



An on-site Isotope diffusion experiment in snow on Greenland

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All three stable isotopes of water (2H , 17O and 18O) show a significant seasonal cycle, most pronounced in polar areas. After deposition, however, the amplitude dampens over the years as the consequence of isotope diffusion in the firn phase. Diffusion takes place quite efficiently by water vapour transport through the microchannels in the firn. This diffusion process has been modelled by various authors and ice core isotope signals generally are being corrected for this process ("back-diffused"). Although the description of diffusion in firn is reasonable in the qualitative sense, it is still in need of "fit parameters". Validation in the field is most welcome. Therefore we performed a field firn diffusion experiment, by deposition of a layer of 2H -isotopically labelled snow. The first site of choice was the "S10" site, about 150 km east of Kangerlussuaq at almost 2000 m altitude. In August 2005, we performed the experiment in the field. For producing and applying a "natural" snow layer we used a small commercial snow gun arrangement. We applied a typically 2 cm w. eq. layer of isotopically labelled snow on a 6 times 6 meter area. The total amount of over 1 m³ water was deuterium labelled to about +1100 ‰. The temperature profile of the site is continuously monitored using a thermistor array and a data logger. In August 2006, our layer was at apr. 85 cm deep, we drilled two small cores on two different positions on the site. The samples have been isotopically analysed at the CIO. We indeed rediscovered our isotope-labelled layer. First diffusion fitting attempts give quite reasonable agreement. In the 2006-2007 Austral summer, an isotope-labelled layer has been produced on Antarctica (close to Svea station). It is planned to produce one more at Summit (Greenland) summer 2007. We will then have three diffusion experiments, widely different in terms of temperature and yearly precipitation.