Large-scale Precipitation Tracking Using TRMM-GPM data to Assess Predictability of MJO Convection and Propagation in ECMWF IFS Stochastic Ensembles

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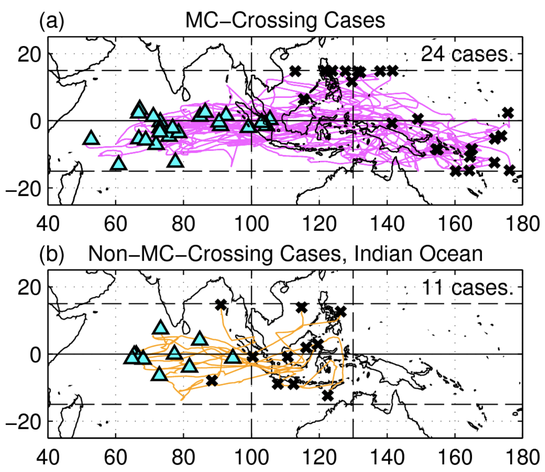
Hurricanes and Coupled Modeling Group

Introduction

The **goals** of this study are to

- better understand and predict MJO convective initiation and eastward propagation over the Indian-Pacific warm pool
- better understand predictability and model uncertainty in the MJO forecasts

Scientific Issue: The Maritime Continent (MC) barrier effect on the MJO. While convective signals of roughly 30% of all MJO events initiated over the Indian Ocean fail to propagate through the MC, more than 50% MJO events fail in model forecasts.



Tracks of centroids of large-scale precipitation of MJO events that (a) propagated through and (b) did not propagate through the MC based on TRMM rainfall during 1998-2015. Triangles mark the initiation and crosses mark the termination locations of these MJO events. Tracking stops at 15˚N and S. (From Kerns and Chen 2016).

IFS Model and Stochastic Ensembles

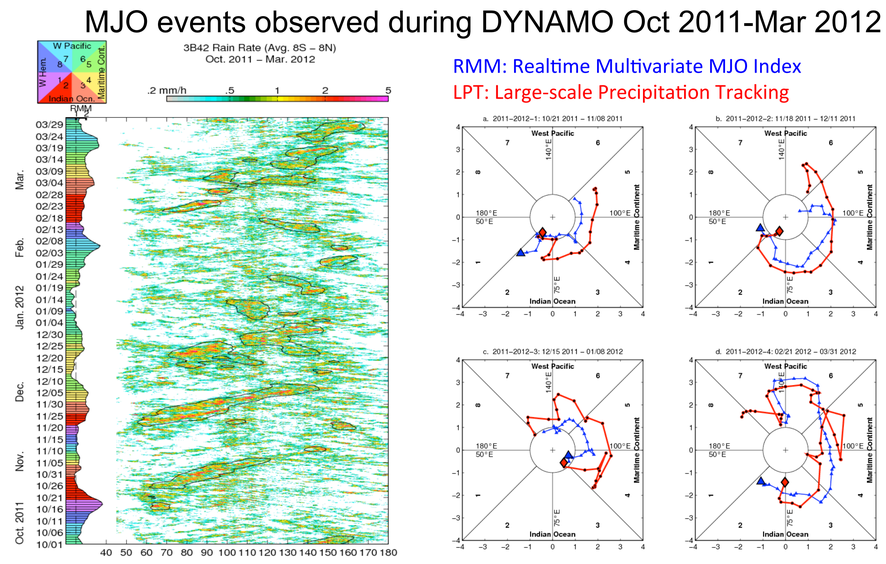
Integrated Forecast System (IFS) ensemble experiments (T639): 4 initialization times: 18, 20, 22, 24 November 2011

Each with 4 perturbations:

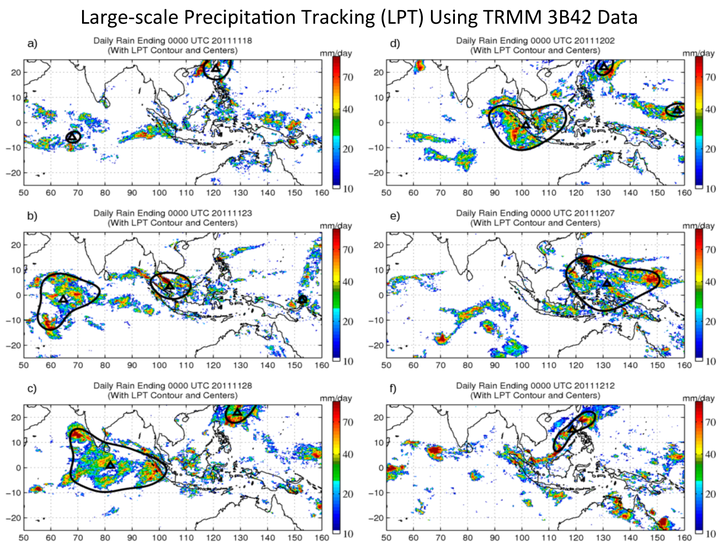
1. IC
2. IC+SPPT
3. IC+SKEBS
4. IC+SPPT+SKEBS

