Geophysical Research Abstracts
Vol. 18, EGU2016-5823, 2016
EGU General Assembly 2016

Composition of Stratospheric Aerosol Particles collected during the SOLVE campaign 2000

Katharina Schütze (1,2), Benker Nathalie (1), Ebert Martin (1), Weigel Ralf (2), Wilson James C. (3), Borrmann Stephan (2,4), and Weinbruch Stephan (1)

(1) Institute of Applied Geosciences, Technical University Darmstadt, Darmstadt, Germany (schuetze@geo.tu-darmstadt.de), (2) Institute for Atmospheric Physics, Johannes Gutenberg-University, Mainz, Germany, (3) Department of Engineering, University of Denver, Denver, Colorado, USA, (4) Max Planck Institute for Chemistry, Particle Chemistry Department, Mainz, Germany

Stratospheric Aerosol particles were collected during the SAGE III Ozone loss and validation Experiment (SOLVE) in January-March 2000 in Kiruna/ Sweden onboard the scientific ER-2 aircraft with the Multi-Sample Aerosol Collection System. The particles are deposited on Cu transmission electron microscopy (TEM) grids. Particles of six samples from different flights (including one PSC sample) were analyzed by TEM and Energy Dispersive X-ray detection (EDX) regarding their size, chemical composition and morphology.

Most particles are sulfates (formed from droplets of sulfuric acid) which are not resistant to the electron beam. In addition, refractory particles in the size range of 100-500 nm are found. They are either embedded in the sulfates or occur as single particles. The refractory particles are mainly carbonaceous showing only C and O as major peaks in their X-ray spectra. Some particles contain minor amounts of Si and Fe. Both, the O/C (median from 0.10-0.40), as well as Si/C (median from 0.05-0.32) ratios are increasing with time, from the middle of January to the end of February. The largest Fe/C ratio (median: 0.37) is found in a sample of the end of January.

Based on the nanostructure and the absence of potassium as a tracer, biomass burning can be excluded as a source. Soot from diesel engines as well as from aircrafts show a nanostructure which is not found in the refractory particles. Due to the fact that large volcanic eruptions, which introduced material directly into the stratosphere, were missing since the eruption of Mt. Pinatubo in 1991, they are a very unlikely source of the refractory particles. The most likely source of the refractory particles is thus extraterrestrial material.