

MJO Diabatic Heating Model Inter- Comparison

Duane Waliser, Xianan Jiang and MJO Task Force

A proposed sub-project by the WCRP-WWRP/THORPEX
MJO Task Force

With possible collaboration with GEWEX/GCSS

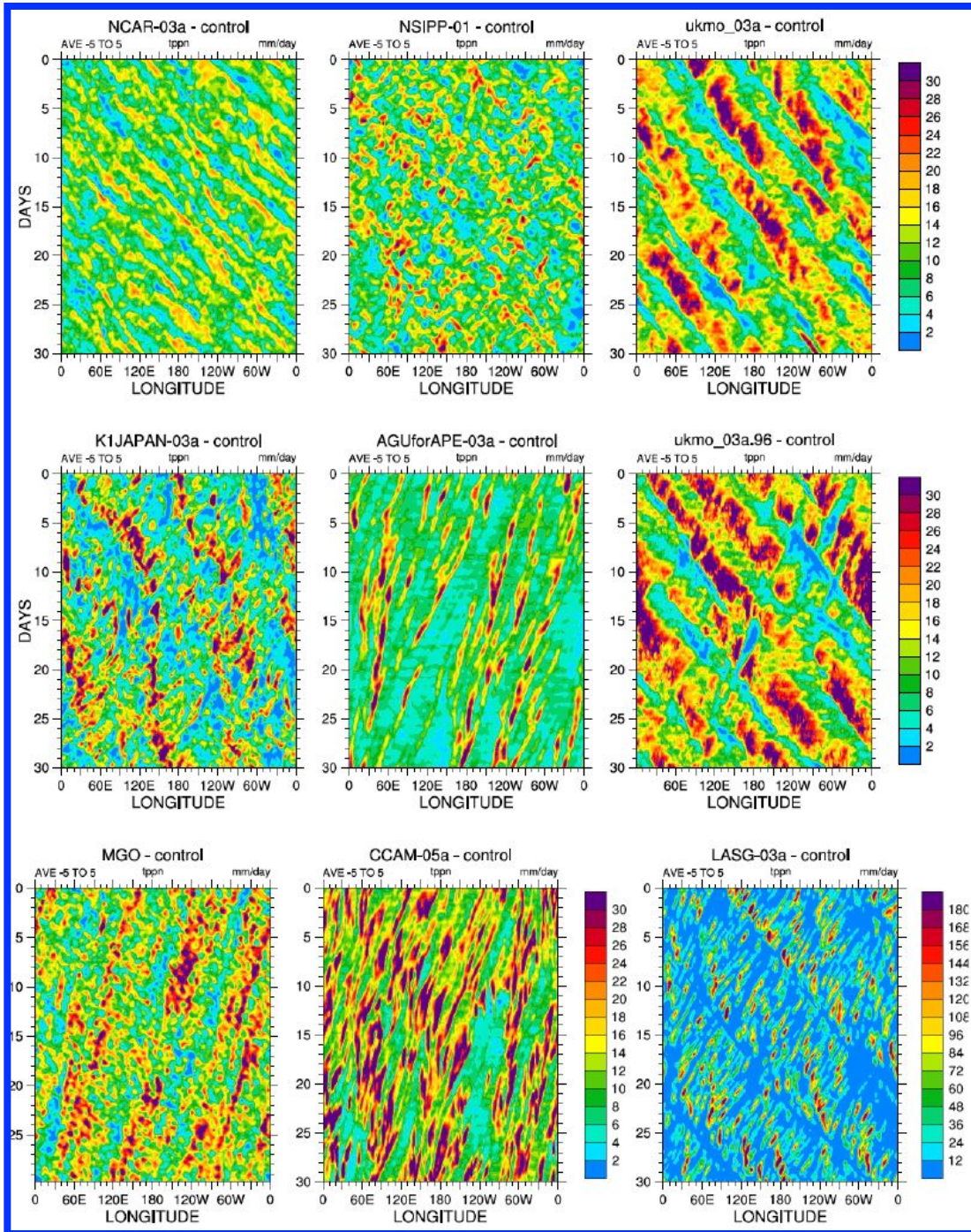
&

Other Related Projects

A STARK DEMONSTRATION OF THE CHALLENGE OF REPRESENTING TROPICAL WAVES Aqua-Planet Experiment

