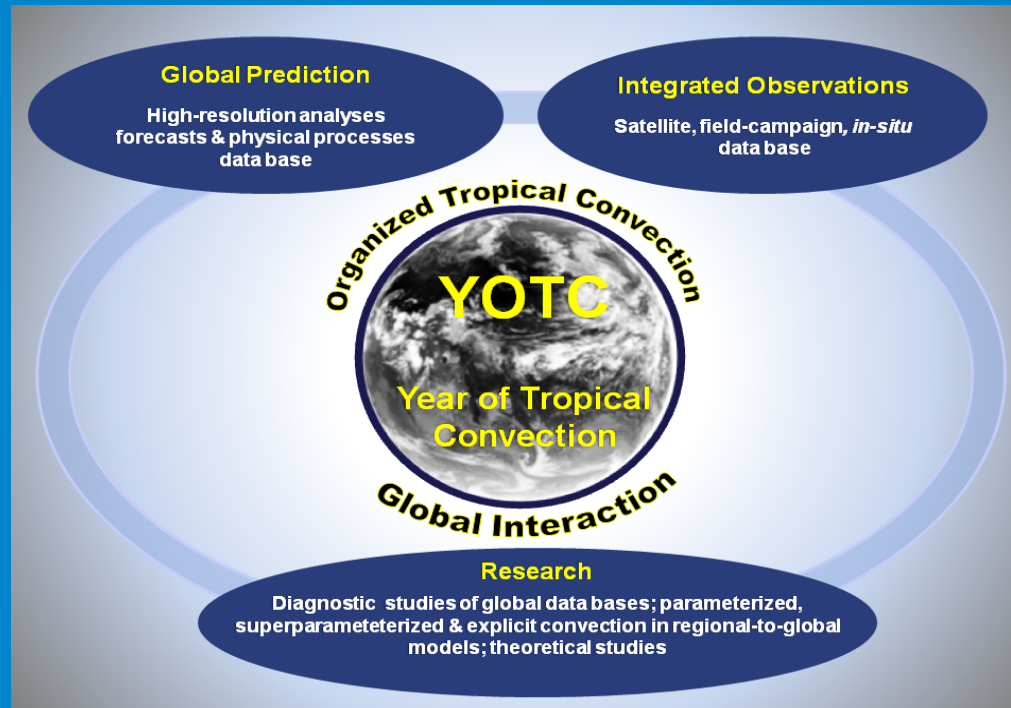


# The Year of Tropical Convection (YOTC) 'A Virtual Global Field Campaign'

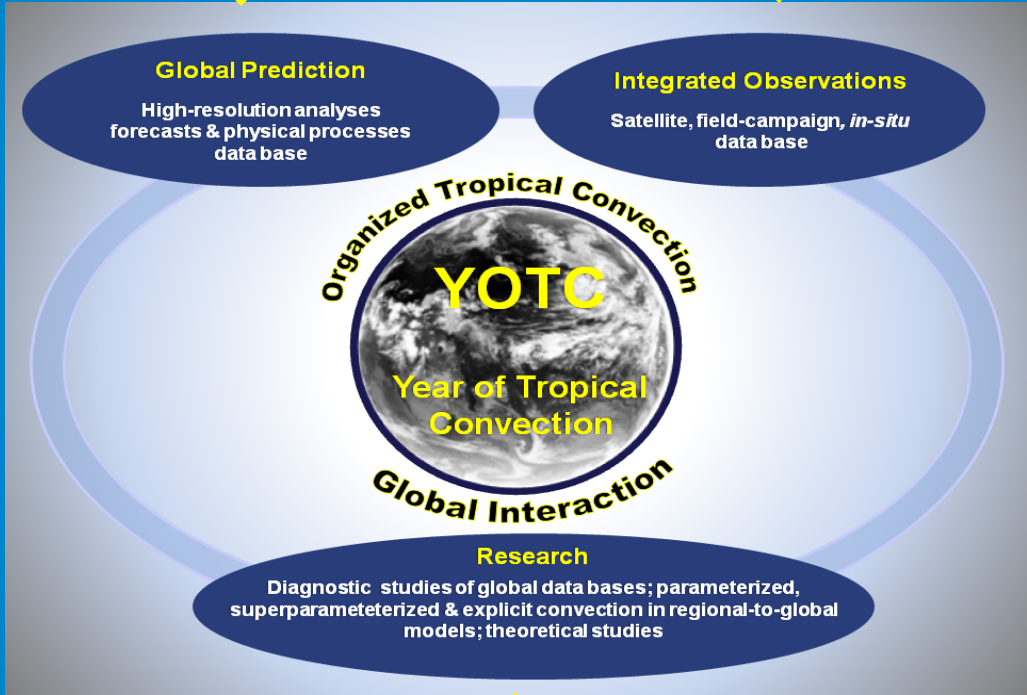
Mitch Moncrieff (NCAR) & Duane Waliser (JPL)  
Co-Chairs



