likely linked to the human eye versus microscope search scale, and has no proven fundamental reasons.

During the 2003 and 2006 Antarctic campaign of the Italian *Programma Nazionale delle Ricerche in Antartide* (PNRA) we discovered a large and virtually unbiased micrometeorite collection on the tops of the Victoria Land TAM [2]. Thousands of micrometeorites >400 μm in diameter were found trapped within the fine-grained, local detritus accumulated within weathering pits and joints of glacially eroded granitic summits with exposure ages older than 2 Myrs [2]. These traps have been collecting micrometeorites over the last ~ 1 Myr, as testified by the ~ 0.8 Myr-old Australasian microtektites found therein [3]. The finding of unusual micrometeorites up to 2 mm in size prompted a more thorough search for these "giant micrometeorites" during the 2009 PNRA expedition on the top of Miller Butte (72°42'S, 160°14'E). Extraction of extraterrestrial particles from about half a ton of detritus sieved in the 0.4-5 mm size fraction were carried out in situ using a portable magnetic separator. 320 fully melted minimeteorites in the 0.8 to 3.2 mm size range were identified with certainty. The exponent of the linear fit of the cumulative size distribution in a log-log diagram is -5.3, as observed in unbiased micrometeorite collections [4]. Several tens of unmelted (similar to meteorites) to partially melted particles up to 5 mm size were also extracted, although further laboratory work is required to confirm the extraterrestrial nature of some. The ratio of unmelted versus melted micrometeorites increases with increasing size, as theoretically expected for the micrometeorite to meteorite transition. Note that the number of minimeteorites from the TAM collection is two orders of magnitude larger than that previously found in other Antarctic collections (for instance, only 3 spherules >0.8 mm in diameter are reported for the South Pole Water Well Collection [4]). A full week of dedicated field work could lead to gain another order of magnitude.

Our finding confirms that the TAM micrometeorite traps are an extraordinary source of new and valuable material for planetary scientists, like the meteorite traps found on the Antarctic ice sheet [5]. In particular, the discovery of minimeteorites is of great interest since it will allow multiple high-precision analyses (e.g., oxygen isotope and cosmogenic nuclide analyses) of individual micrometeorites for the obtainment of a statistically representative information on their parent bodies for the first time.

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