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Deuterium excess in the Lomonosovfonna ice core, Svalbard: searching for the moisture source

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We examine a profile of deuterium excess (d) in a 121 m deep ice core drilled at the summit of the ice field Lomonosovfonna at 1250 m asl in the spring of 1997. The core has been dated to cover the past 800 years with a sub-annual resolution back to beginning of the 19th century. It is commonly accepted that d in the final precipitation is a sensitive indicator of humidity and temperature at the sea surface. The analysis is thereby aimed at identifying the primary moisture source for the core location in order to link the variability of d with historical variations of the sea surface temperature in some remote area. The deuterium excess content exhibits pronounced multidecadal variations with generally negative anomalies of ä in the 1700s and positive in the 1800s years. During the last 150 years d shows a significant negative trend. This is not in line with widely accepted conception of a generally colder environment during this period, at least within the European - Northern North Atlantic sector of Atlantic. We calculate sliding correlations between the annual mean d, and gridded winter NOAA SST data for the period 1854-1997 to identify spatial teleconnections and detect oceanic patterns showing variability similar to d. The analysis suggests that the location of a potential source area may vary in time, altering between the tropical and subtropical Pacific (positive d anomalies) and middle latitudes in North Atlantic (negative d anomalies). A special case of particularly high values of d in the 19th century could be due to weakening of the thermo-haline circulation during the Little Ice Age that caused a southward shift of the polar front which then lead to a blocking of warm water masses further south. The analysis thereby does not support the conception of single stationary

source for d in the profile and shows that d for this core is rather indicative of the type of circulation in a particular period of time. This makes an application of multiproxy reconstruction of the past climate using this record problematic.