Weather-Climate Intersection  
Subseasonal-to-Seasonal Prediction

**YOTC-ECMWF**  
Virtual Global Field Campaign  
(May 2008-April 2010):  
Global Analysis, 10-Day  
Forecasts, Subgrid Tendencies  
25-km/16km Mesh

**YOTC- Giovanni Satellite Data  
Analysis & Dissemination  
Resource**  
  
**YOTC A-train Database**



**Global Prediction**  
High-resolution analyses  
forecasts & physical processes  
data base

**Integrated Observations**  
Satellite, field-campaign, *in-situ*  
data base

**Research**  
Diagnostic studies of global data bases; parameterized,  
superparameterized & explicit convection in regional-to-global  
models; theoretical studies

- MJO & Convectively-coupled waves
- Easterly Waves & Tropical cyclones
- Monsoon Intraseasonal Variability
- Tropical-Extratropical Interaction
- Diurnal cycle

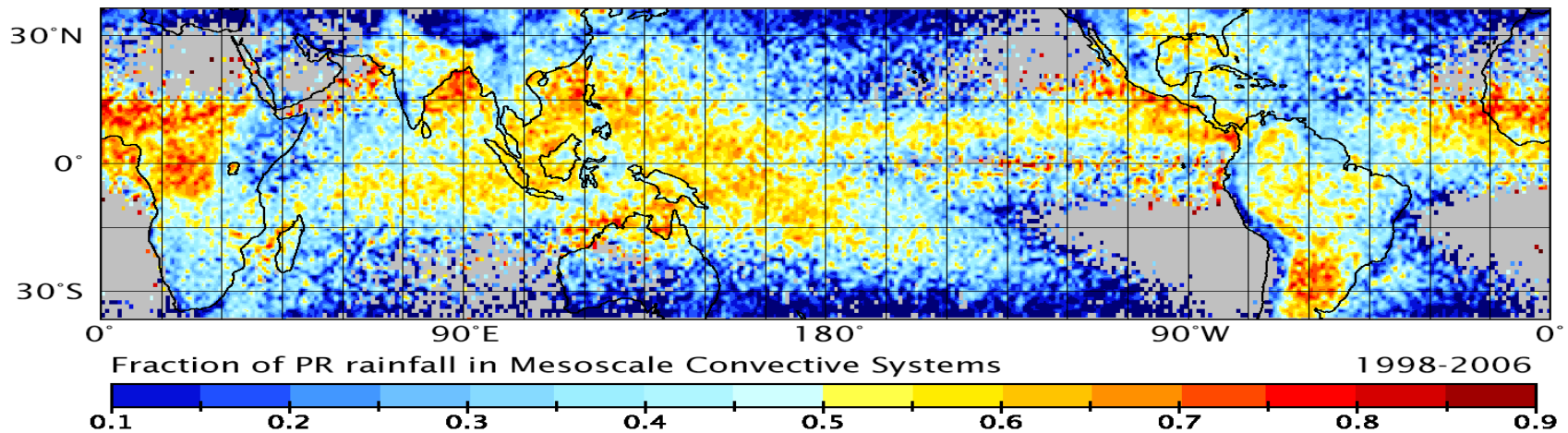
**Physical & Dynamical Processes  
at the Weather-Climate Intersection**

