Recent Status of NEMS/NMMB-AQ Development

Youhua Tang1, Jeffery T. McQueen2, Sarah Lu1, Thomas L. Black2, Zavisa Janicic2, Mark D. Iredell2, Carlos Pérez García-Pando3, Oriol Jorba Casellas4, Pius Lee5, Daewon Byun5, Paula M. Davidson5, and Ivanka Stajner6

Recent Status of NEMS/NMMB-AQ Development

Summary and Future plan

The development of NEMS/NMMS inline air quality model has started using ESMF framework. Most of related chemical/physical modules are zero-dimensional or one-dimensional, which can be placed into this system directly, either as normal subroutines or as an ESMF gridded component. We will use CMAQ existing chemical modules in this system. The new mass-conservative NMM-B advection scheme can support air quality applications, and the corresponding meteorological prediction is under testing now.

In next step, we will add and test convective mixing for passive tracers, in-cloud/under-cloud chemical scavenging, replace interpolated emissions with native-grid emissions (CMAQ SMOKE package), and put biogeochemical and dry deposition inline. Alternative more flexible coupling approach through a separate chemistry grid component (method A) will be explored.

Two Inline Approach

Method A: Atmosphere model decorated with AQ component. Might be computationally more expensive than Method B. Different components may use different dynamics/physics. Reimplements may exist between meteorological and air quality modules. Difficult to achieve different dynamics/physics in coupled models. Low flexibility. Requires different meteorological and air quality modules. Method B: Atmosphere model decorated with AQ component. Requires minimal changes. Can keep most of the original AQM and AQ processes in the meteorological modules. Low flexibility. Allows flexibility and can be made consistent. Low overhead due to different dynamics/physics. Different components can run on different grid and time scales. High efficiency.
