Geophysical Research Abstracts
Vol. 17, EGU2015-1598, 2015
EGU General Assembly 2015

Biological ice nuclei are rapidly lost from precipitating clouds

Emiliano Stopelli (1), Franz Conen (1), Christine Alewell (1), and Cindy Morris (2)

(1) University of Basel, Dept. Umweltgeowissenschaften, Basel, Switzerland (emiliano.stopelli@unibas.ch), (2) INRA PACA, UR0407 Pathologie Végétale, Montfavet, France

Ice nucleation is a key step for the formation of precipitation in cold clouds. Particularly interesting is the nucleating behaviour of aerosols of biological origin, showing activity at temperatures up to -2˚C. Yet, the effective impact of biological ice nuclei (IN) on the development of precipitation on global and local scales compared to more abundant IN active at colder temperatures is still ambiguous.

The results coming from a year of observations at the High Altitude Research Station of Jungfraujoch, in the Swiss Alps, 3580 m a.s.l. will be presented. Freshly fallen snow was collected (91 samples in total) from precipitating tropospheric clouds and analysed immediately on site for the concentration of IN active at temperatures warmer than -12˚C by immersion freezing. The stable oxygen ratio (δ^{18}O) of each sample was measured as well; this value was used to estimate the fraction of water vapour lost from a precipitating cloud (1-f_v) prior to its arrival at Jungfraujoch.

IN and the fraction of water vapour lost showed a very similar pattern of variation both on a time scale of hours and over the whole year. Our analysis of the data suggests that the abundance of IN in snowfall is rapidly halved, with every 10% of water vapour lost through precipitation and that IN tend to be preferentially activated and lost compared to other particles of similar size. This provides a substantial constraint for the role of such IN in conditioning precipitation in time and space. Up to 75% of the observed variability in IN concentrations at Jungfraujoch was explained by the factors 1-f_v and wind speed, suggesting that wind may play a role in keeping activated IN suspended in the air.

Unresolved issues like the role of other parameters (seasonality, source region) in describing IN abundances and a deeper characterisation of biological IN active material collected at Jungfraujoch will be discussed.