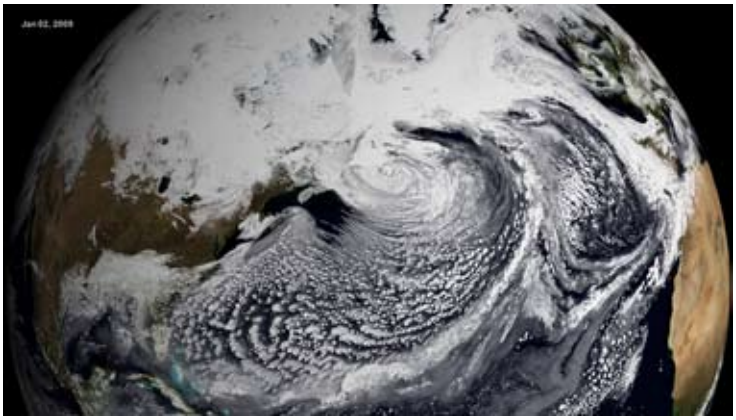
Global Non-Hydrostatic Modeling with the NASA GEOS-5 Atmospheric Model

NASA is committed to observing and understanding the weather and climate of Earth through the use of multi-scale modeling systems and space-based observations. Our work with the Goddard Earth Observing System Model (GEOS-5) at cloud-permitting resolutions places NASA modeling at the forefront in scientific exploration of our atmosphere and climate. This work is being integrated into the GEOS-5 data assimilation system to incorporate space- based and conventional observations capable of providing more accurate initial conditions for forecast models, and reanalyses that produce a continuous record of global climate data for scientific study and model validation.

Using a special "cubed-sphere" version of GEOS-5, we have explored a series of incremental increases in global resolution from the standard 72-level 27-km resolution (~5.5 million cells covering the globe from the surface to 0.1 hPa) down to 3.5 km (~3.6 billion cells). At these extremely high resolutions, GEOS-5 is capable of resolving regional weather/climate impacts and mesoscale features including hurricane inner-core structures, tropical convection, stratocumulus cloud formations in the marine layer, cumulus cloud streets, and von Karman vortices, while maintaining consistency with the prevailing large-scale circulation in a single atmospheric model. Global atmospheric modeling at these cloud-permitting resolutions, however, would not be possible without NASA's advanced computational capabilities, particularly the Discover cluster at Goddard. Access to thousands of computational processors with large and fast memory capabilities permits GEOS-5 to perform efficiently at these extremes of global modeling at regional scales.

By exploring global climate at regional scales we are able to better understand the influence of regional features such as organized tropical convection, hurricanes, flooding, and drought, and the effects these features have on the global circulation, as well as how these features might be altered in a changing climate.



GEOS-5-modeled clouds at 3.5-km global resolution on January 2, 2009 as a strong blast of arctic air moves off the east coast of the United States, producing a series of cumulus cloud streets forming over the ocean, parallel to the flow of the low-level winds.



GEOS-5-modeled clouds at 3.5-km global resolution on July 27, 2009.

http://sivo.gsfc.nasa.gov/cubedsphere.html
http://gmao.gsfc.nasa.gov/systems/geos5/

William Putman, NASA Goddard Space Flight Center
William.M.Putman@nasa.gov