Geophysical Research Abstracts
Vol. 13, EGU2011-4513, 2011
EGU General Assembly 2011

Atmosphere-land Interactions Study on Aerosols over the Boreal Forest (ALANIS-Aerosols)

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The interest in investigating anthropogenic in contrast to natural aerosol dynamics over boreal Eurasia stems from two main concepts. The first on is the direct modification of atmospheric particles over the boreal forest both through the emission of biogenic volatile compounds and through the regular occurrence of new particle formation events generating secondary organic aerosols. The second one is periodical occurrence in northern Eurasia of long-range transported anthropogenic aerosols, such as those formed by energy production, traffic and industrial activities which are transported to the area in particular wind circulation conditions.
Several extensive investigations and coordinated field campaigns have been carried out to assess the impact of anthropogenic aerosols on climate but very few studies have been conducted using remote sensing data. Satellite remote sensing of aerosol is an ill-posed problem because the information content in the data is insufficient to retrieve the aerosol chemical composition needed to discriminate anthropogenic from natural aerosol components, in particular in conditions with low aerosol burden. Therefore, a complete picture can only be obtained using a combination of information sources, including satellites, ground-based observations and modeling.
The ALANIS Aerosols project is a feasibility study on the use of existing EO-based products for discriminating between natural aerosols emitted by boreal Eurasian forests and long-range transported anthropogenic aerosols. Specific objectives are (1) to investigate, develop and validate novel algorithms solely exploiting as input currently available EO-based products for discriminating natural from anthropogenic aerosols in boreal Eurasia; in particular the feasibility are investigated to use satellite products to determine the occurrence of nucleation events. (2) to investigate, develop and validate novel strategies for assimilating already existing EO-based products into an existing chemical transport model to discriminate natural from anthropogenic aerosols in boreal Eurasia. (3) to evaluate results from both stand-alone EO products method and EO/model based methods, including an evaluation of the merits of each method, through three case studies performed using data from selected ground sites located in boreal Eurasia.
An overview of the project will be presented.