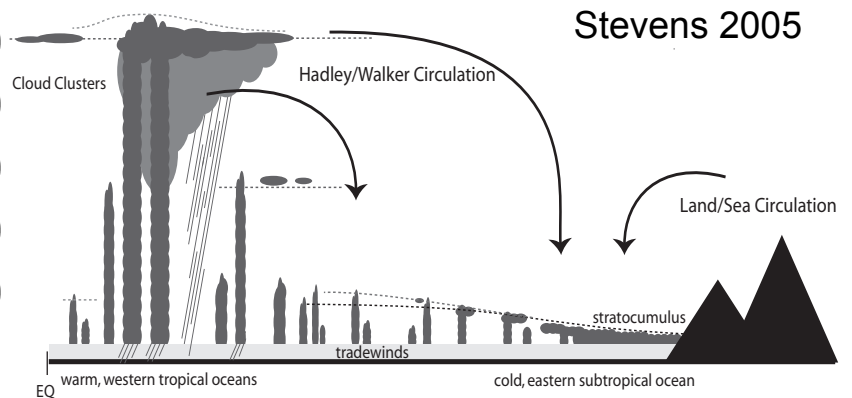
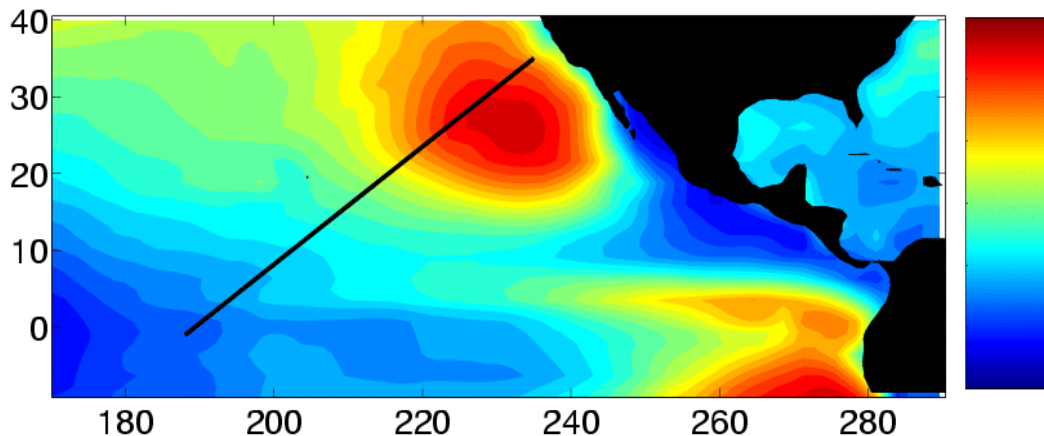


Stratocumulus to Cumulus Transition CPT

Joao Teixeira (JPL)

Goal: Improve the representation of the cloudy boundary layer in NCEP GFS and NCAR CAM5 with a focus on the subtropical stratocumulus to cumulus (Sc-to-Cu) transition

Low-level clouds (%), ISCCP, ANN



NCEP H. Pan (PI), J. Han, R. Sun

NCAR S. Park (PI), C. Hannay

JPL J. Teixeira (CPT lead PI), M. Witek

U. Washington C. Bretherton (PI), J. Fletcher, P. Blossey

UCLA R. Mechoso (PI), H. Xiao

LLNL S. Klein (PI), P. Caldwell

NOAA funded
2010 - 2014
(additional internal
JPL and DOE funds)

