Identifying source regions for airborne particles in East Antarctica, Dronning Maud Land, using backward trajectory modelling

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Atmospheric composition plays an important role in present and near-future climate change. Airborne particles can serve as cloud condensation and ice nuclei and have therefore a strong influence on cloud formation and thus also on precipitation. This is in particular of interest in Antarctica, since precipitation is the only source of mass gain to the Antarctic ice sheet, which is expected to become the dominant contributor to global sea level rise in the 21st century. A detailed insight into the transport pathways and distribution of airborne particles is therefore essential.

At the Belgian Antarctic research station Princess Elisabeth in Dronning Maud Land, East Antarctica, aerosol particles and their characteristics are measured. Atmospheric particles have been collected on filters during the last three austral summers for organic and inorganic chemical analysis by high-volume sampling. In addition, the atmospheric particle number concentration, size distribution and optical particle properties have been measured since 2010.

The geographical source regions of airborne particles in Dronning Maud Land remain however to a large extent unknown. In this work, we investigate the climatology of the particle properties with respect to their source regions. To that end, we use the FLEXTRA model to calculate 10-day 3D backward trajectories over the past 10 years. We apply a non-hierarchical cluster method to identify and classify the dominant source regions.