**yotc.ucar.edu**

# Fraction of tropical rainfall from MCS (TRMM)



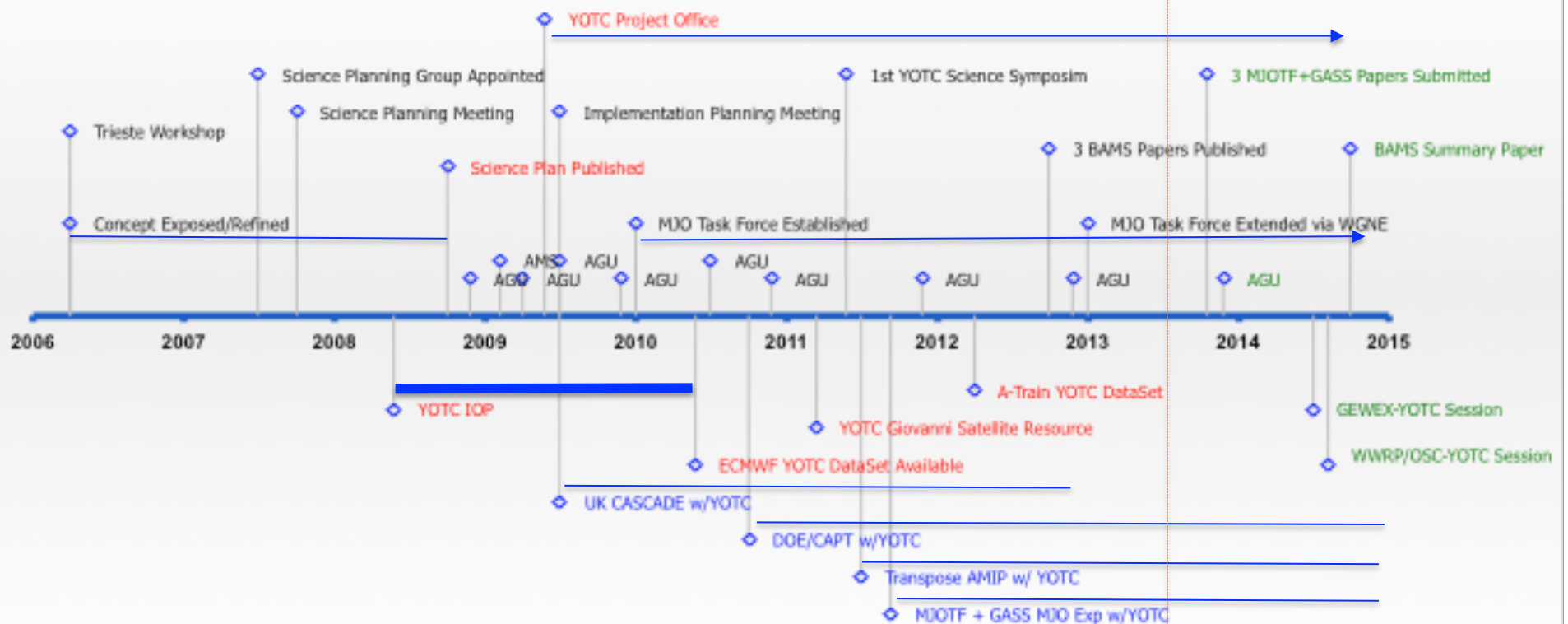
Is organized convection a building block for large-scale tropical phenomena and variability, e.g., MJO, monsoons?



Tao & Moncrieff (2009)

# Progress, Timeline, Near-term Plans

## YOTC Timeline



# Summary of YOTC

**Objective:** Advance our understanding and representation of multi-scale organization of tropical convection and accompanying scale interactions in global models, focused on the intersection of weather and climate.

**Novel element:** Virtual global field-campaign (i.e., intensive observation period, IOP) utilizes high-resolution global prediction models (e.g., ECMWF IFS) that assimilate huge volumes of data, notably satellite data.

YOTC IOP: May 2008- April 2010

**Science and Implementation Plans:** Completed in 2008 and 2009, respectively.

**Programmatics:** Joint activity of WCRP & WWRP/THORPEX

YOTC Project Office established in 2009 with support from US THORPEX and NSF.

**Database Development:** ECMWF High-Res IFS (15-25km) analyses, forecasts, subgrid tendencies.  
Multi-Sensor A-Train CloudSat-collocated cloud/convection satellite dataset.  
NCEP and NASA analyses, and NASA GIOVANNI Satellite Data Tools.

## **Research & Modeling:**

- **MJO Task Force (YOTC TF)**
  - 1) MJO Model Simulation Process Diagnostics.
  - 2) Forecast Metric & Forecasts for Boreal Summer Monsoon intraseasonal variability .
  - 3) MJO Metrics for CMIP Characterization & Climate Metrics Panel.
  - 4) MJO TF + YOTC/GASS Multi-Model Physical Processes Experiment for El Nino MJOs

About 50 contributing groups: analysis of results underway
- **Modeling:** i) WGNE/CMIP Transpose- AMIP for La Nina MJOs; ii) UK CASCADE high-res limited-area simulations; iii) DOE CAPT Transpose-AMIP parameterization sensitivity exps based on CAM; iv) item 4) above + DYNAMO/CINDY case study; v) Intra-Seasonal Variability Hindcast Experiment (ISVHE)

