MICROMETEORITES IN THE 400-1100 μm SIZE RANGE FROM THE TRANSANTARCTIC MOUNTAINS

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Introduction: We report the discovery of hundreds of unmelted micrometeorites in the 400-1100 mm size range from the Transantarctic Mountains. This extraordinary collection of extraterrestrial matter was found together with thousands of smaller micrometeorites and cosmic spherules within the micrometeorite traps discovered on the tops of Frontier Mountain and Miller Butte (Victoria Land) during the Italian 2003 and 2006 PNRA expeditions [1]. These traps consists of joints and weathering pits of million year old, flat, glacially eroded granitic surfaces [2, 3] filled with fine-grained bedrock detritus. These are extraordinary structures for the collection of fallout material from the last million years, as recently testified by Australasian microtektites found therein [4].

Samples and methods: Hundreds of micrometeorites were magnetically extracted from 11.5 kg of detritus in the 400-2000 mm size range. Over 130 unmelted particles in the 400-1100 μm size range were studied using a SEM-EDS to gain information about size, morphology, structure and surface mineralogy. So far, six particles have been mounted in epoxy, sectioned and polished for SEM-EDS petrographic study and EMP analyses.

Physical characteristics: About 30% of the studied particles are fresh and show rounded to subrounded shapes. Some of these show angular sides and are likely fragments of larger particles. Fresh micrometeorites exhibit a magnetite-rich, scoriaceous crust. One particle shows unusual spherulitic structure [5]. The remaining particles are partially to totally covered by Fe-oxides and/or sulfate-rich encrustations due to terrestrial weathering. The variable degree of weathering attests to the different terrestrial residence times of particles.

Petrography: The six sectioned particles are coarse-grained micrometeorites with chondritic structure and mineralogy. Four particles contain readily-delineated chondrules typical of low petrographic types, whereas two others exhibit granoblastic textures typical of high petrographic types. Olivine and low-Ca pyroxene compositions are in the Fa_{18} - Fs_{17} to Fa_{26} - Fs_{22} range, indicating H and L chondritic chemical classes. The six particles represent at least two lithologies, with four non-equilibrated H4 particles, and two equilibrated L6 particles. The fusion crust observed in some sections shows a magnetic rim typical of unmelted and scoriaceous micrometeorites.

Conclusions: The presumed age of the micrometeorite traps and the size fraction studied here are unique. Their ongoing study will therefore provide new insight into the flux of micrometeorites to Earth over the recent geological past. The ordinary chondritic composition of some of the particles studied so far is an outstanding discovery, which shows for the first time that at least part of the extraterrestrial micrometeorite flux to Earth in the 400-1100 mm size range is related to ordinary chondritic material.

References: [1] Folco L. et al. 2006. *MAPS* 41:343–353. [2] Welten et al. 2008. *EPSL (in press)* [3] van der Wateren et al. 1999. *GPC* 23:145-172 [4] Folco L. et al. 2008. *Geology* 36:291-294. [5] van Ginneken M. et al. 2008. *MAPS* this issue.

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