

Name of research institute or organization:

**Institut für Umweltgeowissenschaften, Universität Basel**

Title of project:

Biological ice nucleators at tropospheric cloud height

Project leader and team:

Dr. Franz Conen, project leader

Mrs. Marianne Caroni

Project description:

In this project we are trying to quantify ice nucleators that are active at relatively warm temperatures ( $>-15$  °C). Most of them are probably of biological origin, such as bacteria, pollen and debris thereof. Biological ice nucleation in the atmosphere is a new field of activity for us and we are still working on our methods. In 2010, we have been sampling through a self-made inlet at the research station. In 2011, we were generously allowed to access the total aerosol inlet on the Sphinx operated by the Laboratory of Atmospheric Chemistry of the Paul Scherrer Institute (PSI). On 11 August (15:00-21:00 UTC), we tested the operation of two liquid impingers connected with a specially built adapter to this inlet (Figure 1) and found 0.1, 0.4, and 6.1 ice nuclei active at -10, -12, and -15 °C, respectively.



**Figure 1.** Liquid impingers connected to the total aerosol inlet provided by the Laboratory of Atmospheric Chemistry of the Paul Scherrer Institute (PSI) at the Sphinx laboratory, High Altitude Research Station Jungfraujoch, August 2011.

Operating the impingers requires permanent attention. Liquid has to be re-filled at ½ to 1 hour intervals, depending on atmospheric humidity. However, it is probably the least disruptive sampling method for biological particles, and we are planning more and longer sampling campaigns in 2012, as part of students' projects.

In the meantime, we have thought of a less labour intensive approach to learn something about ice nucleators in the atmosphere. Claudia Zellweger and Christoph Hüglin from National Air Pollution Monitoring Network (NABEL) at Empa, Dübendorf, have generously provided us filter sections from their high-volume PM<sub>10</sub> sampler operating on Jungfrauoch. The filters had sampled air masses from different origins with PM<sub>10</sub> loads between 5.9 and 28.0 µg m<sup>-3</sup>. We have found a way to analyse the filters for the number of ice nucleators (<http://www.atmos-meas-tech-discuss.net/4/6845/2011/amtd-4-6845-2011-discussion.html>). Number concentrations of ice nucleators active at -8, -10, and -12 °C were on average 3.3, 10.7, and 17.2 m<sup>-3</sup>, respectively. Interestingly, per unit mass of PM<sub>10</sub>, ice nucleation activity was smaller at these temperatures when air masses had been influenced by a Saharan dust event, compared to air masses with Swiss/southern German influence.

Key words:

Biological ice nucleation

Internet data bases:

<http://pages.unibas.ch/environment>

Collaborating partners/networks:

Dr. Ernest Weingartner, Aerosol Physics Group, PSI, Villigen  
Group for Climate Gases, Empa, Dübendorf  
NABEL, Empa, Dübendorf

Dr. Cindy Morris, Plant pathology research unit, INRA, Avignon, France

Scientific publications and public outreach 2011:

Conen, F., Henne, S., Morris, C., Alewell, C., Atmospheric ice nucleators active  $\geq -12$  °C may be quantified on PM<sub>10</sub> filters, Atmospheric Measurement Techniques Discussions doi:10.5194/amtd-4-6845-2011, **4**, 6845-6860, 2011.

<http://www.atmos-meas-tech-discuss.net/4/6845/2011/amtd-4-6845-2011.html>

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