**Publications:** Overviews: Moncrieff et al. (2012a; BAMS); Waliser et al. (2012; BAMS)  
About 70 peer-reviewed science articles refer to YOTC database, etc  
[yotc.ucar.edu](http://yotc.ucar.edu)

**Outreach:** YOTC International Science Symposium, Beijing, 2011 -- Moncrieff et al. (2012b; BAMS)  
MJO Task Force Workshop, Busan 2010 -- Hendon et al. (2011; BAMS)  
8 AGU Sessions & 1 AMS Session





## PROGRESS AND DIRECTION IN TROPICAL CONVECTION RESEARCH

YOTC International Science Symposium

BY MITCHELL W. MONCRIEFF, DUANE E. WALISER, AND JAMES CAUGHEY

# MULTISCALE CONVECTIVE ORGANIZATION AND THE YOTC VIRTUAL GLOBAL FIELD CAMPAIGN

BY MITCHELL W. MONCRIEFF, DUANE E. WALISER, MARTIN J. MILLER,  
MELVYN A. SHAPIRO, GHASSEM R. ASRAR, AND JAMES CAUGHEY

Vastly improved satellite and in situ measurements, data assimilation, and modeling make possible a virtual field study of multiscale Earth system problems, such as convective organization and its interaction with larger-scale circulation.

## THE “YEAR” OF TROPICAL CONVECTION (MAY 2008–APRIL 2010)

Climate Variability and Weather Highlights

BY DUANE E. WALISER, MITCHELL W. MONCRIEFF, DAVID BURRIDGE, ANDREAS H. FINK, DAVE GOCHIS,  
B. N. GOSWAMI, BIN GUAN, PATRICK HARR, JULIAN HEMING, HUANG-HSUING HSU, CHRISTIAN JAKOB, MATT JANIGA,  
RICHARD JOHNSON, SARAH JONES, PETER KNIPPERTZ, JOSE MARENGO, HANH NGUYEN, MICK POPE, YOLANDE SERRA,  
CHRIS THORNCROFT, MATTHEW WHEELER, ROBERT WOOD, AND SANDRA YUTER

May 2008–April 2010 provided a diverse array of scientifically interesting and socially important weather and climate events that emphasizes the impact and reach of tropical convection over the globe.

