1065-35-250 **Judith C Hill*** (hilljc@ornl.gov), PO Box 2008 MS 6367, Oak Ridge National Laboratory, Oak Ridge, TN 37831, and **Katherine Evans**, **George Fann** and **Jun Jia**. *High-order deferred correction time integration methods for climate models.*

Modern atmospheric climate models that are part of the Community Earth System Model include coupled nonlinear physical and chemical processes that span multiple scales. Spatially, resolution of the smaller scales is achieved by finer grid resolution or higher-order spatial approximations. Because of the scalability and throughput requirements of production simulations, many of the climate models employ first-order accurate fully explicit temporal discretizations. However, because of the finer spatial resolutions now required, the restriction on the time step size for the stability of these schemes is severe.

In this talk, we will discuss the spectral and Krylov deferred correction methods that provide a spectral discretization in time and yield high-order accuracy that is dependent on the discretization order. We will demonstrate that these techniques, implemented in a production atmospheric model, allow time steps on the order of one day (compared to minutes for a first-order method) to be taken without loss of accuracy. We will also compare the algorithmic cost of these methods to the existing leapfrog scheme and show that, despite a higher per time step cost, the increase in time step size yields a net gain in efficiency. (Received September 14, 2010)