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## Retrieval of aerosol particle size distributions in the stratosphere from SCIAMACHY limb observations and comparison to balloon-borne measurements and ECHAM5-HAM simulations

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Stratospheric aerosols play an important role in the climate system and the atmospheric chemistry. They alter the radiative budget of the Earth affecting the global temperature and interact with stratospheric trace gases leading to ozone depletion. Effects are most noticeable after volcanic eruptions enhancing the amount of aerosols in the stratosphere. Thus, vertically and spatially resolved knowledge about stratospheric aerosols, such as the particle size distribution and extinction coefficient, is crucial for the initialization of climate models, investigation of geoengineering, validation of aerosol micro-physical models, and improvement of trace gas retrievals. We present an algorithm to retrieve aerosol particle size distribution parameters (mode radius and distribution width, number density) from limb observations of SCIAMACHY (SCanning Imaging Absorption spectroMeter for Atmospheric ChartographY) operated aboard Envisat between 2002 and 2012. SCIAMACHY retrieved particle size distribution profiles are compared with in-situ balloon-borne measurements from Laramie, Wyoming. Both data-sets show good agreement. The stratospheric plume evolution after the eruption of Sarychev in the Kuril Islands, Russia, in June 2009 is investigated and compared to the output from the aerosol-climate modelling system ECHAM5-HAM.