# MJOs during YOTC

WGNE /WGCM  
Transpose-AMIP  
CMIP5 Model Evaluation

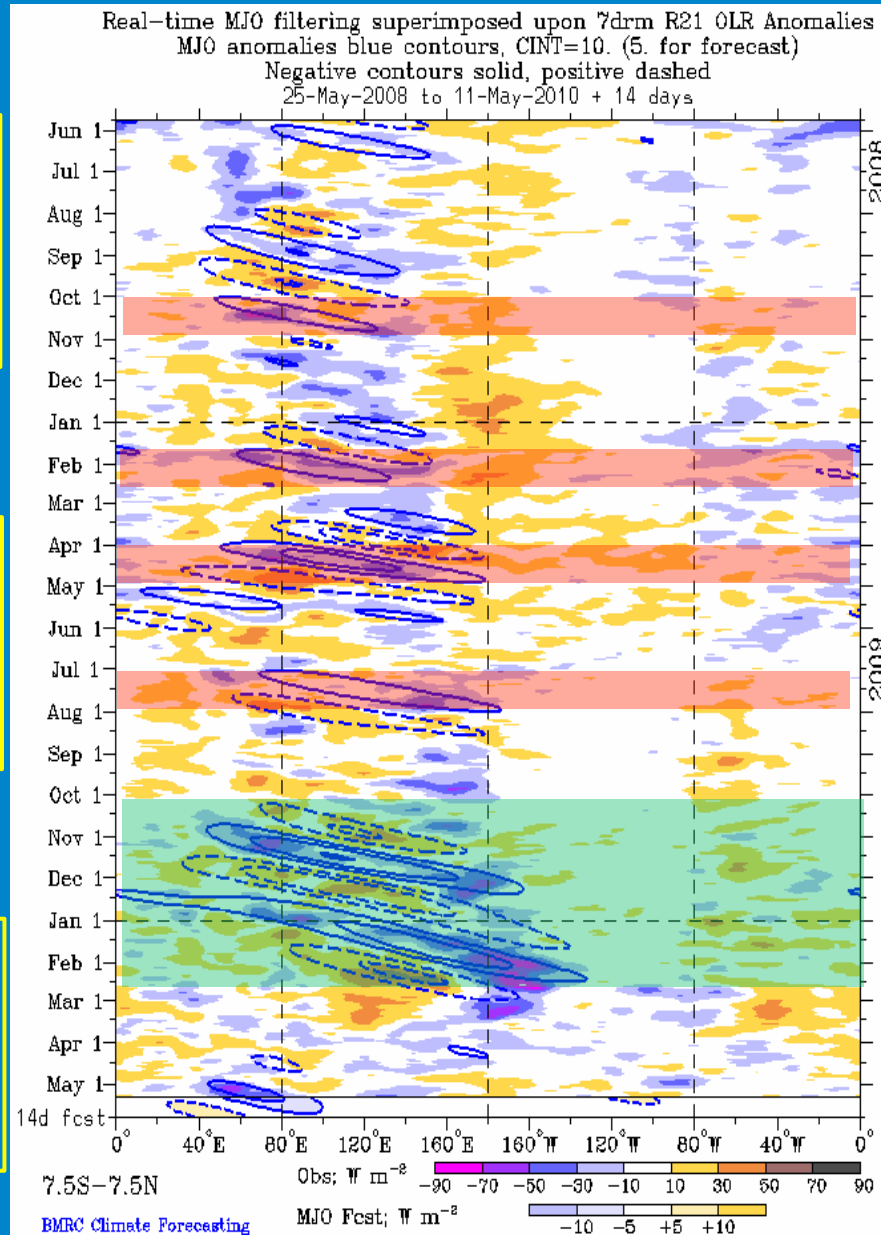
Keith Williams, MetOffice

MJO Task Force/YOTC/GASS  
Model Evaluation Project

N. Klingaman, U. Reading  
P. Xavier, MetOffice  
X. Jiang, JPL

[About 50 contributing groups]

2008  
2009  
2010

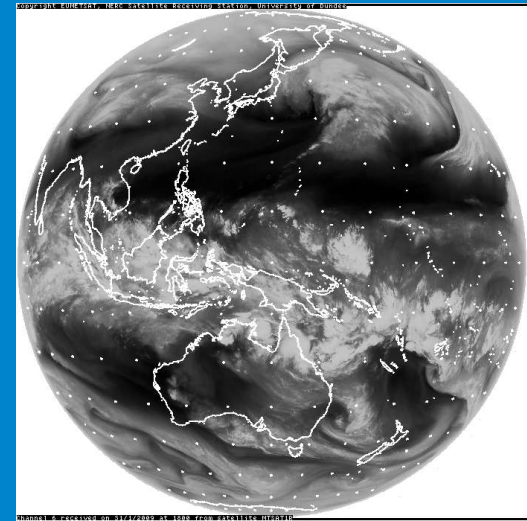
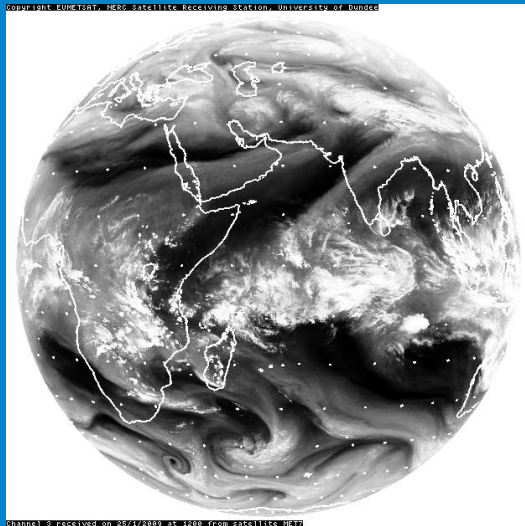
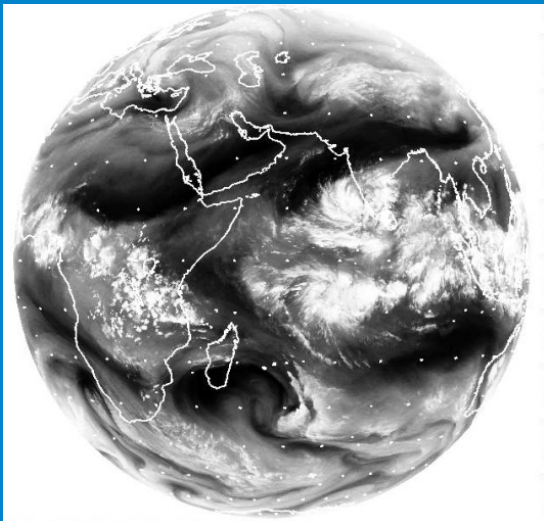