N Models => N Answers

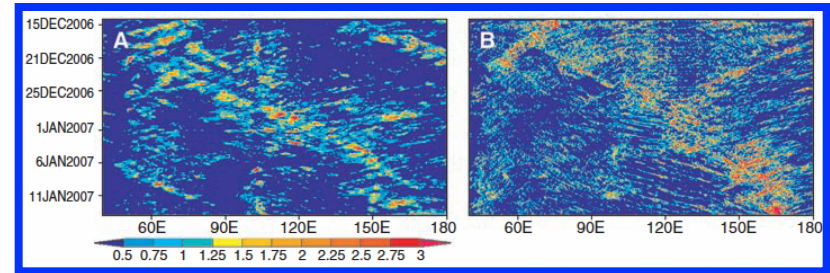
COURTESY,
DAVE WILLIAMSON, NCAR



YOTC MJO Case Study Experiments

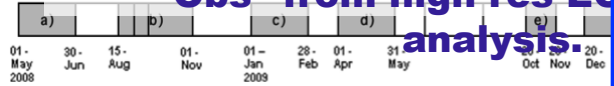
- 6 periods identified w/ help M. Wheeler

- ~5 high-res-ish modeling groups committed (e.g. NICAM, GMAO GEOS, GMAO HiRes, CMMAP and GSFC MMFs, Rave/WRF.)

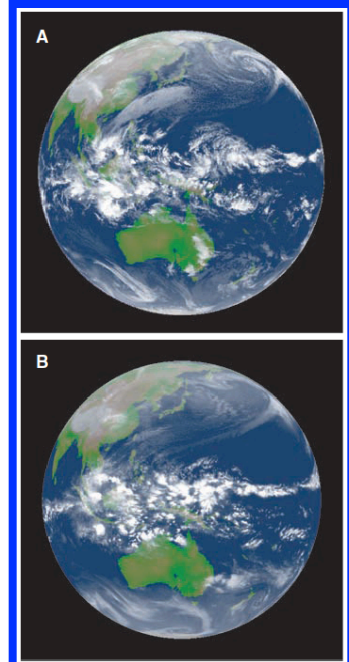
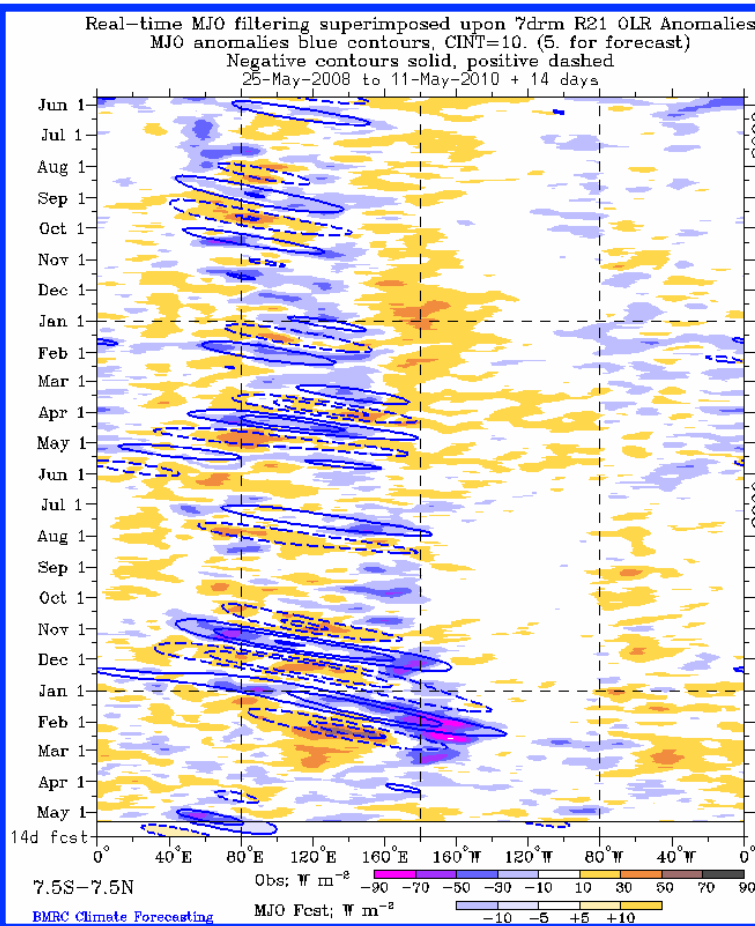