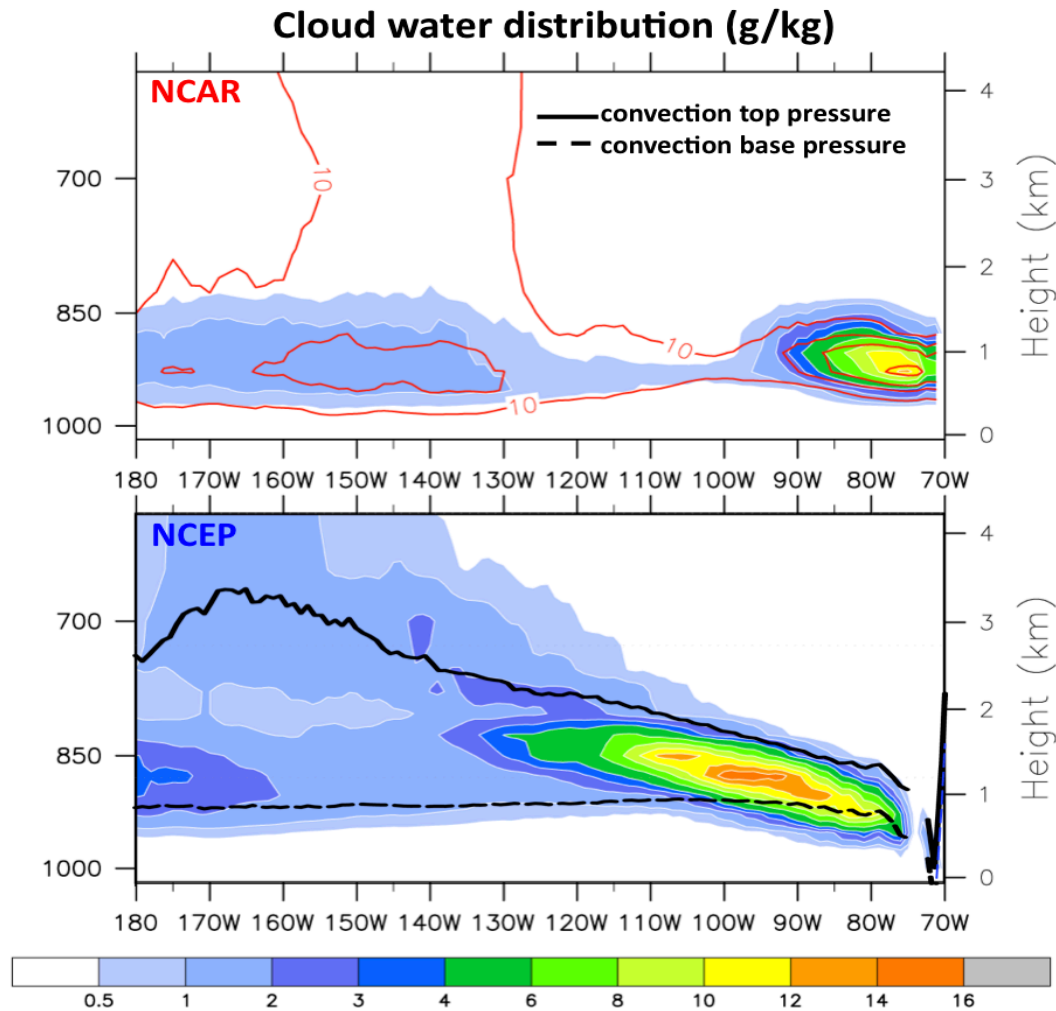
CPT Main Objectives

- a) Better climate diagnostics for NCEP/GFS
- b) Create single-column GFS: testbed for new parameterizations
- c) Development/testing of PDF cloud scheme in CAM5 & GFS
- d) Development/testing of EDMF parameterization in NCEP/GFS

$$\overline{w'\varphi'} = -k \frac{\partial \bar{\varphi}}{\partial z} + M(\varphi_u - \bar{\varphi})$$

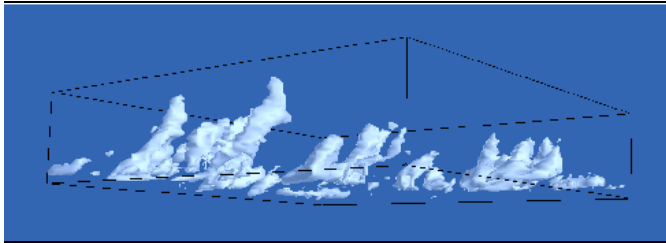
NCEP/NCAR diagnostics of cloud transition

