

# AMR For Global Atmospheric Modelling and Transport

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In this paper a Godunov-type methodology is applied to three-dimensional global atmospheric modelling. Numerical issues are addressed regarding the formulation of the tracer advection problem, the application of dimensional splitting and the implementation of a numerical scheme, based on the Godunov-type methodology, on spherical geometries. Particular attention is paid to addressing the problems which arise because of the convergence of the grid lines towards the poles. A three-dimensional model is then built on the sphere which is based on a uniform longitude/latitude/height grid. This provides the framework within which an Adaptive Mesh Refinement (AMR) algorithm is applied, to enhance the efficiency and accuracy with which results are obtained. These methods are not commonly used in the area of atmospheric modelling, but AMR in particular is commonly used with great success in other areas of CFD. The model is initially validated using a series of idealised case studies which have exact solutions, but is then developed into an off-line model of tracer advection, forced by data from meteorological analyses, suitable to study the evolution of trace chemical species in the atmosphere.