



## **GEMS-Aerosol at ECMWF: An update.**

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Over the past two years, the ECMWF Integrated Forecast System has been upgraded to include an experimental representation of aerosols in both its forecast and analysis modules.

As of beginning of January 2007, the forecast model includes 3-bin representations for both sea-salt and desert dust aerosols, and organic and black carbon aerosols are represented from their hydrophilic and hydrophobic components with two variables for each aerosol types. Within the forecast model, these prognostic aerosols are advected by the dynamics, the vertical diffusion and the convection, and undergo the usual aerosol physical processes (source, dry and wet deposition, sedimentation).

On the other hand, the four-dimensional (4D-Var) analysis system has been adapted to include an aerosol analysis. The observations that are currently ingested at an experimental level are the retrieved aerosol optical depth from the Moderate Resolution Imaging Spectroradiometer (MODIS) on board of the Terra and Aqua satellites. The model equivalent aerosol optical depth is calculated from pre-compiled Mie look-up tables, which provide the aerosol optical properties at 0.55 microns and from the aerosol mixing ratio of all aerosol species included in the forecast model. The minimization is performed with respect to a total aerosol mixing ratio and increments in this control variable are then redistributed to the different species. Analysis with a bin configuration including the 3 bins for sea salt and the 3 bins for desert dust has been successfully run for two weeks. Results are encouraging and show the capability of the analysis system in correcting the aerosol optical depth to match the observation. However, some of the signal coming from the observations and clearly attributable to aerosols other than sea salt and desert dust is aliased into these two aerosol types. The more complete model configuration including other aerosol species such as black carbon and organic matter is currently being tested in analysis mode.