A Finnish project on Antarctic atmospheric composition and processes in 2013 - 2016

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The main driver of current and near-future climate change is the atmospheric composition change, more specifically regional changes in the amount and properties of atmospheric aerosol particles and increases in global greenhouse gas concentrations. The primary goal of the four-year (2013 – 2016) project Atmospheric Composition and Processes relevant to climate change in ANTarctica (ACPANT), funded by the Academy of Finland, is to provide new scientific insight into atmospheric composition and associated processes relevant to climate change in the Antarctic atmosphere. The project is a consortium of the University of Helsinki and the Finnish Meteorological institute.

The project focuses on four thematic issues: i) atmospheric new-particle formation, ii) properties and sources of cloud condensation nuclei, iii) aerosol optical properties and iv) oceans and coastal shelf areas around Antarctica as sources and sinks of carbon dioxide and methane. Within and across these thematic issues, we have introduced 11 research questions to be addressed and seven hypotheses to be tested.

The hypotheses to be tested during the project, are:

– NPF takes place over both central and coastal Antarctica, and this phenomenon is not restricted to the summer season

– Emissions from local melt-water ponds are able to initiate NPF and contribute to summertime CCN production in the Antarctic atmosphere

– NPF is a central player of the Antarctic CCN budget but it has only minor influence on aerosol optical properties and thereby on direct radiative forcing

– Organic compounds have significant influences on CCN and aerosol optical properties.

– During elevated wind speeds downward flow formed around mountains will bring aerosols and gases down from upper atmospheric levels to the surface

– Black Carbon (BC) has only minor influence on aerosol optical properties in the Antarctic atmosphere, and BC deposited on snow causes a non-negligible reduction in snow albedo.

– Elevated methane concentrations are detected in air masses coming from the coastal areas which have potential for the sea bottom methane emission

The investigation is based on continuous measurements at three research stations located in Antarctica: the joint Italian-French Concordia station at Dome C in the upper plateau of East Antarctica, the German station Neumayer in coastal Antarctica, and the Argentinian station in Marambio – a small island at the northern tip of the Antarctic Peninsula. The continuous measurements will be supported with two intensive field campaigns, one of which will be conducted in Neumayer and the other one in the Finnish station Aboa.

Recent results of the work conducted by the consortium at the various measurement sites have been presented, e.g., by Järvinen et al. (2013), Kyrö et al. (2013) and Teinilä et al. (2014. In this presentation results from all sites will be presented.

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