Please Note: Many additional NCEP model forecast graphics (in addition to what is included here) are available at the DYNAMO data catalog and span from hourly to Week-2.

Work supported by NOAA’s Climate Program Office

NOAA/CPC – Jon Gottschalck, Matt Rosencrans, Michelle L’Heureux
ESSIC/CICS – Augustin Vintzileos
CICS-NC – Carl Schreck
SUNY-Albany – Paul Roundy
Australia BOM – Matt Wheeler
Review of Conditions During the Past Week
Several different modes of tropical variability contributed to a large area of enhanced convection from the central Indian Ocean (IO) across the South Pacific Convergence Zone (SPCZ) to east of the Date Line in the central Pacific south of the equator. Higher frequency signals such as a westward moving equatorial Rossby wave (ERW), a robust eastward moving Kelvin wave (KW) and interaction with the extratropical circulation have likely initiated a new, distinct MJO event as some observational indicators are more coherent. La Nina, mid-latitude interactions and perhaps any leftover enhanced phase of the previous MJO also contributed to enhanced convection over eastern areas of this large enhanced rainfall region.

Weekly averaged OLR anomalies show enhanced convection was observed from the DYNAMO array eastward to encompass much of the Bay of Bengal, the MC, northern Australia and the western Pacific. Two tropical cyclones developed during the past week, one in the southern Bay of Bengal and another just north of central Australia coast. Strong westerlies were evident across the equatorial IO and the middle of the MC, while upper-level winds remained generally close to average. SST’s have decreased across many areas of the IO and negative anomalies are now evident just east of the DYNAMO array south of the equator.

The MJO index increased in amplitude during the past week and has shown some eastward propagation in the last few days. The index continues to be substantially impacted by the several forms of variability mentioned above. Model forecasts of the index from the last two weeks were generally good in indicating the general persistent nature of the index observed in the last 1-2 weeks. The DYNAMO outlook from last week did a good job in highlighting the large area of enhanced rainfall during the week, but did not explicitly indicate tropical cyclone development in the Bay of Bengal. The Week-2 outlook failed to indicate the strong enhanced convection across the IO along and south of the equator.
Weekly Spatial OLR

Total field

Anomalies
OLR Time Longitude – Tropical Modes

Ovals are projections of leading modes: MJO (blue), KW (green), ER-1 (black)

Courtesy: Matt Wheeler - CAWCR
Zonal wind shaded, direction by vector
Westerly total/anomalies (red shades)
Easterly total/anomalies (blue shades)

Pentad averages for last 5 days
(bottom) and 5 days previous (top)
Zonal wind shaded, direction by vector
Westerly total/anomalies (red shades)
Easterly total/anomalies (blue shades)

Daily averages for last 4 days
Zonal wind shaded, direction by vector
Westerly total/anomalies (red shades)
Easterly total/anomalies (blue shades)

Pentad averages for last 5 days (bottom) and 5 days previous (top)
Sea Surface Temperature

SST (°C) 21 DEC 2011

SST Anomalies (°C) 21 DEC 2011

NOAA - Climate Prediction Center
Equatorial Cross Section

Pressure Longitude Cross-section -- 5N - 5S
Mean U-W (streamlines), Specific Humidity (shaded) (g/kg)
DEC 18 2011 -- DEC 24 2011

Pressure Longitude Cross-section -- 5N - 5S
Anomalous U-W (streamlines), Specific Humidity (shaded) (g/kg)
DEC 18 2011 -- DEC 24 2011
Velocity Potential

19 Dec 2011

26 Dec 2011
MJO Index
MJO Index Validation

1 Week Ago

Forecasts from: 20111220

2 Weeks Ago

Forecasts from: 20111212
MJO Index

Data updated through 28 Dec 2011
Verification

X ➔ Denotes TC development location

Observed 7-day mean OLR anom from day 20111219

Development of a tropical cyclone that eventually reaches tropical storm strength.
Weekly total rainfall in the upper third of the historical range.
Weekly total rainfall in the lower third of the historical range.
7-day mean temperatures in the upper third of the historical range.
7-day mean temperatures in the lower third of the historical range.

