Contribution ID: **203** Type: **Oral presentation**

Reconstruction of the pre-industrial to industrial changes of carbonaceous aerosols using ice core archives

Monday, 3 October 2022 11:00 (20 minutes)

Atmospheric aerosols play a pivotal role in the Earth's system by changing cloud features, affecting air quality and directly impacting the Earth's radiative budget through the scattering and the absorption of the incoming solar radiation. However, the impact of aerosols on climate remains poorly constrained, leading to considerable uncertainties in predicting the climate sensitivity to greenhouse gases. A large fraction of these uncertainties is due to our deficient knowledge of the composition and magnitude of natural emissions before 1750.

Ice sheets and glaciers are valuable natural archives that contain information about the history of the Earth' s atmosphere and that can fill this knowledge gap. Contrarily to polar ice cores, ice cores from high altitude and mid-latitude glaciers, due to their geographical position, preserve information about emissions of anthropogenic aerosols.

In this study we provide ice-core based long-term records of mass concentration of the water-insoluble (WIOC) and water-soluble (WSOC) fraction of organic aerosols as well as elemental carbon (EC) from the pre-industrial to the industrial period from Colle Gnifetti glacier in Switzerland. We use the powerful tool of radiocarbon (14C) analysis to distinguish the contribution of natural (biogenic) and anthropogenic (fossil) sources to the individual fractions. The total concentration of carbonaceous aerosols (sum of WIOC, WSOC and EC) was three times the pre-industrial background at the end of the 20th century. Total organic aerosol concentrations (WIOC and WSOC) show a sharp increase around 1940, but largely of non-fossil origin, suggesting increased emissions of precursor gases and enhanced formation of secondary organic aerosols.

Primary author: SINGER, Thomas (PSI - Paul Scherrer Institut)

Co-authors: JENK, Theo Manuel (PSI - Paul Scherrer Institut); FANG, Ling (PSI - Paul Scherrer Institut); SCHWIKOWSKI-GIGAR, Margit (PSI - Paul Scherrer Institut)

Presenter: SINGER, Thomas (PSI - Paul Scherrer Institut)

Track Classification: Pollution records