

Influence of breeze circulation on local wind climatology and AOD changes in Svalbard fjords: Kongsfjorden and Hornsund

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In this research we study wind directions in two Svalbard fjords. We analyse data series (1992-2013) of wind measurements from meteorological station in Ny-Alesund (Kongsfjorden) and Hornsund and relate them to the surface layer winds from the NCEP/NCAR analysis (Kalnay et al., 1996). Surface winds usually blow along the axis of the fjord (Esau and Repina, 2012).

We show large distinctions between the local wind direction and directions of wind compatible with analysis of the pressure fields. We argue that one of the most important factors controlling the wind directions in Svalbard fjords is breeze circulation. The temperature difference between the neighbouring glaciers and surface sea temperatures of open waters warmed by the West Spitsbergen Current (WSC) creates atmospheric circulation patterns similar to night breeze in temperate climates.

The measurements of AOD (aerosol optical depth) levels from 6th of April were made along the Kongsfjorden with use of the Microtops II hand-held sunphotometers. The AOD height was impacted by the breeze circulation observed in the area.

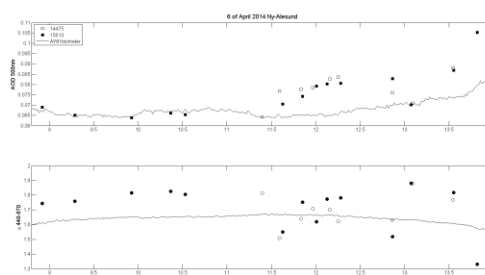


Figure 2. Aerosol optical thickness and angstrom exponent.

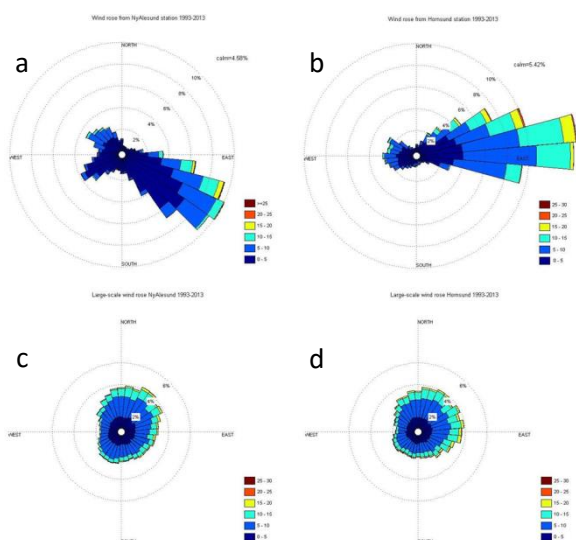


Figure 1. Local wind rose for Ny-Alesund station (a) and Honsund station (b), large-scale wind rose (from NCEP/NCAR reanalysis) interpolated for Ny-Alesund station position (c) and Hornsund station position (d).

Most of the breeze events are mesoscale phenomena of at least 200 km length (investigated fjords are separated by 2 degrees of latitude). The large scale of this phenomena means they may have impact on air-sea fluxes off the Spitsbergen coast in the region of the WSC.

Local breeze circulation was observed during the iAREA campaign in Ny-Alesund in spring in 2014.

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