Miura et al. 2007

“Obs” from high res EO analysis



Target Periods (priority)	Features
a) 01MAY2008 - 30JUN2008 (4)	- fast propagation of MJO into Bay of Bengal. - caused strong modulation of eastern Pacific ITCZ, including embedded TCs.
b) 15AUG2008 - 01NOV2008 (5)	- MJO convective onset (in central IO) about Aug 15 suppressed period in mid-Sept, the second convective onset in IO occurred around Oct 12.
c) 01JAN2009 - 28FEB2009 (3)	- Weak sequence of the MJO that started with a suppressed IO from about 10-20 Jan. - MJO convection onset then followed in the IO on 28 Jan, propagating into N Australia in early Feb; coincident with a strong compensating descent to south exacerbated temperature in NSW/Victoria that affected the wild fires; strong cyclones, i.e., association with severe weather (floods, fires)
d) 01APR2009 - 31MAY2009 (2)	- strongest MJO in the YOTC period up to Hawaii confined to Indian Ocean and Tropical Western Pacific; propagation; convectively coupled Kelvin wave activity; westerly anomalies in Pacific; basin-wide SST increase; transition for MJO between La Nina and El Nino; MJO possibly triggered
e) 20OCT2009 - 20DEC2009 (1)	- strong MJO onset in Indian ocean; propagation into E. Pacific; El Nino conditions; effects on N-hemispheric weather season and climate.
f) 20DEC2009 - 20FEB2010 (1)	- strong MJO onset in Indian Ocean; propagation into E. Pacific southward in mid-Pacific region.



Dec 2006 MJO

Recommendation at Pan-GEWEX
MJO Task Force & GEWEX collaborate
on GCSS Subproject on MJO

- Leverages existing MJO programmatic framework and expertise but with need for GCSS expertise.
- Integrating cloud theme: shallow cu, congestus, deep cu, stratiform/anvil, cirrus
- Pan-WCRP/GEWEX/CLIVAR Cross-Cut Activity

