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Coupling groundbased ALOMAR lidar measurements to high resolution global modelling and CALIPSO backscatter assimilation to characterize aerosol properties in the Arctic.

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Stratospheric aerosols are involved in cloud formation processes, especially in polar regions where thermodynamical conditions lead to polar stratospheric clouds (PSC) formation. Beside the well-known chemical effect of these clouds on polar ozone, the overall radiative impact of PSC and especially stratospheric aerosols remains unclear. Assessing the global stratospheric sulphuric load remains an issue, as measurements require both global coverage and high sensitivity. Volcanic eruptions regularly impact this aerosol budget even at high latitudes, as the stratospheric circulation takes particles throughout the dynamical barriers up to the polar regions.
Around the 13th of June, 2011, the Eritrean Nabro volcano experienced a major eruption, injecting dust and particles in the upper troposphere/lower stratosphere. The transport of the newly oxydized aerosols has been reported by the CALIOP/CALIPSO spaceborne lidar. The particles produced significant optical backscatter for several months. We use a high-resolution microphysical-transport model to gain access to the small filamentary structures of the volcanic plume. CALIOP backscatters are assimilated into such a model to provide accurate constraints on the advection over time at stratospheric altitudes, where the horizontal transport is dominant. Validation is locally performed against ground-based lidar measurements acquired at the ALOMAR observatory, where microphysical aerosol properties derived from multiwavelength lidar can be compared to the model-calculated ones. Coupling the advanced detection capabilities of a stratospheric lidar to high-resolution global modelling allows for global assessment of aerosol and cloud surface area densities and volumes, which are of critical importance in ozone depletion processes.