October climatology along 20 S cross-section



NCAR and NCEP results are significantly different

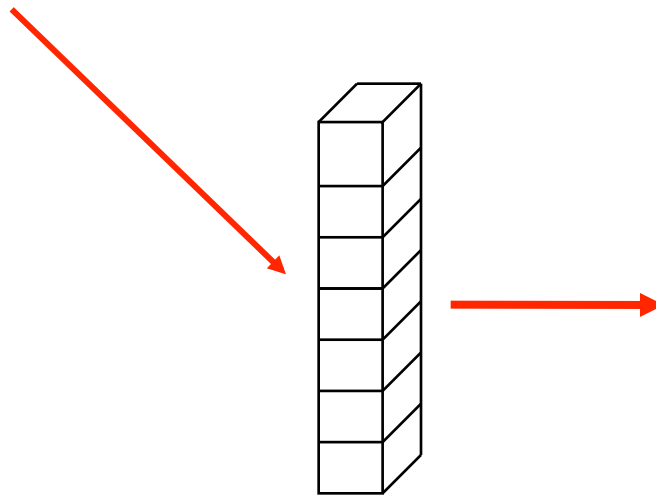
Single-column testing and improvement of GFS



High-resolution model data:

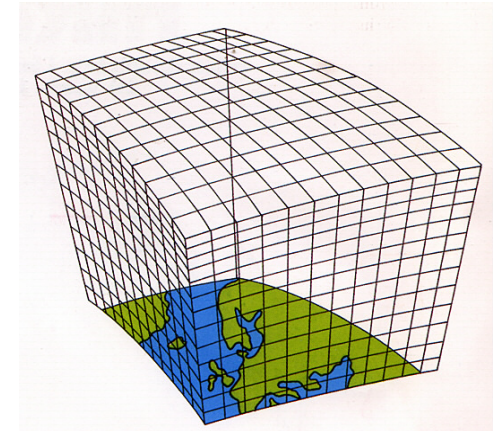
Large Eddy Simulation (LES) models

Cloud Resolving Models (CRMs)



Testing in Single Column Models:

