Geophysical Research Abstracts
Vol. 19, EGU2017-4199, 2017
EGU General Assembly 2017

Arctic ocean seawater, water vapor and precipitation isotopes using in situ measurements from the icebreaker Healy and the Alaska Water Isotope Network

Jeff Welker and Eric Klein
University of Alaska Anchorage, Biological Sciences, Anchorage, United States (jmwelker@alaska.edu)

The Arctic hydrological, atmospheric and cryosphere are all undergoing changes associated with global temperature increases. Central to understanding the dynamics of each major component and especially their interactions requires new approaches that quantify critical processes in situ and continuously; especially the water isotope cycle. We have been measuring the in situ Arctic seawater and water vapor onboard the US icebreaker Healy in conjunction with precipitation on land in Alaska developing a complete depiction of the water isotope cycle under a range of sea ice and from the Gulf of Alaska, into the Bering, Chukchi and Beaufort seas. We find that as sea ice density increases the associated reductions in kinetic fractionation lead to low d-excess values and that these in situ measurements are reflected in Greenland Ice Core records of d-excess. We also have quantified surface sea water at ultra-high resolution with a gradual depletion from -1 per mil in the Gulf of Alaska into the Bering and Chukchi Seas where the most depleted values reaching -3 per mil. These seawater isotope values are extended on shore as precipitation values that reflect condensation fractionation, continental, and altitudinal processes. Together, our Arctic Ocean ship based in situ seawater & water vapor isotope measurements and our complementary land-based precipitation measurements are transforming our understanding of the modern Arctic water isotope cycle and providing a means by which to more fully understand climate records in ice cores.