-duct targets broad scale conditions integrated over a 7-day period for US interests only.
Forecast Graphics
Outlook and Forecast Rationale

Most dynamical model MJO index forecasts indicate a stronger, eastward propagating signal during much of the period, especially in Week-1. This behavior may in part be related to the evolution of the KW described above, but it appears a distinct, separate MJO may be shifting eastward during the forecast period. The propagation speed of the signal at the current time is somewhat fast, in fact the ECMWF monthly prediction system has this weak amplitude signal propagating to the IO within two weeks. It is too early to say whether the new developing MJO will return to its strong, coherent nature observed during the autumn. The above forecasts would favor enhanced rainfall to focus across the MC and SPCZ during Week-1 with a tendency toward drier-than-average conditions across the equatorial IO during the period.

The outlook favors a large area of enhanced rainfall from the MC across the SPCZ to the south-central Pacific Ocean based on a combination of factors including the MJO, La Nina, KW activity and consistent model forecast guidance. There are two extensions back to west across the Bay of Bengal and another stretching southwest into the south-central IO, both of which are associated with tropical cyclone activity or the potential thereof in the coming week. Model guidance favors an area of enhanced rainfall for the southwest IO northeast to the southwest portion of the DYNAMO array. Near-to-below average rainfall is most likely across much of the equatorial IO including the northern section of the DYNAMO array which is consistent with the passage of the KW and also the eastward moving MJO along with model guidance. There is high uncertainty for Week-2, but the outlook tends toward continuation of the anomalous enhanced (suppressed) rainfall for the SPCZ region (equatorial IO). Some tools indicate the potential for enhanced rainfall across the western IO late Week-2 as hinted at by some MJO index model forecasts.

Probability of at least moderate strength MJO (Outside WH unit circle with eastward propagation):
Week-1: 70%, Week-2: 50%, Week-3: 30%
DYNAMO Forecast

Tropical Hazards/Benefits Outlook
Climate Prediction Center

Week 1 - Valid: Dec 28, 2011 - Jan 03, 2012

Week 2 - Valid: Jan 04, 2012 - Jan 10, 2012

Confidence
High Moderate

Tropical Cyclone Formation
Development of a tropical cyclone that reaches a max. sustained wind of 63 km/hr.

Above-average rainfall
Weekly total rainfall in the upper tercile.

Below-average rainfall
Weekly total rainfall in the lower tercile.

Produced: 12/27/2011
ECMWF MJO Index Forecast
OLR/u850 Spatial Forecast Maps – Tropical Modes

Courtesy: Paul Roundy - SUNY

Daily snapshots

a. Summed OLR on 31-Dec-2011
b. Equatorial Rossby OLR Anomaly on 31-Dec-2011
c. MJO OLR Anomaly on 31-Dec-2011
d. 2–10 Day Westward OLR Anomaly on 31-Dec-2011
e. Seasonal to Interannual OLR Anomaly on 31-Dec-2011
f. Kelvin and Extratropical OLR Anomaly on 31-Dec-2011

a. Summed OLR on 07-Jan-2012
b. Equatorial Rossby OLR Anomaly on 07-Jan-2012
c. MJO OLR Anomaly on 07-Jan-2012
d. 2–10 Day Westward OLR Anomaly on 07-Jan-2012
e. Seasonal to Interannual OLR Anomaly on 07-Jan-2012
f. Kelvin and Extratropical OLR Anomaly on 07-Jan-2012
OLR Spatial Forecast Maps – Tropical Modes

Courtesy: Carl Schreck CICS-NC

Madden-Julian Oscillation in OLR

Kelvin Waves in OLR
OLR Spatial Forecast Maps – Tropical Modes

Courtesy: Carl Schreck CICS-NC

Equatorial Rossby Waves in OLR

Sum of MJO, Kelvin, ER
MJO Composites

Courtesy: CPC
Ensemble GFS Forecasts – Week-1

GEFS precip for week 1 from: 20111227

GEFS aprecip for week 1 from: 20111227

NOAA – Climate Prediction Center
GFS / CFS Forecasts – Week-2

GFS frost Precip for week 2 from: 20111226all

GFS - CMORPH frost Precip for week 2 from: 20111226all

Week 2 Anomalies (mm/day) 3Jan2012–9Jan2012

REVH vs. A-Wind for week 2 from: 20111226all (850hPa)

NOAA - Climate Prediction Center
Ensemble GFS Forecasts – Week-2

GEFS precip for week 2 from: 20120103

GEFS apricip for week 2 from: 20120103

NOAA – Climate Prediction Center
Operational GFS Precipitable Water and 10 m Anomalous Wind
Comments, Suggestion and Questions?