
The NASA GMAO retrospective analysis for the 21st Century GEOS-R21C

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Abstract

Building on the success of MERRA, and its successor MERRA-2 (released in 2009 and 2015 respectively), the GMAO continues its incremental effort towards a decadal goal of an Integrated Earth System retrospective analysis, MERRA-3 (~2025), coupling atmosphere, ocean, chemistry, land, and ice. With aspects of the coupled Goddard Earth Observing System (GEOS) still under development, an intermediate reanalysis featuring recent advances in the GEOS atmospheric component is planned as a stepping-stone towards MERRA-3.

The GEOS-5 Retrospective analysis for the 21st Century, GEOS-R21C, will be a hybrid 4D-EnVar atmospheric reanalysis at 25km, covering the period 2000-onwards, and featuring the NASA's EOS and post-EOS satellite observations. MERRA-2 by contrast covers 1980-present and uses 3DVar at 50km. Other planned features in GEOS-R21C include All-sky radiances, new/re-processed data, and new radiance and aircraft bias correction strategies. Efforts to reduce field discontinuities involve alternative treatment of ozone data and an adjustment to the frequency of the Incremental Analysis Update (IAU) in the initialization process. The output fields from GEOS-R21C are planned to drive an off-line chemistry reanalysis (GEOS-R21C-Chem) and a high-resolution downscaling for the polar regions (PolarMERRA). GEOS-R21C is currently in the pre-production stages.

This talk presents the GMAO strategy for upcoming reanalyses and focuses on GEOS-R21C configuration details and preliminary results from prototype-R21C with comparisons with MERRA-2 and ERA5. Along with an overall review of the new features, a reassessment of MERRA-2 strategy for dry-mass conservation is presented as well as a new diagnostic tool for GEOS-R21C.

Keywords: reanalysis, data assimilation

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