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Data assimilation of IASI mineral dust observations in an advanced chemistry transport model

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The arrival of satellite retrieved aerosol information allows the preparation of assimilation based analysis maps. In combination with aerosol in situ measurements it is possible to verify the satellite data and to integrate complementary estimates of the aerosol load.
The DLR IASI mineral dust retrieval is assimilated in the Polyphemus/DLR chemistry transport model. A three-dimensional (3Dvar) data assimilation scheme has been developed and applied using mineral dust aerosol observations from IASI. Dust retrieval from IASI produces dust Aerosol Optical Depth (AOD) at 10μm as well as the transfer to 0.5μm assuming log-normal particle size distributions. Moreover the intrinsic uncertainty of the retrieval and dust particle size information are provided by the IASI observations.
As background (or first guess) mineral dust data is delivered by the aerosol model Polyphemus-SIREAM (The SIze REsolved Aerosol Model), implemented as integral part of the Polyphemus/DLR regional chemistry transport model.
The presentation includes a description of the formulation of the variational approach, namely the design of the non-factorized 3D-background error covariance matrix with related formulation of anisotropic and inhomogeneous influence radii, to account for regional differences. As satellite retrievals are available in near real time, this approach aims at the applicability of mineral dust assimilation in an operational forecast model. This is of considerable value adding, as retrievals offer the opportunity to include irregular aerosol emission processes such as desert dust outbreaks in future operational products.