*La Nina*  
state

*El Nino*  
state

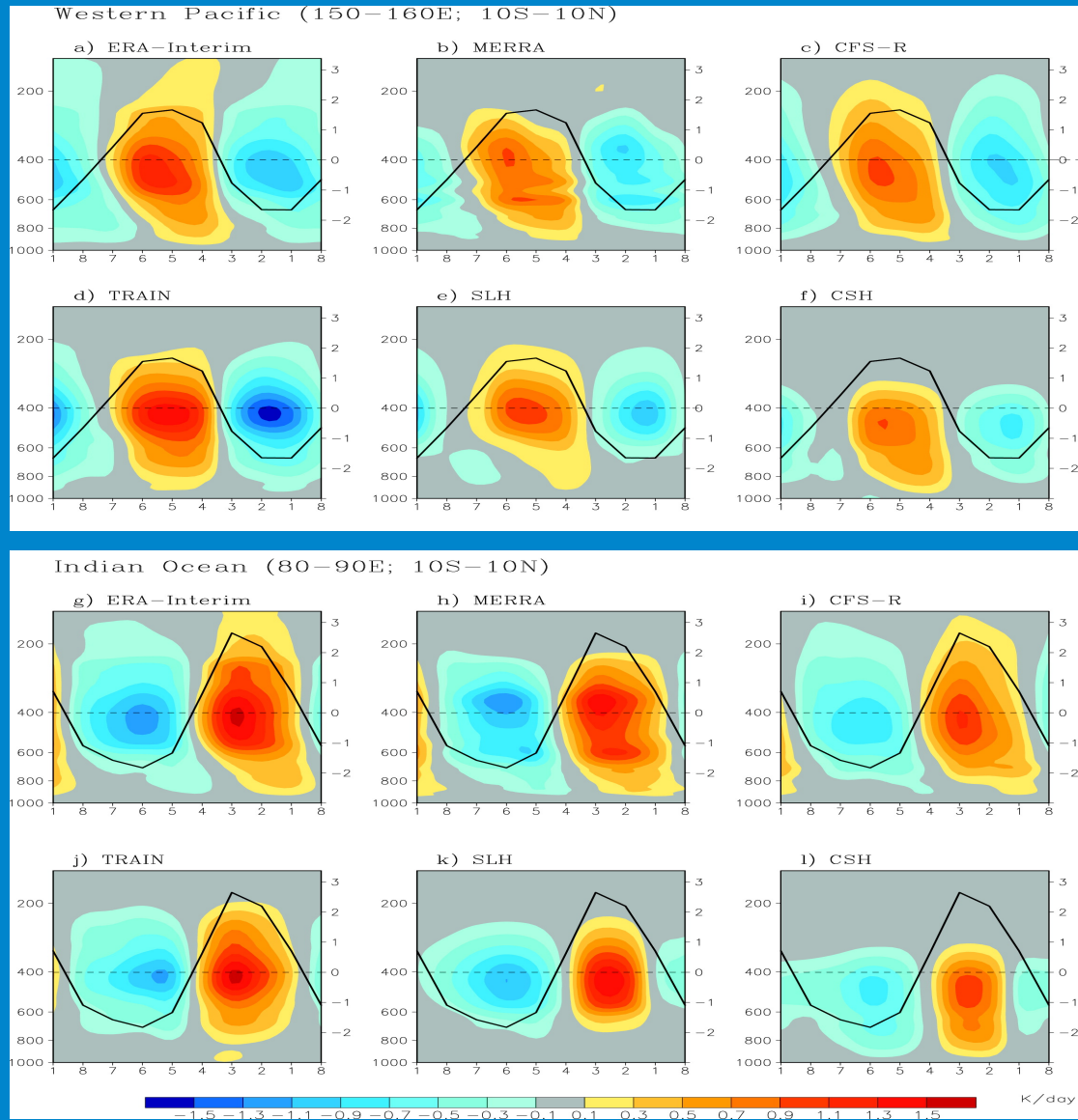
# MJO Studies

Utilize physical-dynamical models to interpret high-resolution global simulations of the MJO and its synoptic/mesoscale sub-structure, and provide direction for climate model development