Versions of Climate Models



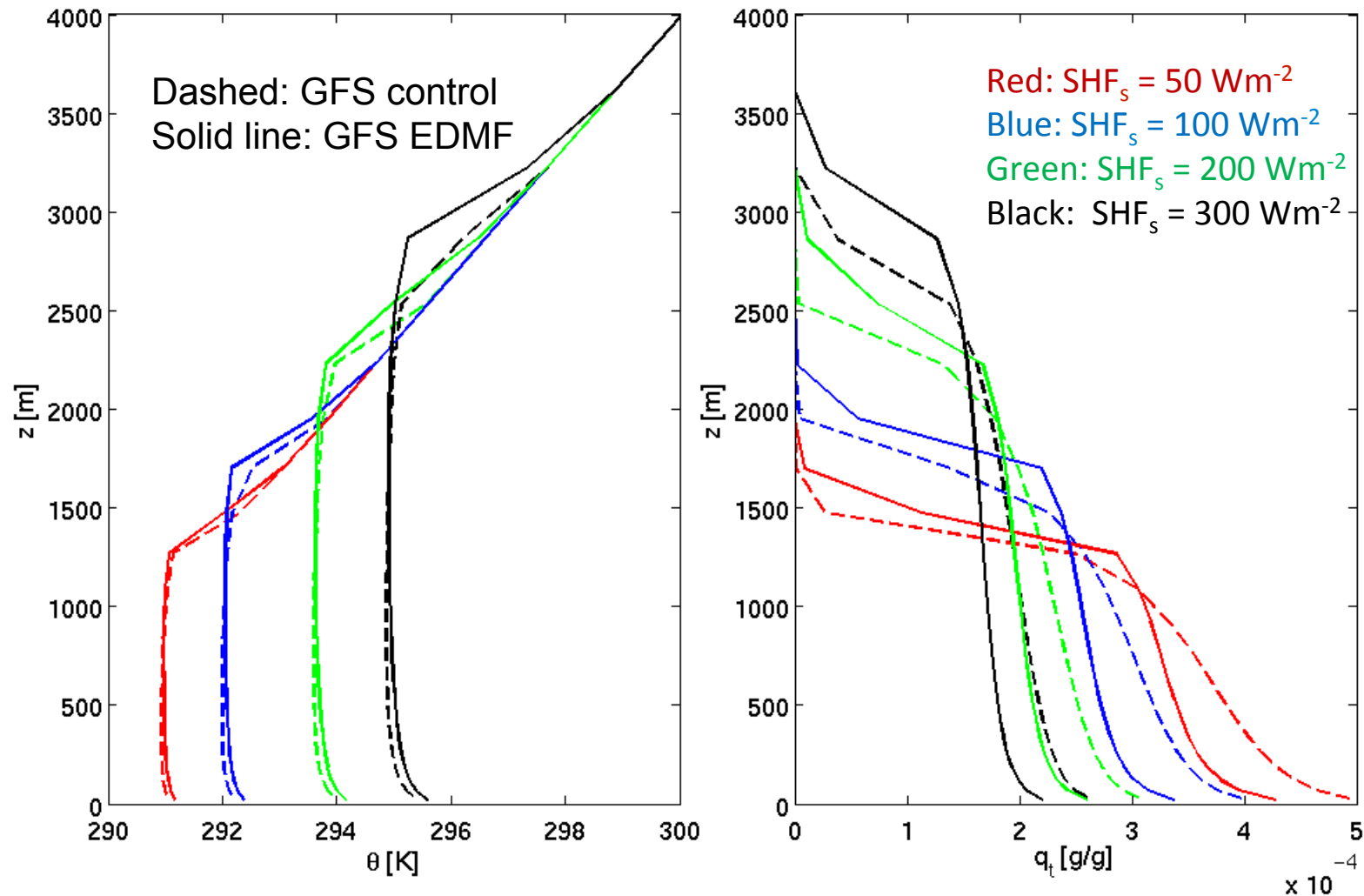
3D Climate/Weather Models:

Evaluation and Diagnostics with
satellite observations

LES/CRM models provide unique information on small-scale statistics

Implementation of EDMF in GFS SCM

Dry convective boundary layer



EDMF improves dry convective boundary layer in GFS

Sc-to-Cu CPT: Accomplishments

1. New global climate diagnostics for GFS developed
2. New SCM GFS parameterization testbed created
3. New cloud schemes implemented in GFS and CAM5
4. Dry EDMF implemented/tested (for operations) in GFS

Sc-to-Cu CPT: Issues

Original CPT AO: Issues with multi-agency funding of projects → 3 NSF CPTs + 1 NOAA CPT

Strong & successful collaboration with NCEP (1st time)