Transpose AMIP CMIP5 Model Evaluations

•4 periods; 16 5-day hindcasts in each

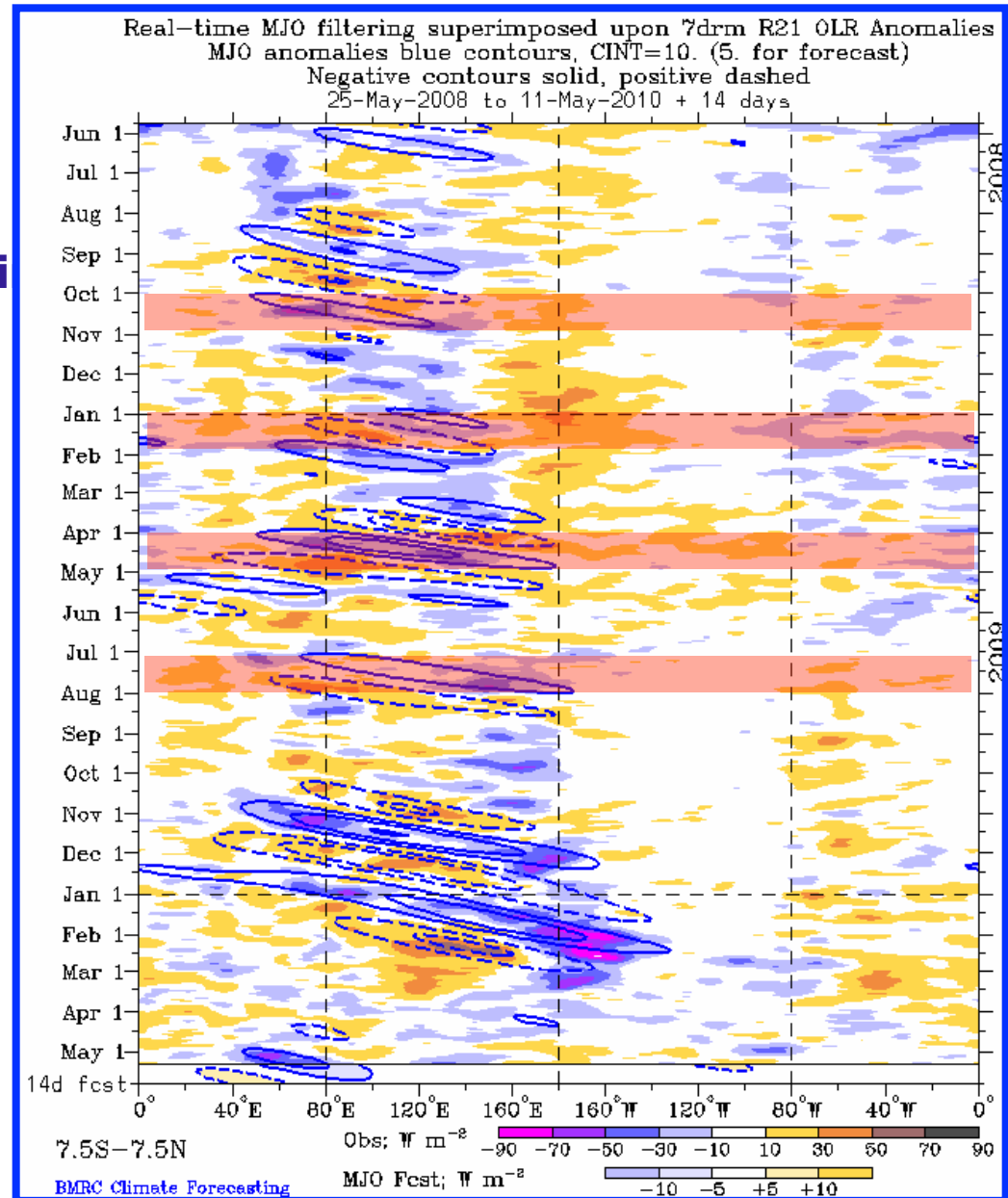
•9 proposed subprojects – e.g. Cloud Regimes, Williams; MJO, Moncrieff.

