EGU23-1738, updated on 25 Apr 2023
https://doi.org/10.5194/egusphere-egu23-1738
EGU General Assembly 2023

The spatial variability in isotopic composition of surface snow and snowpits on the East Antarctic Ice Sheet

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The water isotope composition of snow precipitations, archived in the Antarctic ice sheet every year, is an important proxy of climatic conditions. This signal depends on several parameters such as local temperature, altitude, moisture source areas and air mass pathways.

However, especially in areas where snow accumulation is very low (as on the East Antarctic Plateau), the isotopic composition is affected by additional spatial variability induced by the interactions between the atmosphere and snow surface, and the pristine signal may be modified through isotopic exchanges, sublimation processes and mechanical mixing originated from wind action.

Here, we present the isotopic composition (δD and $\delta^{18}O$) and the second-order parameter d-excess of surface snow and snowpit samples collected during the Italian-French campaign in Antarctica (2019-2020). The sampling sites cover the area from Dumont D'Urville to Concordia Station and from Concordia Station towards the South Pole (EAIIST – East Antarctic International Ice Sheet Traverse). These data, compared with a previous dataset of Antarctic surface snow isotopic composition (Masson-Delmotte et al. 2008), are analyzed to determine the variability of the spatial relationship between precipitation isotopic composition and local temperature in relation to geographical parameters (latitude, distance from the coast and elevation). The interpretation of these factors determining the isotope signature is the base to better define the amount of the effects caused by subsequent interaction between atmosphere and surface snow, and by the wind action.

Understanding the spatial variability of this proxy, which strongly decreases the signal-to-noise

ratio, could permit to improve the use of the “isotopic thermometer” to quantify past changes in temperature based on the stable isotopic record of deep ice cores.