SEARCH FOR THE TUNGUSKA EVENT IN THE ANTARCTIC SNOW; R. Rocchia (1), M. de Angelis (2), D. Boclet (3), Ph. Bonté (1), C. Jéhanno (1), E. Robin (1). (1) Centre des Faibles Radioactivités, Laboratoire mixte CEA-CNRS, 91190 Gif-sur-Yvette, France. (2) Laboratoire de Glaciologie, CNRS, Grenoble. (3) Service d'Astrophysique, CEN-Saclay.

The Tunguska explosion in 1908 is supposed to have been produced by the impact of a small celestial body. The absence of any identifiable crater together with the huge energy released by the event suggest that the impactor exploded in midair and that its material was widely spread over the Earth. The short term contribution of such exceptional events to the total accretion rate of extraterrestrial material by the Earth could be significant. Ganapathy (1) observed in an Antarctic snow-ice core, recovered at South Pole Station, an iridium peak he attributed to the 1908 explosion. He estimated the total infall of cosmic debris to more than $7 \cdot 10^6$ tons, equivalent to 10^3 years of micrometeoroid accretion. However, when considering the stratigraphic chronologies of this core, one notes that the Ir flux increase occurs, shifted by several years, between 1912 +/- 4 and 1918 +/- 4. Although this delay could be non significant, it casts some doubt on the validity of Ganapathy's conclusions. This prompted us to carry out new analyses on Antarctic snow samples.

Sample preparation and analysis.

Samples were chosen in a core electromechanically drilled in 1984 near South Pole Station. There, the low temperatures, preventing melting all year long, and the nearly regular snow fall rate (6 to 8 cm $year^{-1}$ in water equivalent) provide good conditions for a reliable continuous record of any infalling material. The time markers are the acidity spikes produced by the Tambora eruption in 1815 (at 23-23.7 m depth) and the 1955 increase in snow radioactivity due to the stratospheric contamination by nuclear tests (at 6.03 m depth). The interpolation places the Tunguska explosion at a depth of ~ 13 meters. For a good evaluation of the background we analyzed a continuous section between 9.2 and 14.5 meters. Snow samples were picked up in sub-cores about 1 meter long which were cut with a plastic saw into slices 10 to 12 cm thick. To remove the surface contamination resulting from the drilling operation all the slices were recored with a subcorer consisting in a PTFE cylinder equipped with molybdenum teeth. The central part of each slice was allowed to melt at room temperature and then filtered through a 0.4 μ Nuclepore filter. To avoid contamination during filtering we have discarded all the instruments containing stainless steel parts and used filter holders made exclusively of plastic material. The volume of water was generally close to 80 cm^3. Filters, together with blanks and standards, were placed in ultrapure quartz vials and irradiated for 70 hours in the $2 \cdot 10^{14}$ cm^{-2} s^{-1} neutron flux of Pierre Sué laboratory (Saclay). The content of cosmic material was estimated from the amount of iridium measured with a 2-dimension γ-ray spectrometer. This instrument detects the coincidence of the 468 and 316 kev lines produced by ^{192}Ir decay. The drastic reduction of the instrumental background resulting from the coincidence system provides an improved sensitivity over standard γ-ray spectrometers.

Results.

In many samples Ir was below the detection limit of our instrumentation. The iridium infall averaged over 45 samples is $2.7 +/- 0.4 \cdot 10^6$ Ir atoms cm^{-2} $year^{-1}$. In a few samples the iridium content is significantly higher than the average: the frequency and amplitude of such fluctuations can be explained by the presence on some filters of finite size cosmic particles. No significant systematic increase above the average level is observed in the part of the core corresponding to the Tunguska event (11.5 to 13.9 m depth). These results are in total disagreement with Ganapathy's ones. The two major results of this study are:

1- The presence of Tunguska explosion debris in the Antarctic snow is not confirmed. Our measurements give a strict upper limit for the iridium excess at about $7 \cdot 10^{-15}$ g cm^{-2}, lower by a factor 20 than the value reported by Ganapathy.

2- Our estimate of the average iridium infall, $\approx 10^{-15}$ g cm^{-2} year^{-1}, is an order of magnitude lower than the Ganapathy's background but is close to the values measured in Antarctic snow and atmospheric samples by Takahashi et al. (2) and Tuncel et al. (3). Our results are also consistent with the flux of micrometeoroids deduced from optical and radar observations (4) or derived from the study of Greenland cosmic dust collection (5) but are lower than the flux at mid-latitude measured in paleocene-oligocene sediments from the central part of the Pacific Ocean (6).

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