•Modeling Group Pledges

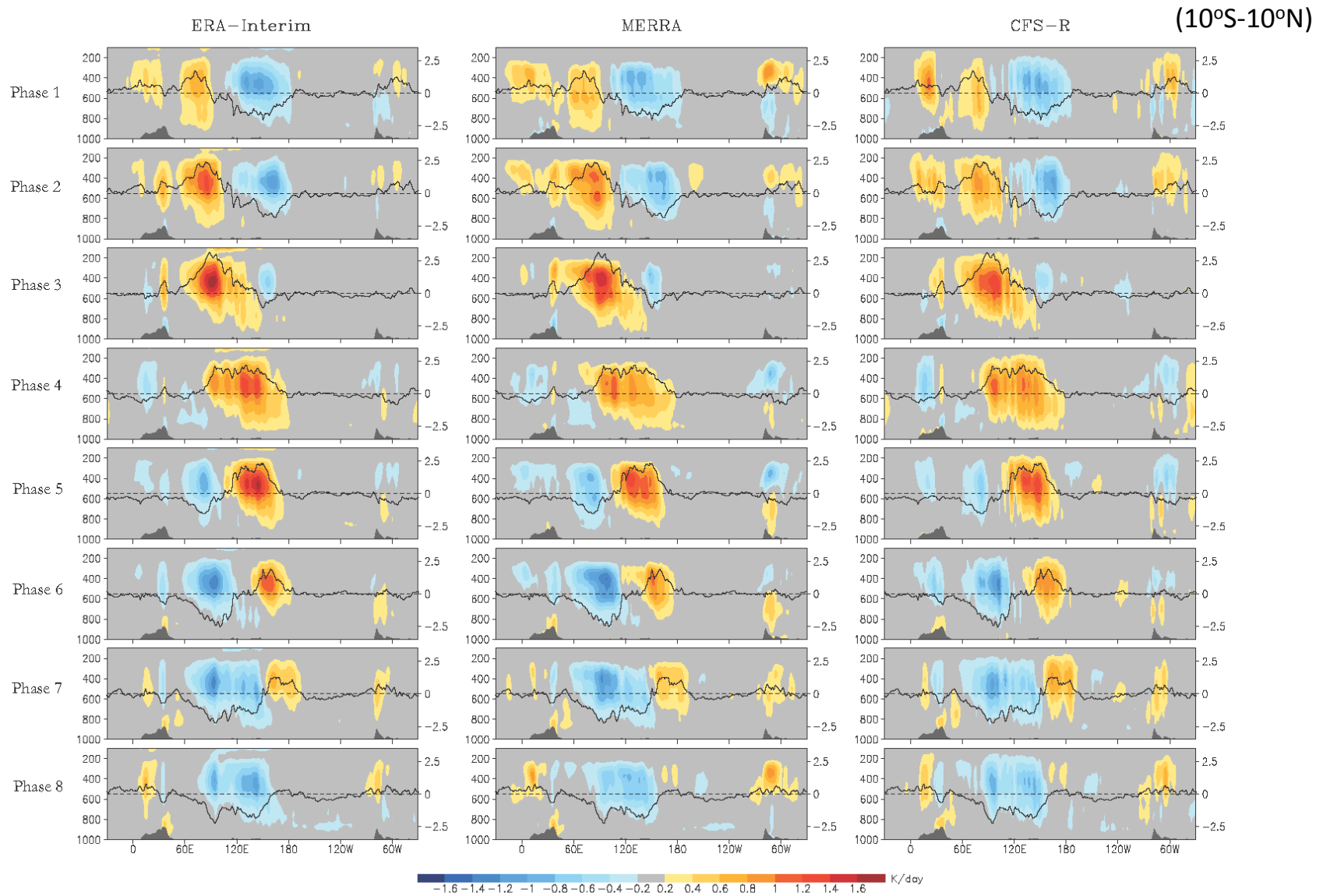
- EC-Earth (Frank Selten)
- IPSL (Sandrine Bony)
- Met Office (Keith Williams)
- Meteo France (Michel Deque)
- MIROC (Masahide Kimoto)
- MPI (Bjorn Stevens)
- MRI (Masahide Kimoto)
- NCAR (David Williamson)

hadobs.metoffice.com/tamip

YOTC Period



Vertical Diabatic Heating Structure of the Madden-Julian Oscillation - **Reanalysis**

