Snow cover of Central East Antarctica (Vostok station) as an ideal natural spot for collecting Cosmic Dust: preliminary results on recovery of chondritic micrometeorites.

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During the 2010/2011 season nearby the Vostok station the 56th Russian Antarctic Expedition has collected surface snow in a big amount from a 3 m deep pit using 15 220 L vol. containers (about 70 kg snow each). Snow melting and processing by ultra-centrifugation was performed in a clean (class 10000 and 100) laboratory. Total dust concentrations were not exceeded 37.4 mkg per liter with particle dispersal mode around 2.5 mkm. To analyze the elemental composition of fine dust particles aimed to reveal Antarctic micrometeorites (AMM) two electron microscopy devices equipped with different micro-beams were implemented. As a preliminary result, 3 particles (of 107 analyzed) featured by Mg content clearly dominated over Al along with Si and Fe as major elements (a feature of carbonaceous chondrites) were observed. By this the Vostok AMM CS11 collection was established. The occurrence of given particles was averaged 2.8% - the factual value obtained for the first time for chondritic type AMM at Vostok which should be considered as the lowest estimate for all other families of AMM. Given the reference profile of total dust content in East Antarctic snow during Holocene (18 mkg/kg [1]) the MM deposition in Antarctica was quantified for the first time – 14 tons per day for carbonaceous chondrites for the Vostok AMM CS11 collection and up to 245 tons per day for all MM types for the Concordia AMM DC02 collection.

The results obtained allowed to prove that snow cover (ice sheet in total) of Central East Antarctica is the best spot (most clean of other natural locations and always below 0°C) for collecting native MM deposited on the Earth during the last million years and could be useful in deciphering the origin and evolution of solid matter in our Solar System and its effects on Earth-bound biogeochemical and geophysical processes including the life origin. The farther analyses of the Vostok AMMs are in a progress.

References:

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