Geophysical Research Abstracts
Vol. 18, EGU2016-4960, 2016
EGU General Assembly 2016

A Climatology of Atmospheric Rivers Potentially Impacting the Boundary Layer over Greenland: 1871-2012

William Neff and Gilbert P. Compo
University of Colorado, CIRES, NOAA/ESRL/PSD, Boulder, United States (william.neff@noaa.gov)

Recently, (Neff et al. 2014) examined the 2012 Greenland melt episode and compared it to the last episode in 1889 using the Twentieth Century Reanalysis (Compo et al. 2011), finding similar factors at work. A key factor in 2012 was the presence of an Atmospheric River (AR) that transported warm air from a mid-continent heat wave over the Atlantic Ocean and thence to the west coast of Greenland and then over the Greenland ice sheet (GIS) with a confirming water vapor isotopic signature (Bonne et al. 2015). ARs are thin filaments of high-moisture air occurring at frontal boundaries and represent an efficient poleward transport mechanism for warm moist air (Newell et al. 1992) to the Arctic (Bonne et al. 2015; Neff et al. 2014) and the Antarctic (Gorodetskaya et al. 2014). Some common characteristics of the events in 1889 and 2012, in addition to the expression of poleward transport as an AR, included continental heat anomalies in the trajectory source regions as well as a trough-ridge pattern that focused transport along the west coast of Greenland. The latter consisted of a trough of low-pressure situated to the west, generally over Baffin Island, and a high-pressure ridge to the southeast of Greenland. This type trough-ridge pattern was also implicated in a major rain event in 2011 along the western margin of the Greenland ice sheet in late summer that accelerated the flow of ice into the ocean (Doyle et al. 2015).
Although the events of 2012 and 1889 were extreme, the question remains of how frequent are the near-misses of ARs that are likely to have affected lower elevations and/or included increases in moisture over the GIS that would have modified the boundary layer over the high elevations of the GIS. In this presentation we will show an example of the boundary layer modification lifecycle during the 2012 event and then the climatology of events that reveal an increase in such AR events along the west coast of Greenland over the last three decades.