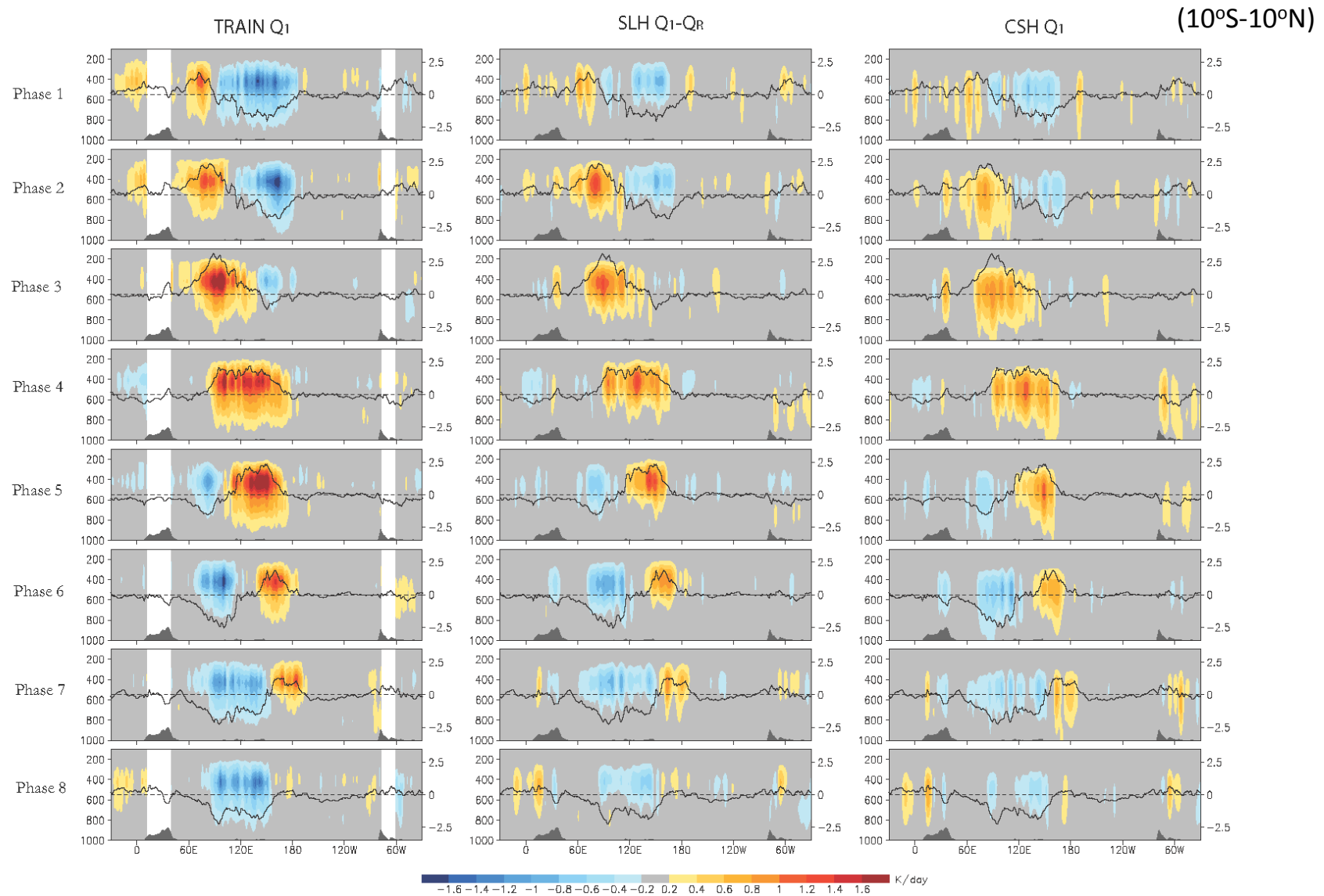


Curves: TRMM 3B42 rainfall

Shading: Diabatic heating

Jiang et al. 2010

Vertical Diabatic Heating Structure of the Madden-Julian Oscillation – TRMM



Jiang et al. 2010

Curves: TRMM 3B42 rainfall

Shading: Diabatic heating

Vertical-time evolution of the diabatic heating associated with the MJO

Western Pacific (150-160°E; 10°S-10°N)

Curves:

