



GMAO Current and Future System Configurations

Current production:

- Model version - pre-MERRA-2 with MERRA-model cryosphere, MOM4 ocean, CICE sea ice
- Resolution - 1 degree atmosphere (LatLon) x 72 levels, 0.5 degree ocean X 40 levels
- ODAS - EnOI of Keppenne et al (2008)
- Hindcasts/Forecasts - Ocean Assimilation with atmosphere replayed to MERRA-2
- Ensembles and perturbations - Atmosphere perturbations only (Borovikov et al 2017)

System "frozen", hindcasts running, in production ~September 2017:

- Model version - Current NWP system atmosphere and cryosphere, two moment microphysics, interactive aerosol (GOCART), MOM5 ocean, CICE sea ice
- Resolution - c180 atmosphere (~0.5 degree) x 72 levels, 0.5 degree ocean X 40 levels
- ODAS - LETKF (Penny, 2014)
- Hindcasts/Forecasts - Initialize ocean using LETKF ODAS, nudging to MERRA-2 SST/ICE, initialize land and atmosphere with MERRA-2, "intermittent" replay.
- Precipitation correction will be included in ODAS (replay) sequence.
- Ensembles - As in current, without "breeding" perturbations.



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Planned 2018 Sub/Seasonal System Configuration

- Resolution: AGCM: c180 (~0.5 deg), 72 levels OGCM: MOM5 with ~0.25 deg, 50 levels
- AGCM: Two-moment microphysics, interactive aerosols, may also include shallow convection, Grell-Freitas convection, currently under development/testing.
- ODAS: LETKF
- New handling of atmospheric "replay" for Ocean Data Assimilation: Surface fluxes computed using observed SST/Sea Ice and zero lower boundary wind
- Handling of "skin layer": Tskin analysis, diurnal warming and cool layer (This replaces skin layer currently in atmosphere/ocean interface)
- Initialization - LETKF ODAS and NWP system (analyzed ozone and aerosol)

Highest priority development

- Skin layer - Ice melt, runoff, compatibility with Tskin analysis current in NWP system
- Alternative ensemble perturbations (current reliability too low)
- Bias corrected forecasts



GMAO Priority investigation of sources of predictability

Impact of NASA data on prediction/predictability

- Land initialization using SMAP soil moisture
- Dynamic Phenology (may include assimilation of MODIS/VIIRS vegetation index, for example)
- Coupling between atmosphere and composition
 - Interactive biomass burning emissions
 - Some forecasts with interactive ozone chemistry, initialized with NWP analyzed ozone

Dynamical sources of prediction/predictability

- Transport associated with Rossby wave guides
- Feedbacks between sea ice and extent and surface pressure