Abstract Submitted for the SES08 Meeting of The American Physical Society

Wavelet-based adaptive mesh refinement algorithm for atmospheric chemical transport modeling¹ YEVGENII RASTIGEJEV, North Carolina A&T State University — Numerical modeling of chemical transport in the Earth atmosphere is essential for addressing problems and issues related to atmospheric air quality, greenhouse gases budget and climate forcing. Chemical transport models (CTM) combine chemical reactions with advection by a meteorologically predicted flow velocity. The resulting system of equations is extremely stiff, nonlinear and involves a large number of chemically interacting species. The difficulty of solving these equations imposes severe limitations on the spatial resolution of the CTMs. Wavelet-based Adaptive Mesh Refinement (WAMR) algorithm has been developed to address these difficulties. WAMR allows a fine grid in the regions where sharp transitions and cruder grid in the regions of smooth solution behavior. Thus WAMR results in much more accurate solutions than conventional finite difference methods implemented on a uniform grids. Numerical experiments showed the algorithm ability to achieve much higher accuracy than traditional numerical methods with the same number of grid points.

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Date submitted: 15 Aug 2008

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