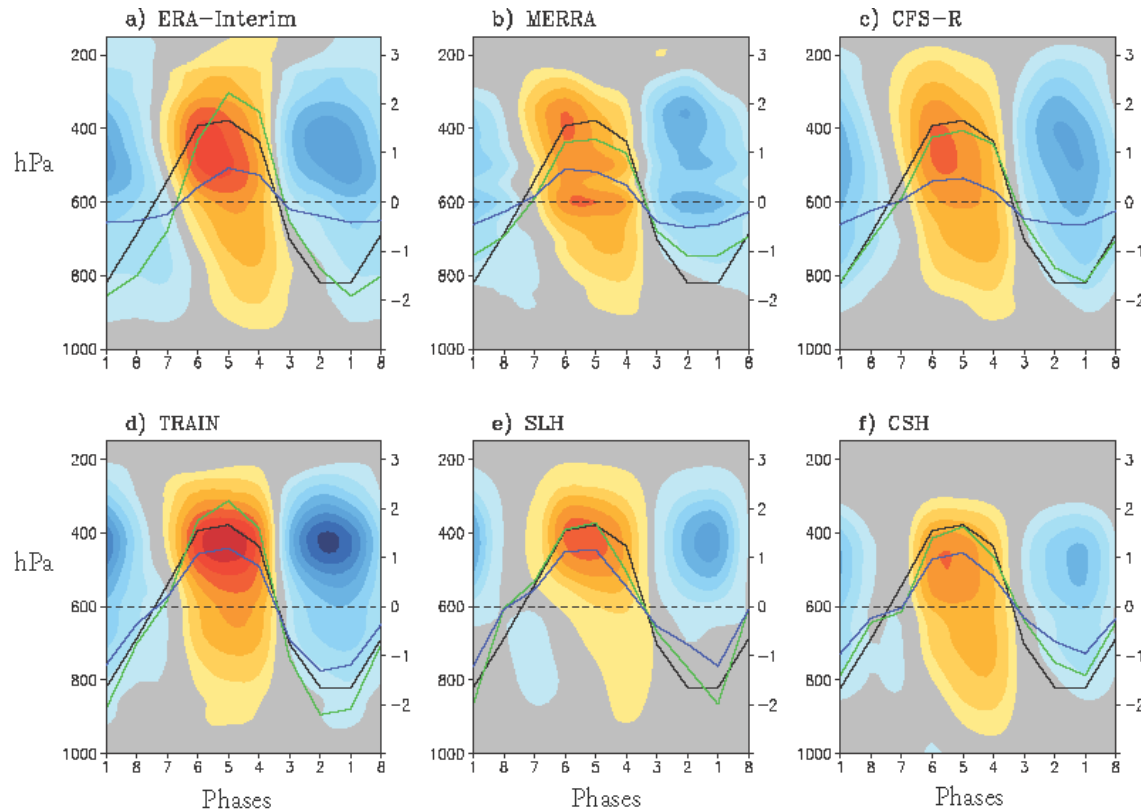
Black: TRMM rainfall

Green – Total

Blue - Stratiform

Shading:

Diabatic heating



Jiang et al. 2010

1. Numerical experiments

- Either AGCM (with climatological SST specified for simplicity) or CGCM run, or both, will be integrated for 20 years based on each participating model.
- Proposing to add a small number of case studies during YOTC as forecast experiments to examine development of model bias.

Requested output and model information

- a) Brief Model Documentation
- b) 2 and 3-D atmospheric fields – inclusion of all diabatic terms (GCSS has a fairly standard set of model outputs/diagnostics)
- c) Common output format, grids and levels?
- d) Archive location – TBD
- e) Target deadline – June 2011

Participating Modeling Groups

(based on long-term simulation only)

1. APCC/CCSM3:
2. ABOM: Harry Hendon h.hendon@bom.gov.au
3. CNRM: Gilles Bellon gilles.bellon@cnrm.meteo.fr
4. CMCC: Andrea Alessandri andrea.alessandri@cmcc.it
5. ECMWF: Frederic Vitart Frederic.Vitart@ecmwf.int / Franco Molteni
6. GFDL/AM3: Bill Stern bill.stern@noaa.gov
7. GFDL/HIRAM: Ming Zhao Ming.Zhao@noaa.gov
8. GMAO: Siegfried Schubert siegfried.d.schubert@nasa.gov
9. JAMSTEC: T. Yamagata, J.-J. Luo luo@jamstec.go.jp
10. MPI/ECHAM6: Traute Crueger traute.crueger@zmaw.de / Eric Roeckner
11. MRI/JMA: Akio Kitoh kitoh@mri-jma.go.jp
12. NCAR/CCSM4/CAM4/CESM1/CAM5: Rich Neale rneale@ucar.edu
13. PNU: Kyung-Hwan Seo seo@pnu.ac.kr
14. SNU: In-Sik Kang kang@climate.snu.ac.kr
15. UH/ECHAM4: Baoqing Xiang Baoqiang@hawaii.edu
16. UKMO: Prince Xavier prince.xavier@metoffice.gov.uk
17. U.Tokyo/MIROC: Yukari N. Takayabu yukari@aori.u-tokyo.ac.jp

YOTC (Year of Tropical Convection)

A joint project of the WWRP-THORPEX and the WCRP

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IntraSeasonal Variability Hindcast Experiment (ISVHE)

Bin Wang¹, J.-Y. Lee, H. Hendon, D. Waliser, I.-S. Kang, J. Shukla
and CliPAS ISO Team

¹International Pacific Research Center, University of Hawaii, USA
wangbin@hawaii.edu

