

Multi-scale Multi-physics Simulations for Weather/Climate Forecast on the Earth Simulator

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Abstract:

Intensive research efforts have been made on understanding the climate/weather system. The earth system is a typical complex system that is composed of phenomena with different scales of space and time. Fully coupled atmosphere-ocean-land-sea ice models are widely accepted as a most powerful tool available for assessing future weather/climate. Under the condition of global warming, there have been changes in climate variability such as El Nino Southern oscillation or Indian dipole mode phenomena. Furthermore, weather/climate in urban areas will be influenced by climate variability. This fact requires us not only to model physical phenomena with interactions among atmosphere, ocean, land and sea-ice but also to perform a huge scale of simulations capitalizing on high performance computing capabilities.

The Earth Simulator Center has been developing an ultra-high resolution coupled model that incorporates non-hydrostatic atmosphere, ocean, land and sea-ice model components, which is made tailored to high performance computing architectures. We call the above coupled model Multi-scale Simulator for the Geoenvironment (MSSG). MSSG is coupled with a nesting scheme between the globe and a region for both atmospheric and oceanic components. It means that MSSG is capable of conducting seamless, comprehensive simulations with a single model for different scales ranging from the entire globe to urban areas (Figure).

Our latest simulation results from MSSG, computational performance on the ES2 and future strategy will be presented and in this presentation.