Tracking MJO Convection using TRMM-GPM data

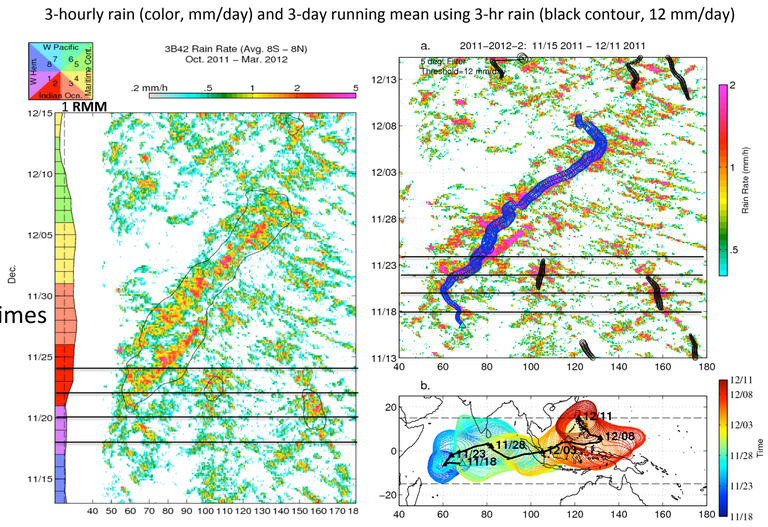
MJO events observed during DYNAMO Oct 2011-Mar 2012



Large-scale Precipitation Tracking (LPT) Using TRMM 3B42 Data

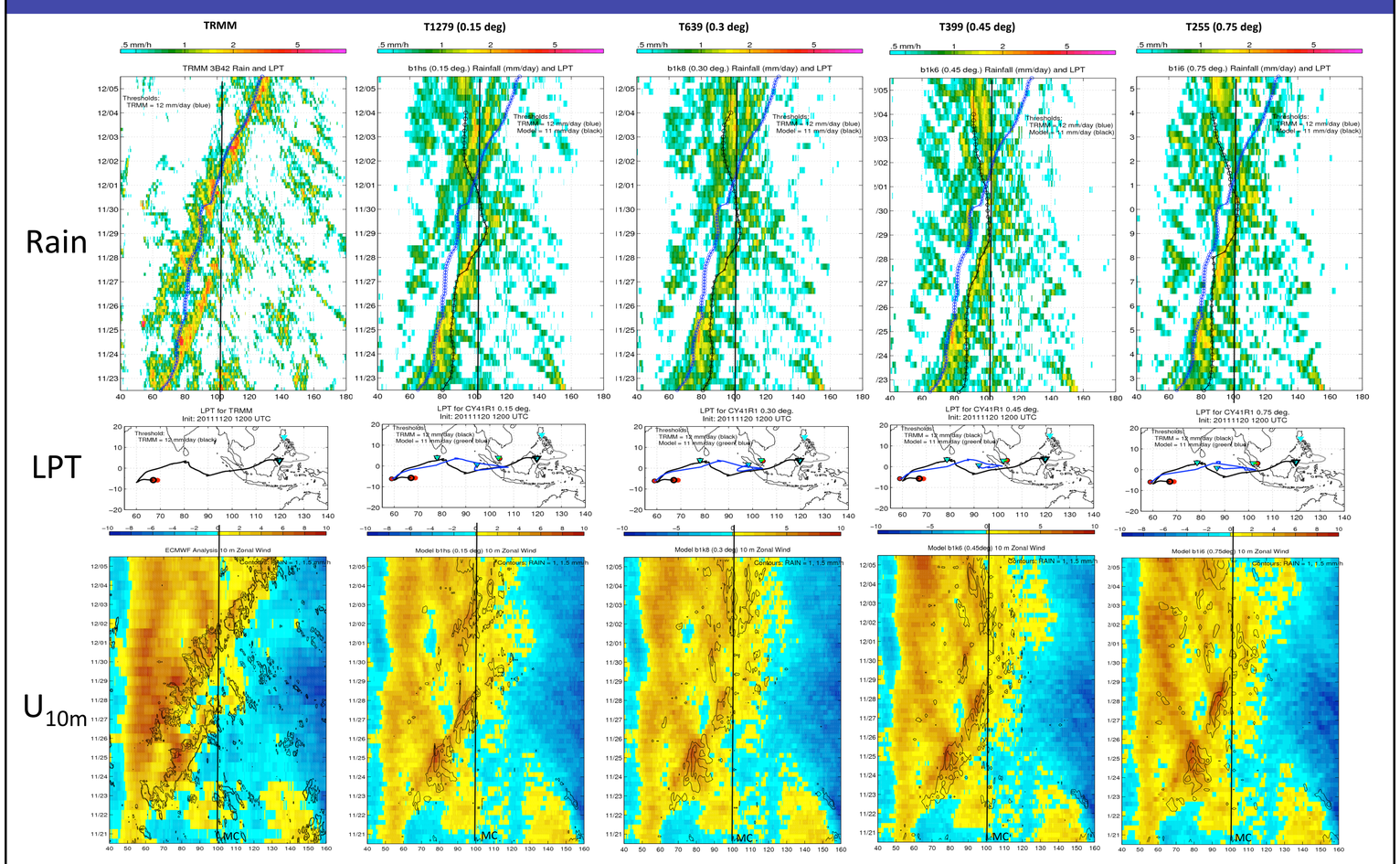


3-hourly rain (color, mm/day) and 3-day running mean using 3-hr rain (black contour, 12 mm/day)

