



Understanding climatic controls on Svalbard water vapour and precipitation isotopic composition

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We investigate the meteorological and climatic controls on the isotopic composition of vapour and precipitation at Ny Alesund, Svalbard. This is based on the IAEA database of monthly precipitation isotopic composition data spanning 1993-2012 as well as new measurements performed using a PICARRO CRDS analyzer deployed since June 2014 at Ny Alesund. The precipitation data depict a strong decoupling between oxygen 18 and temperature at the seasonal scale and for monthly anomalies. While a relationship is observed between winter precipitation isotopic composition and temperature, this disappears during summer, at the inter-annual scale. Moreover, the deuterium versus oxygen 18 relationship depicts different meteoric water lines in winter and summer, consistent with the strong seasonal cycle of deuterium excess, and indicating shifts in moisture origin. The continuous water vapour data (investigated from July to December 2014 so far) show in contrast a tight relationship between hourly oxygen 18 data and surface temperature and humidity, as well as strong antiphase between deuterium excess and oxygen 18. No significant diurnal variability is observed. We show how precipitation intermittency strongly alters the sampling provided by precipitation data and distorts the relationship with local temperature. The surface vapour deuterium data are compared with FTIR retrievals. The importance of changes in air mass origins is also assessed by comparison with moisture backtrajectories.