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Implementation and evaluation of a microphysical aerosol module in the ECMWF Integrated Forecasting System

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As part of the European Global Monitoring for Environment and Security (GMES) program, the Monitoring Atmospheric Composition and Climate (MACC) project will provide a system for monitoring and predicting the characteristics of atmospheric constituents. Our contribution to this work is the incorporation and evaluation of the UKCA-mode microphysical aerosol scheme (Mann et al., 2010, GMD) within the ECMWF Integrated Forecasting System (IFS). The two-moment modal UKCA-mode scheme includes new particle formation, condensation, coagulation, cloud-processing, and wet and dry deposition. UKCA-mode is already incorporated as a module within the GLOMAP-TOMCAT chemistry transport model and within the UK Met Office HadGEM3 general circulation model. In these frameworks, the scheme compares well against a wider range of benchmark observational datasets including measurements from short-term field campaigns and long term monitoring sites.

Presented here are the results of early tests of UKCA-mode in the IFS, comparing the new aerosol scheme with the mass-only scheme developed during GEMS. The use of a microphysical, process-based model allows a more realistic representation of the properties of the multi-component aerosol and will enable aerosol-cloud interactions to be robustly simulated within the IFS system. Sophisticated regional aerosol-chemistry models will also benefit from the new UKCA-mode-IFS system via improved boundary condition information.