A coordinated IntraSeasonal Oscillation (ISO) hindcast experiment, which is supported by APCC, CLIVAR/AAMP, and the AMY (2007-2011), was launched, in January 2009. This project aims to estimate intraseasonal predictability and determine realized prediction skill in the state-of-the-art climate models, including major operational centers' models worldwide. While the establishment of the Madden-Julian Oscillation (MJO) diagnostic metric and the coordination of operational forecast activity have made a great advance, there is an urgent need to exploit these efforts to full potential and to produce a multi-model ensemble (MME) intraseasonal forecast. To this end, the lead-dependent model climatologies (i.e. multi-decade hindcast data sets) are an intrinsic requirement to properly quantify the skills of each model and to produce MME prediction as a function of lead-time and season. The development and analysis of the multi-model hindcast experiments is a critical step for advancing climate prediction on subseasonal time scale. The ISO hindcast experiment includes a set of retrospective ISO forecasts that covers the last 20 years from 1989 to 2008. The minimum (standard) specification of the hindcast are: (a) Prediction is initiated every 10 days on 1st, 11st, and 21st of each calendar month throughout the entire 20-year period; (b) Integration length for each forecast is 45 days; (c) The number of ensemble for each forecast is at least 5. The free coupled run or AMIP-type run is served as control experiment for better understanding the dependence of the prediction on initial conditions and better defining metrics that measure the "drift" of the model toward their intrinsic MJO/Monsoon ISO modes. Currently, 11 modeling groups have finished their experiments. The current status of MJO and Monsoon ISO hindcast capacity will be discussed using seven coupled models and four atmospheric-alone models in terms of MJO diagnostics developed by CLIVAR/MJO working group and Monsoon ISO evaluation metrics developed by CliPAS ISO team.

Current Status of ISVHE Experiment

Dear Colleagues

Hindcast Experiment for Intraseasonal Prediction

Support

Programmatic: MJO Task Force, CLIVAR AAMP, Asian Monsoon
Financial: Asian Pacific Climate Center, NOAA Climate Prediction Center



ISVHE
Intraseasonal Variability
Hindcast Experiment
Suited for MJO & other ISV

Contacts:
Bin Wang & June-Yi Lee

Close Collaboration:
YOTC, AMY, APCC

Partial Support: NOAA CTB

Institution	Participants	Model	Current Status	
ABOM	Harry Hendon	POAMA 1.5 CGCM	26-year integration initiated the first day of every month with 10 ensemble simulations (1980-2006)	Collected
CMCC	Tony Navarra A. Alessandri	CMCC CGCM	20-year integration initiated every 10 days (1989-2008)	Collected
CWB	Mong-Ming Lu	CWB AGCM	25-year integration initiated every 10 day (1981-2005)	Collected
ECMWF	F. Molteni, Frederic Vitart	ECMWF CGCM	20-year integration initiated the 15 th of every month (1989-2008)	Collected
GFDL	W. Stern	CM2.1 CGCM	27-year integration initiated the first day of every month (1982-2008)	Collected
JMA	K. Takahashi	JMA CGCM	20-year integration initiated every month (1989-2008)	collected
NASA/ GMAO	S. Schubert P. Pegion	GMAO AGCM	20-year integration initiated every day (1989-2008)	
NCEP/ CPC	A. Kumar J.K.E. Schemm	CFS CGCM	26-year integration initiated every 10 days (1981-2008)	Collected
SNU	I.-S. Kang	SNU CGCM	21-year integration initiated every five days during NDJFM season (1981-2001) and MJJAS season (1998-2008)	Collected
UH/IPRC	X. Fu J.-Y. Lee	UH CGCM	20-year integration initiated every 5 day during MJJAS (1989-2008)	Collected
MRD/EC	Gilbert Brunet Hai Lin	GEM	24-year integration initiated every 10 days (1985-2008)	Collected

YOTC International Science Symposium & 8th AMY International Workshop

16-19 May, 2011
Beijing, China

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Conference Agenda

Date: 16-18 May, 2011

Preliminary agenda

Monday May 16

Session 1: Overview, Challenges & Highlights of the WWRP/THORPEX-WCRP YOTC Project

Session 2: Madden-Julian Oscillation & Convectively-coupled Tropical Waves

Tuesday May 17

Session 3: Easterly Waves & Tropical Cyclones

Session 4: Hierarchical Modeling & Seamless Prediction

Wednesday May 18

Session 5: Tropical-Extratropical Interaction

Session 6: Monsoon Intraseasonal Variability

Thursday May 19

8th Asian Monsoon Years (AMY) Workshop

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▶ **Ms. Jenny Lin**

LASG/IAP/CAS

P.O. Box 9804, Beijing 100029,

China

Tel: +86-10-82995299