Geophysical Research Abstracts
Vol. 17, EGU2015-9119, 2015
EGU General Assembly 2015

Micro Radiocarbon Dating - Applications and challenges in Alpine glaciology

Helene Hoffmann (1), Pascal Bohleber (1,2), and Dietmar Wagenbach (1)

(1) Institute for Environmental Physics, Heidelberg University, Heidelberg, Germany (helene.hoffmann@iup.uni-heidelberg.de), (2) Climate Change Institute, University of Maine, Orono, USA

The interpretation of proxy records from ice cores obtained at cold small scale Alpine glaciers is hampered first and foremost because of challenges in obtaining a reliable age scale, especially for highly thinned basal ice. Where conventional stratigraphic dating methods fail, either due to complex flow dynamics or missing layering, radiocarbon measurements of organic impurities are up to now the only option to retrieve absolute age markers. Supplementing stratigraphic records, age of basal ice itself can provide valuable information on paleoclimatic conditions, e.g. related to the onset of formation of the respective ice body. In this respect, potential targets are basal sections of Alpine ice cores and small isolated ice patches or ice caves. Organic material in ice can be separated mainly by size into DOC (Dissolved Organic Carbon) and POC (Particulate Organic Carbon). Here we focus on radiocarbon dating of the POC fraction, because the DOC fraction is known to be biased by in situ production at high Alpine sites. Concentrations of POC in high Alpine ice can be very low, ranging from about 10 μgC per kg ice to 50 μgC per kg ice. This becomes an immediate challenge when sampling ice cores, where available masses for dating are typically in the order of a few hundred grams of ice. After developing an unique sample preparation system we managed to reduce the process blank reproducibly below one microgram carbon, independent of other sample characteristics. Utilizing a gas ion source at the Accelerator Mass Spectrometer MICADAS at the Klaus-Tschira-Lab in Mannheim (Germany) we are now able to reliably date samples with concentrations as low as 10 μg carbon. Accordingly, this approach becomes applicable for high Alpine ice samples. Here we present first results from POC radiocarbon dating of Alpine ice cores along with selected basal ice samples from smaller ice caps and cave ice in order to obtain a broader picture regarding age ranges of Alpine ice bodies. For reliable age interpretation, special focus lies on the investigation of possible reservoir effects such as inputs of old Saharan dust or Alpine soil and their potential bias of radiocarbon dates.