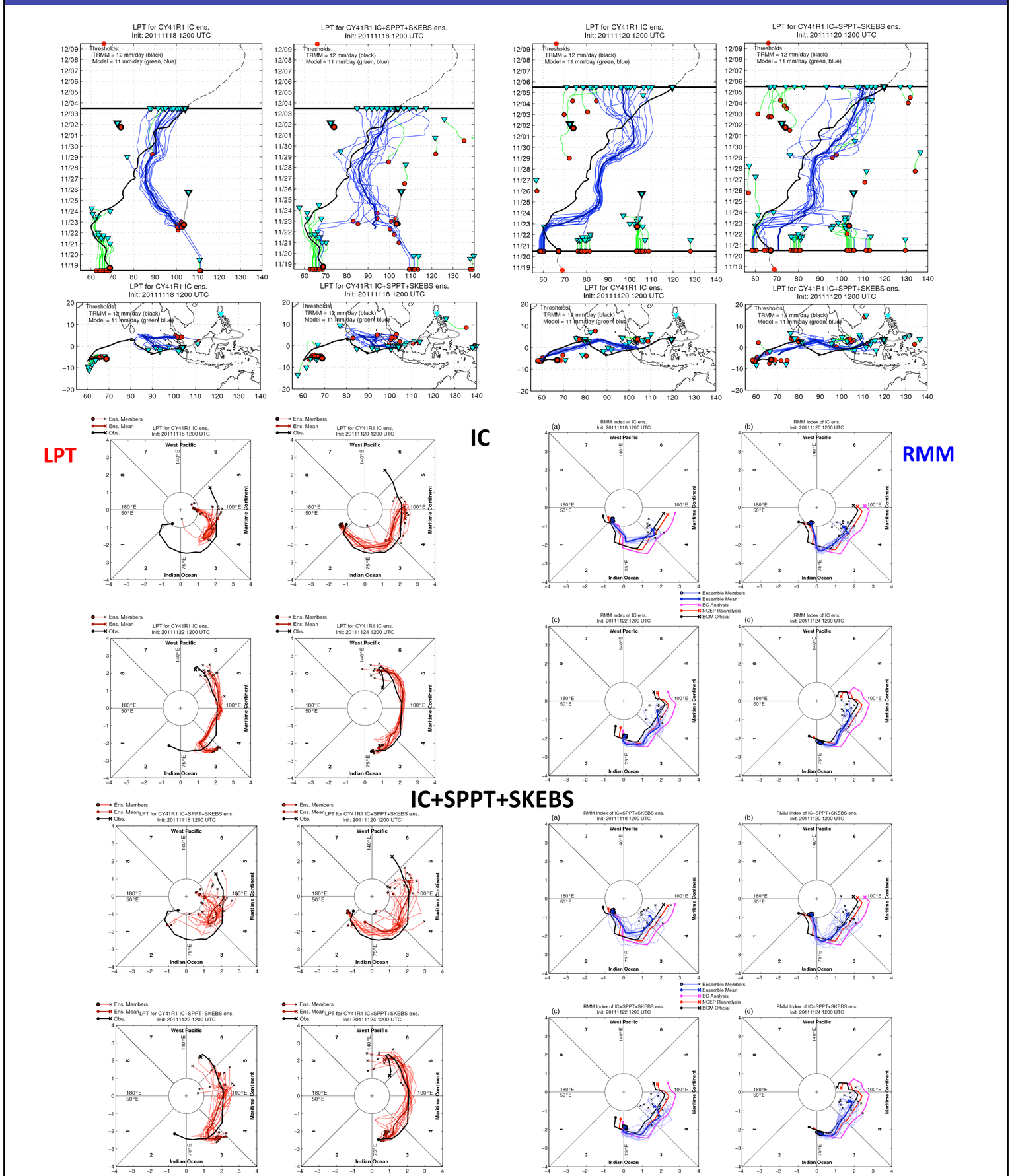


4 Initial times
24 Nov
22 Nov
20 Nov
18 Nov

IFS Control Forecast Experiments (T1279, T639, T399, T255) Initialized on 20 Nov 2011



IFS Control Forecast Experiments (T639) Initialized on 18, 20, 22. 24 Nov 2011



Summary

- Control forecasts suffered the "MC barrier" effect that was not in observations in the MJO of Nov-Dec 2011
- MJO convective initiation was not predicted in leadtime 0-2 days, whereas RMM was insensitive to leadtime
- Stochastic ensembles seem to reduce model bias compared with the initial perturbation ensembles

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