Evaluating and Improving Cloud, Aerosol, Precipitation and their Interaction (CAPI) Schemes in the GFS-CFS-NGGPS Systems

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Summary of previous studies

• Evaluation of cloud properties in the NOAA/NCEP Global Forecaster System using multiple satellite product (Yoo and Li, 2012, *Climate Dynamics*)
• Testing and improving low-level cloud parameterizations for the NCEP/GFS model satellite and ground-based measurements (Yoo et al. 2013, *Climate Dynamics*)
• Cloud vertical distribution from radiosonde, remote sensing, and model simulations (Zhang et al, 2014, *Climate Dynamics*).

Objectives of future studies:

• Evaluating the performance of the new physical schemes associated with accounting for the aerosol effects that affect rainfall forecasts and cloud simulations through in-depth comparisons with extensive global satellite and ground-based products and observation-based findings;
• Understanding the causes of discrepancies in simulating clouds and their interactions with aerosol between current and new schemes, and between model simulations and observations by virtue of a high-resolution cloud-resolving model (CRM).
Observation-based diagnosis and testing approaches

Diagnosis input variables

Evaluation of GFS cloud properties

Change of cloud scheme

Evaluate Improvement

Change of Cloud & rainfall

Observations

Li et al. (2011, Nature-Geosci.)

MODIS
AIRS
CERES
CloudSat
CALIPSO
Surface data

Passive Remote Sensing
Active Remote Sensing
Ground Remote Sensing
Modeling framework for testing physical schemes

Yoo et al. (2013, Cli. Dyn.)