Collaboration with NCAR not so successful

Access to NCEP computer resources not always easy



New NOAA CPT (2014-2017): Cloud and Boundary Layer CPT

NCEP: Jongil Han (PI), Ruiyu Sun

GFDL: Chris Golaz (PI), Ming Zhao

JPL: Joao Teixeira (PI), Marcin Witek

U. Washington: Chris Bretherton (Lead PI),
Chris Jones, Peter Blossey

New NOAA CPT Objectives

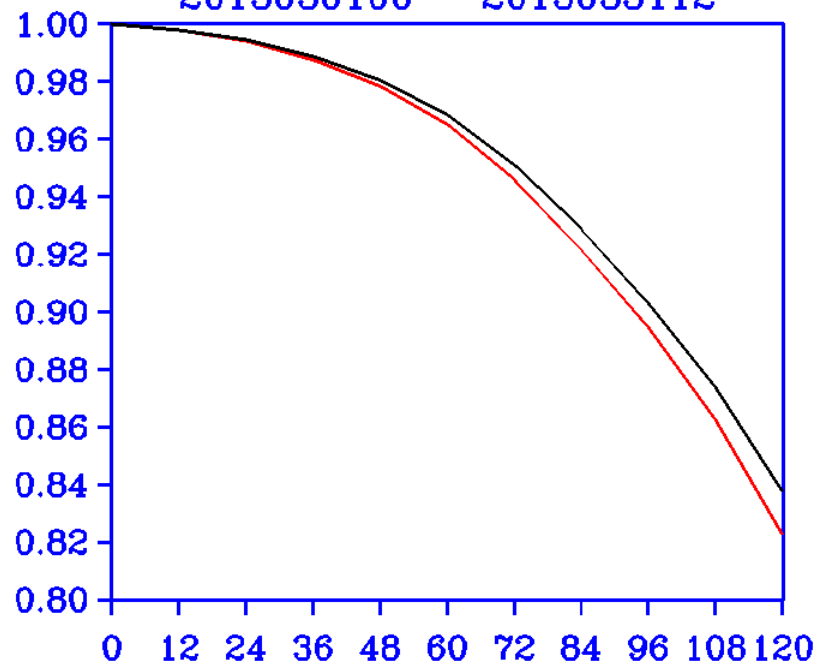
Building on previous Sc-to-Cu CPT:

- Implement moist EDMF parameterization into GFS
- Improve cloud parameterization in GFS
- Reinforce NCEP-GFDL collaboration: diagnostics
- Collaborate with other NOAA CPT (UU, CSU)

Stochastic Moist EDMF implementation into US Navy global model NAVGEM

Southern and Northern Hemisphere 500 hPa Anomaly Correlations for
NAVGEM and NAVGEM with EDMF - Full data assimilation (T359L50)

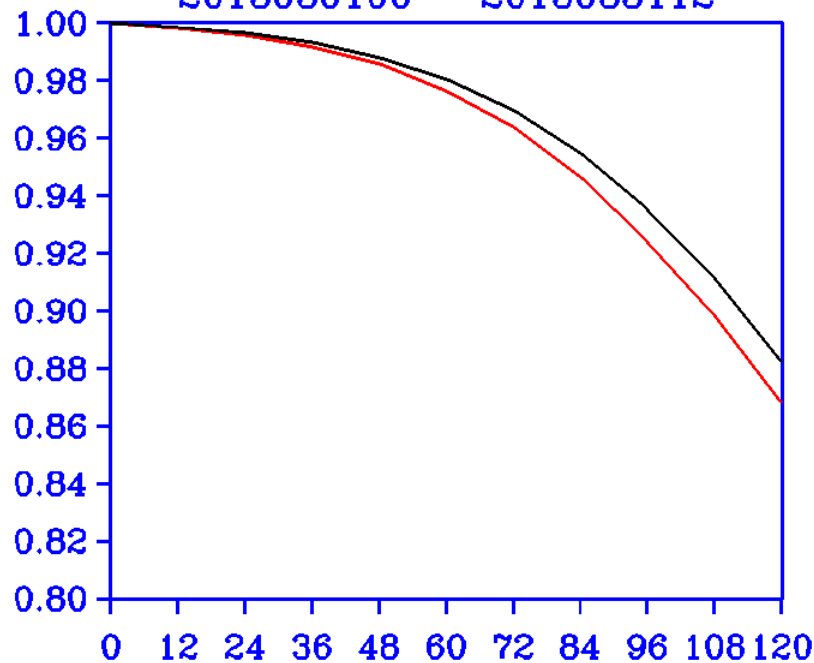
FORECAST MODEL TEST
500 MB SOUTH HEM HEIGHT ANOMALY COR
2013030100 - 2013033112



— NAVGEM

— NAVGEM/MF

FORECAST MODEL TEST
500 MB NORTH HEM HEIGHT ANOMALY COR
2013030100 - 2013033112



— NAVGEM

— NAVGEM/MF

Stochastic EDMF significantly improves Navy NAVGEM model