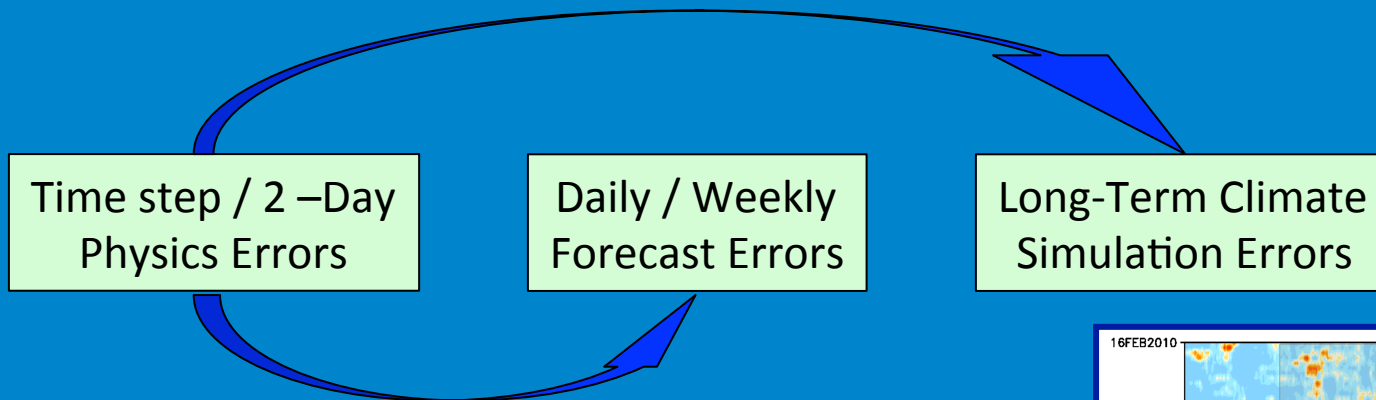
# MJO Diabatic Heating from Recent Reanalysis & TRMM



# Vertical Structure and Diabatic Processes of the MJO: Model Evaluation Project



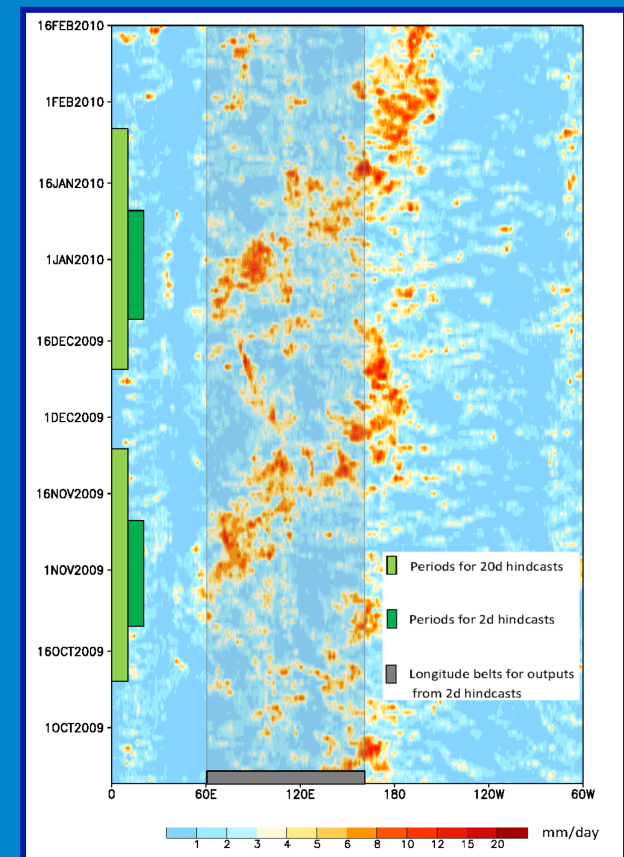
## MJO Task Force/YOTC and GASS



- 1. Climatological** – 20-year global simulations coupled or atmosphere only (X.Jiang, JPL)
- 2. Short-range hindcasts** – daily 2-day lead time for ~20 days of MJO (P. Xavier, MetOffice)
- 3. Medium-range hindcasts** – daily 20-day lead time (N. Klingaman, U. Reading)

[www.ucar.edu/yotc/mjodiab.html](http://www.ucar.edu/yotc/mjodiab.html)

About 50 groups have submitted results for 1 or more of the projects. Analysis phase is presently underway



