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Assimilation of stratospheric aerosols

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Aerosols play an important role in stratospheric radiation and chemistry. Most 3D chemistry–transport models use various climatologies of aerosol surface area densities to take into account these effects. However, the quality of such climatologies is necessarily restricted by observational limitations. In this study, we investigate the possibility to improve these climatologies by developing appropriate assimilation methods.

Two types of models have been built and will be discussed: (1) an advection model of the aerosol surface area density and (2) a model where aerosol are distributed into different size bins and subject to advection, coagulation and sedimentation. Model results are compared with an aerosol climatology derived from SAGE–II (and developed at BIRA–IASB) for a period of medium volcanism, between May 1993 and May 1994.

The assimilation system is based on the 4D–VAR method. Its abilities and limits using both synthetic data generated by our model and SAGE–II observations will be discussed.