Contribution ID: **10** Type: **Oral Presentation**

Radionuclides in glaciers: a study of the Adamello ice core

Thursday, 5 May 2022 09:00 (20 minutes)

ABSTRACT

Alpine glaciers are among the most sensible indicators of climate change. Physical changes in glaciers are in fact a direct and visible evidence of a change in temperature and precipitation regime. Glaciers are also natural archives, registering during their lifetime information about past temperature, precipitations, atmospheric composition. Ice cores give the possibility to access this information and thus reconstruct past environmental conditions of the surrounding area. Considering the many chemical and physical parameters that it is possible to study in ice cores, radionuclides play an important role. They are typically transported following atmospheric pathways and deposited on the surface of glaciers. The stratigraphic signal of some radionuclides can be used as an aid to ice core dating, marking temporal horizons. In addition, inventories of anthropogenic radionuclides in glaciers and alpine environments can be used to reconstruct production, diffusion and deposition of such radionuclides in the environment.

The present work was conceived to better understand how radionuclides, and in particular 137Cs and 3H, behave in temperate glaciers. Temperate glaciers experience frequent melting episodes, which occur during summer. For this reason, it is expected to find some level of alteration along the stratigraphy.

The aim of this work is to use a combination of liquid scintillation counting and gamma ray spectroscopy to reconstruct a profile of 137Cs and 3H in the Adamello ice core.

This work focuses on the study of the 45m ice core drilled at Pian di Neve site, Adamello glacier, in the Italian Alps, during summer 2016. Analysis were initially carried out on the chips of the ice core, which were divided in 71 runs covering the entire length of the ice core. Samples were filtrated prior to analysis: the filter was analyzed for radiocaesium, which is mainly bound to particulate matter, with a germanium well detector; the filtrated water was prepared for tritium analysis.

Further analysis on ice core samples were performed on samples corresponding to the depth at which the highest radioactivity peak was found (30-35m). This allowed to improve the temporal resolution of the radioactivity profile.

Measurements show a radioactivity profile along the ice core with distinct peaks of 137Cs and 3H. The main events taken into account to explain the release of radionuclides in the atmosphere and possible subsequent deposition are the nuclear tests that took place before the Partial Test Ban Treaty (PTBT) entered into force in 1963 and the nuclear accident occurred in Chernobyl in 1986. The annual release of megatons due to the nuclear test explosions which were carried out in the year 1963, prior to the PTBT, was compared to the activities measured in the ice core samples, and a correlation was found. A shallower section of the ice core also showed contamination of 137Cs, but not of 3H, compatible with historical data on the Chernobyl accident.

In conclusion, we present a complete radioactivity profile of ice core with an average resolution of 50cm, and a focus for the 30-35 section with a resolution of 5cm. This profile shows that it is indeed possible to extract a readable signal from the stratigraphy of the ice core and allows some considerations on the melting that has occurred on the Adamello glacier in the past decades.

Primary authors: Dr DELMONTE, Barbara (Environmental and Earth Sciences Department, University Milano-Bicocca); DI STEFANO, Elena (Istituto Nazionale di Fisica Nucleare); Dr BACCOLO, Giovanni (Environmental and Earth Sciences Department, University Milano-Bicocca,); CLEMENZA, Massimiliano (Istituto Nazionale di Fisica Nucleare); Prof. MAGGI, Valter (Environmental and Earth Sciences Department, University Milano-Bicocca)

Presenter: DI STEFANO, Elena (Istituto Nazionale di Fisica Nucleare)

Session Classification: Thematic Session 1: Studies of Climate Change

Track Classification: Thematic Session 1 - Studies of climate change