## 2014 Meetings

- **YOTC Session at GEWEX 7<sup>th</sup> International Science Conference, The Hague, Netherlands, July 14-17, 2014.**
- **YOTC Session at The World Weather Open Science Conference, Montreal, Canada, August 16-21, 2014.**

## **New Research Collaborations**

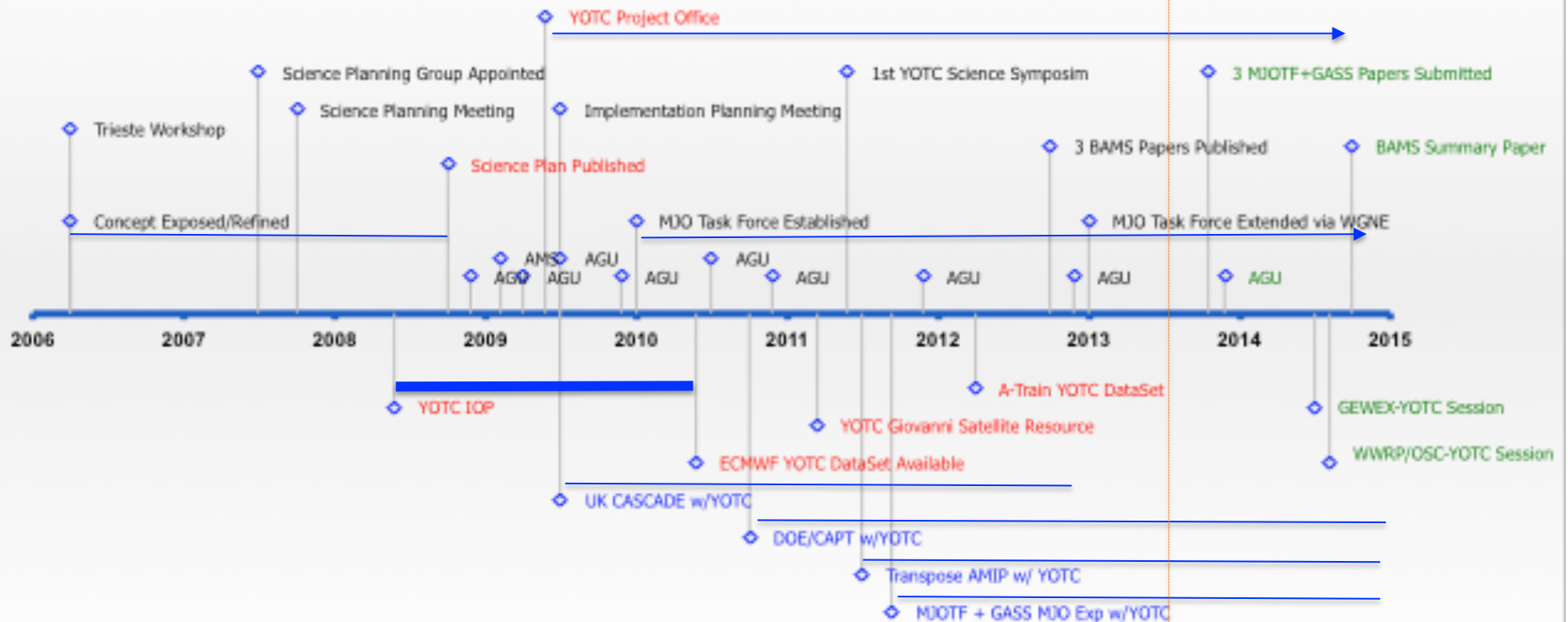
- **NYU Abu Dhabi Institute, Center for Prototype Climate Modeling**
- **Australian Research Council, Centre of Excellence for Climate System Science**
- **New CMMAP Institute ?**

**Thanks for your  
attention**



# YOTC: Progress & Timeline

## YOTC Timeline



### Some YOTC-supported MJO Task Force and Related Accomplishments

- MJO Metric for CMIP & Climate Metrics Panel (Sperber and Kim, 2012)
- Develop Forecast Metric for Boreal Summer Subseasonal Variability (Lee et al. 2012)
- Operational Implementation of MJO & ISO Forecast Metrics (Gottschalck et al. 2010; Lee et al. 2013) with WGNE
- MJO Workshop on Modeling Monsoon Intraseasonal Variability, Busan, 2011, (Hendon et al. 2011, BAMS)
- Ongoing work on process-oriented MJO/Atmos Physics Metrics (papers in various stages)
- Co-support/develop first robust multi-model hindcast experiment for subseasonal variability; ISVHE.