

4.194 Influence of seasonal mesoscale and microscale meteorological conditions in Svalbard on results of monitoring of long-range transported pollution.

Early Career Scientist

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Abstract:

The Zeppelin Observatory is an atmospheric monitoring station located on the north-west coast of Spitzbergen island, in the Svalbard archipelago. The station provides background air composition, meteorological and climatological data for numerous research projects including the Global Atmosphere Watch, the European Monitoring and Evaluation Programme and the Arctic Monitoring and Assessment Programme. The observatory is located on a mountain ridge in a region with complex topography that affects local atmospheric circulation processes. Seasonal change in the position of the Arctic front plays key role in long-range transport of atmospheric pollutants to the site. Due to this, long-range transported pollution prevails in autumn, winter and spring. In contrast, in summer, the ship traffic intensifies and becomes a significant local source of pollution in Ny-Ålesund, a small settlement near the station. The present study investigates influence of micrometeorological conditions, mesoscale dynamics and local air pollution on the data collected at the Zeppelin observatory and at a temporarily station in the settlement. Daily filter measurements of sulphur dioxide and non-sea salt sulphate and meteorological data from both stations have been analysed along with the data from radiosonde soundings and ERA-Interim reanalysis dataset. The statistical assessment of the influence of different micrometeorological phenomena, namely directional and speed wind shear, temperature and humidity inversions, and local pollution from ships on the data at both stations has been made. The reasons for seasonal variation of the correlation between the data from the two stations have been revealed, and the importance of different factors of influence has been examined statistically. The modelling of environmental factors, which are described in the current work, is still challenging, and it needs to be considered when one compares modelling results with in-situ measurements taken at

different heights in the area with complex topography.