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Introducing the GM7/EQSAM3 aerosol dynamics and thermodynamics model; a more comprehensive treatment of hygroscopic growth.

S. Metzger, **K. Pringle**, J. Leliveld

Max Planck Institute for Chemistry, Air Chemistry Department, Mainz, Germany
(pringle@mpch-mainz.mpg.de /Fax: 00496131305436/ Phone: 00496131305436)

It is now widely accepted that aerosol particles play an important role in the Earth's radiative balance. However the global aerosol distribution is very complex and simplifications must be made in order to treat aerosols in global models. One common simplification used in models is in the treatment of aerosol hygrospcopic growth (the growth of a particle in response to changes in relative humidity). Treatment of hygroscopic growth is important in a model as it is this that controls the ambient particle size, important for direct forcing calculations. Treatment of the hygroscopic growth of aerosol particles is also a first step in the calculation of aerosol growth into haze or cloud droplets.

Most models treat hygroscopic growth using prescribed coefficients which relate the particle wet and dry aerosol mass. In reality, the relationship between the wet and dry mass depends on the ionic composition of the particle, but few models carry this degree of chemical information thus they cannot calculate this explicitly. The GM7/EQSAM3 model has been developed to address this problem. The model treats primary black and organic carbon and a range of inorganic and organic compounds (including $NH4^{+}$, $NO3^{-}$, Cl^{-}, K^{+}, Na^{+}, Mg^{+} and $SO4^{2-}$, formate, acetate, oxalate citrate). This allows the explicit calculation of the gas/liquid/solid partitioning and thus treatment of the hygroscopic growth of the ionic salts (described in Metzger, 2007).

In this paper we give an overview of the modelling approach used and show various model inter-comparisons between different treatments of hygroscopic growth. The

first results from the global model are also presented including an examination of the importance of the new model for the prediction of the aerosol wet radius and the aerosol growth factors, as well as their relevance for a consistent aerosol-cloud coupling.