



Bipolar high temporal resolution measurements of snow UV albedo in Sodankylä and Marambio

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In this presentation we will give an overview of our high temporal resolution polar snow UV albedo data from Arctic Sodankylä, and from Marambio, Antarctica. These both are WMO GAW stations with many measurement parameters relevant to the albedo data usage. We will also describe our campaign based polar albedo data (SNORTEX and SOS campaigns), and an important data set of light absorbing impurities (BC) in the Arctic snow.

The black carbon (BC) has been estimated to be the second most important human emission after carbon dioxide, in terms of its climate forcing in the present-day atmosphere. The reflectance effect of BC deposited on snow surface is the bigger the smaller the wavelength, i.e. the albedo effect of BC is the biggest at UV. This is also shown in SNICAR-model simulated albedo values.

In Sodankylä, our bipolar snow ultraviolet (UV) albedo research started within the International Polar Year (IPY) 2007-2008. In 2007, the continuous Sodankylä snow UV albedo measurements were installed in Sodankylä, in the operational albedo field of the Finnish Meteorological Institute Arctic Research Center (FMI-ARC). These Sodankylä 1-min data during snow time were soon compared with the German Antarctic Neumayer Station UV albedo data, also with the same sensor type. In both data we found an up to 10 % decrease in albedo as a function of time within a day, ranging from 0.77 to 0.67 in Sodankylä and from 0.96 to 0.86 in Neumeyer. Physical explanations to asymmetry were found for cases with high relative humidity and low surface temperature during the previous night, favorable to frost and higher albedo on the next morning; new snow on the previous night; snow melting during day time and refreezing during night.

In Marambio, in the beginning of 2013, our new continuous Finnish-Argentinian co-operation snow UV albedo measurements were installed and started as part of a larger continuous meteorological and environmental instrumentation. These new UV radiation data, with the same sensor as in Sodankylä and Neumeyer, allow new polar comparisons. Also the incoming solar irradiance data set can be used separately, for satellite comparisons, e.g.

Since 2009, snow samples have been collected for BC analysis weekly during snow time in Sodankylä. We have results suggesting that Sodankylä snow UV albedo may be affected by high concentrations of carbon due to air masses originating from the Kola Peninsula, Russia, where mining and refining industries are located. Also, seasonal snow melt accumulates the BC in the surface snow as the BC is not washed down with the melt water.

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