1067-49-209 **Xiao Chen*** (xc06@fsu.edu), Florida State University, Department of Scientific Computing, 400 Dirac Science Library, Tallahassee, FL 32306-4120, and **Santha Akella** (santha.akella@gmail.com) and **Ionel Michael Navon** (inavon@fsu.edu), Florida State University, Department of Scientific Computing, 400 Dirac Science Library, Tallahassee, FL 32306-4120. *A dual weighted trust-region adaptive POD 4D-Var applied to a Finite-Volume global shallow-water Equations Model in Sphere.*

In this work we study solutions of an inverse problem for a global shallow water model controlling its initial conditions specified from the 40-yr ECMWF Re-Analysis (ERA-40) datasets, in presence of full or incomplete observations being assimilated in a time interval(window of assimilation) with or without background error covariance terms. As an extension of the work in Chen et al., 2009, we attempt to obtain a reduced-order model of above inverse problem, based on proper orthogonal decomposition (POD), referred to as POD 4-D Var for a finite volume global shallow water equations model based on the Lin-Rood flux-form semi-Lagrangian semi-implicit time integration scheme. Different approaches of POD implementation of the reduced inverse problem are compared, including a dual-weighted method for snapshot selection coupled with a trust-region POD adaptivity approach. Numerical results with various observational densities and background error covariance operator are also presented. The POD 4-D Var model results combined with the trust region adaptivity exhibit similarity in terms of various error metrics to the full 4-D Var results, but are obtained using a significantly lesser number of minimization iterations and require lesser CPU time. (Received August 03, 2010)