



Case studies of sea-effect snowfall on the Finnish coast with ERA5 data

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A good understanding of heavy sea-effect snowfall in the past and present climate is essential if we want to assess potential changes in their frequency and intensity in the future. Sea-effect snowfall is a small-scale phenomenon which is triggered by instability caused by large temperature difference between unfrozen sea surface and upper air temperature. Sea-effect snow bands are typically only 20-50 km wide and 50-200 km long. Because of the small scale also the data used to study these events need to have a high resolution. In addition, long time series of observations or model simulated data over the sea area where the convection cells develop are required in climatological considerations. Since very few in situ observations are made over the sea, we investigate the phenomenon with ERA5 reanalysis. Reanalyses are dynamically consistent methods to reprocess observational data and are therefore widely used in weather and climate research. With increasing spatial and temporal resolutions the chance to detect also small-scale extreme weather events with reanalysis products increases. Our goal is to study the feasibility of ERA5 reanalysis in detecting the basic characteristics of sea-effect snow bands. In a previous case study, we tentatively compared ERA5-based results against outcomes from weather prediction model HARMONIE simulations (Olsson et al. 2018). Although the intensity of the snow bands appeared to be weaker in ERA5, their timing and location were similar in HARMONIE and ERA5. Hence these results were encouraging towards the use of ERA5 data in estimating the occurrence and frequency of sea-effect cases on Baltic Sea region in the past. In the current work, comparisons between ERA5 and HARMONIE are conducted in two well-known sea-effect cases on the Finnish coast, 18.1.2016 (Olsson et al. 2017) and 3.2.2012 (Mazon et al. 2015). The parameters to be analyzed concern 10 m wind speed, temperature difference between sea surface and 850 hPa, wind direction, and precipitation amount, among others.

Mazon, et al. (2015): Snow bands over the Gulf of Finland in wintertime. *Tellus A* 2015, 67, 25102.

Olsson, et al. (2017): Intense sea-effect snowfall case on the western coast of Finland. *Adv. Sci. Res.*, 14, 231-239.

Olsson, et al. (2018): Sea-effect snowfall case in the Baltic Sea region analysed by reanalysis, remote sensing data and convection-permitting mesoscale modelling. *Geophysica*, 53(1), 65-91.