



MJO Prediction in the Climate Forecast System Version 2

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Motivation

- The MJO is a propagating tropical mode of climate variability that offers enhanced prospects for improving intraseasonal climate prediction.
- Realizing this potential is predicated on robust simulation and prediction of MJO variability.
- Societal Relevance & NOAA Interests
 - Active and break phases of Monsoon Systems.
 - Teleconnections. North American T & P.
 - Tropical Cyclone Genesis.
 - Nexus of Weather and Climate.
- 45 Day hindcasts initialized daily provide a unique dataset for examining aspects of MJO prediction.

DATA

- Variables
 - U850/U200
 - OLR
- Hindcasts
 - 01Jan 1999 31Dec 2010
 - 4 members/day out to 45 days.
- Observations:
 - U850/U200 from CFSR
 - OLR from NOAA/AVHRR
- Intraseasonal Anomalies: $F' = F F_c F_L$

Where: F (total field) F_c (daily climo) F_L (previous 90-day anomaly)

MJO Definition

Combined EOFs (U850, U200, OLR) Ave(15S:15N), 20-100-day filtered

Combined EOF, All Season, 1980-2010



OLR EOFs (30S-30N)





MJO Lifecycle





WH MJO Phase Space



PREDICTION SKILL

Bivariate correlation and RMSE of PCs (All Days)



CFSv1 skll is about 10-15 days (Seo et al. 2009)

The Following analysis will be for combined EOFs

Bivariate correlation and RMSE of PCs as a function of initial phase (MJO Days)





Seasonal variation of MJO forecast skill



MJO MAINTENANCE

Evolution of amplitude averaged



Composites forecast for each initial phase.



Initial Phase	1	2	3	4	5	6	7	8
Obs	6.9	6.7	7.4	7.6	6.7	7.2	7.2	6.4
(CFSv2-obs)	(-1.7)	(-1.2)	(-1.2)	(-0.5)	(-1.3)	(-2.0)	(-1.2)	(-1.3)

Composite from initial phase 3



Contours: u850 Shadings: OLR

Composite from initial phase 4



Contours: u850 Shadings: OLR

Composite from initial phase 5



Contours: u850 Shadings: OLR



Observed OLR (10S-10N average)



OLR anomalies from November 18th to December 17th

(a) OBS vs. CFSv2



- Too slow eastward propagation, especially in CFSv2
- Unable to propagate across the Maritime Continent in CFSv2

(c) OBS vs. UH



UH Model: ECHAM 4 coupled to UH ocean model and CFSR for IC.

Shadings: Observed Contours: Forecast

Bivariate correlation during DYNAMO



Fu et al. (2012)

Closing Remarks

- CFSv2 prediction skill is about 20 days, improved compared to CFSv1. Less skillful for convection than dynamic fields.
- Low skill for crossing MC, low skill for initialization.
- CFSv2 MJO amplitude is weaker than observed, especially during early forecast period, likely a result of weaker convection in the model.
- Propagation in CFSv2 is still too slow. There is room for further enhancement with improved model physics.