DARWIN TROPICAL DIAGNOSTIC STATEMENT

November 2004

ISSUED BY DARWIN RSMC

SUMMARY

A combination of El Niño like and neutral ENSO conditions persisted during November. The El Niño like indicators included warm SST anomalies in the central Pacific and suppressed convection over the maritime continent. The east Pacific cold tongue, while persisting, warmed slightly during the month. Neutral ENSO indicators include near average cloudiness over the central Pacific, reduced cloudiness over eastern Pacific and near average trade flow over much of the tropical Pacific. Thus the ENSO phase remained delicately balanced. The MJO signal was weak in November. An area of convection in the Indian Ocean during late October did not progress over the maritime continent, while another in late November was relatively weak. Five tropical cyclones developed in the region during the month.

INDICES

Troup's Southern Oscillation Index (SOI) for November 2004	- 9
5-month mean (centred upon September)	- 6
Darwin mean MSL pressure for November 2004	1009.5 hPa
Pressure anomaly (1933 – 1992 mean)	+0.7 hPa
Tahiti mean MSL pressure for November 2004	1011.0 hPa
Pressure anomaly (1933 – 1992 mean)	- 0.7 hPa

Time series of Troup's SOI:

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2002	+3	+8	-5	-4	-14	-6	-8	-15	-8	-7	-6	-11
2003	-2	-7	-7	-5	-7	-12	+3	-2	-2	-2	-3	+10
2004	-12	+9	0	-15	+13	-14	-7	-8	-3	-4	-9	

The above table presents the monthly values of SOI from the year 2002. Fig.1 shows the monthly SOI and its five-month running mean for the past ten years.

The monthly SOI dropped to -9 in November from -4 last month. The SOI and it's 5-month mean have remained negative for several months, but confined within one standard deviation since July.

TROPICAL CYCLONES

[Fig. 2]

Five tropical cyclones were analysed in the RSMC area during November. Two of them reached typhoon intensity and two developed in the southern Indian Ocean. Another tropical cyclone formed west of RSMC region in the southwestern Arabian Sea. In addition to these cyclones at least two tropical lows formed over northern Indian Ocean but did not reach cyclone intensity. The climatological averages of cyclones for November are 2.7 (1.7 typhoons) for the northwest Pacific, 1.3 for the north Indian Ocean and 1.5 for the southern Indian and Pacific Oceans combined.

Tropical cyclone Arola

Tropical cyclone Arola started off as a low in the southern Indian Ocean east of Diego Garcia on the 6th in the near equatorial trough. A favourable upper level outflow and moderate vertical wind shear helped the system to intensify and become a tropical cyclone during the 8th. It remained almost stationary initially and then moved slowly to the southwest. It began to weaken on the 10th mainly due to an increase in vertical wind shear and cooler sea surface temperatures. It became a low on the 12th and dissipated soon after.

Typhoon Muifa

This system appeared as a low on the 9th within the monsoon trough north of Palau around 150°E. It drifted west and was located east of Philippines on the 14th where it reached tropical cyclone intensity. It remained almost stationary and intensified to typhoon strength on the 17th. It then made a full clockwise loop and slowly moved west and crossed the Philippines on the 19th. Muifa temporarily weakened below typhoon strength from the 19th till the 21st then re-intensified to a typhoon in the South China Sea. It moved parallel to Vietnam coastline, entered Gulf of Thailand and weakened while moving west mainly due to intrusion of dry air and strong vertical windshear. It weakened to a low before reaching the Malay Peninsula. Media reports indicate the typhoon caused loss of life and widespread property damage in the central Philippines and southern Vietnam.

Severe Tropical Cyclone Bento

Severe tropical cyclone Bento appeared as a low in the southern Indian Ocean near-equatorial trough on the 19th. Weak vertical windshear and good upper level divergence helped the system to intensify and become a tropical cyclone on the 21st. The system was slow moving, in a weak steering flow while intensifying. It became a severe tropical cyclone on the 22nd and continued rapid intensification to reach 120kn by 12Z on the 23rd while it moved slowly to the northwest and then to the southwest. It changed its track to the southeast due to a change in the steering flow and started to weaken as it moved polewards. It weakened to tropical cyclone intensity on the 26th. On the 28th it encountered another change in the steering flow, made a loop turn and began to move southwest. Cooler sea surface temperatures and an increase in the vertical wind shear further weakened the system to a low on the 30th.

Tropical Storm Merbok

This short-lived system appeared as a low on the 21st northeast of the Philippines while Typhoon Muifa was intensifying in the South China Sea. Good low level flow and weak vertical wind shear helped the system to intensify and became a tropical cyclone on the 22nd. It moved west northwest and crossed Philippines on the same day. It weakened during landfall and became a low on the 23rd.

Typhoon Nanmadol *(The text will be repeated in the December issue)*

Typhoon Nanmadol formed during the end of November and continued into early December. It started off as a low on the 26th within the monsoon trough in the northwestern Pacific around 160°E and slowly drifted to 150°E on the 28th. Good low level convergence, weak vertical windshear and good upper level divergence helped the system to intensify and become a tropical storm by the 29th. It

moved west northwest and became a typhoon on the 30th. It crossed the northern Philippines on the 2nd December and entered the South China Sea. After making landfall the system weakened and began recurvature on the 3rd of December, moving initially to the north and then to the northeast. On the 4th of December it just touched the southern tip of Taiwan and merged in a frontal system while undergoing transition to an extra tropical system. Media reports indicate several people were evacuated in the northern Philippines to reduce the loss of life after a tropical depression had caused extensive loss of life and property damage just before the approach of the typhoon.

SEA SURFACE TEMPERATURE

[Figs. 3a, 3b]

Warm SST anomalies between +0.5 and +1.0ºC dominated large areas within the equatorial oceans. The west Pacific warm pool remained focussed near the date line, though warm anomalies extended both eastwards and westwards during November. The large pool of warm sub-surface waters in the central Pacific that has been evident for several months persisted during November (outside of map coverage). This was considered consistent with a shift towards El Niño, though was not followed by other typical El Niño trends. For instance, the SSTs of the east Pacific cool tongue close to the South American coast (not shown on the map) persisted during November (though showed some warming trends during the month). The northern Indian Ocean remained mostly warmer than normal.

MSL PRESSURE

[Figs. 4a, 4b]

Above average mean sea level pressures prevailed over most of the equatorial western Pacific and maritime continent except for a few equatorial areas close to the date line. Most of the tropical Indian Ocean experienced pressures lower than climatology. Below average pressures in the southern Indian Ocean were consistent with the formation of two tropical cyclones in the region during the month.

850 hPa FLOW

[Figs. 5a, 5b]

Near-equatorial troughs on either side of the equator persisted during most of November. The tropical circulation was mostly close to climatology. The passage of long waves in the subtropical high-pressure system made the flow more meridional in each hemisphere and contributed to the stronger than normal easterly flow over northern Australia. The wind anomalies near the date line in the equatorial Pacific indicate near normal conditions in the area.

200 hPa FLOW

[Figs 6a, 6b]

Slightly above normal easterly flow prevailed in the equatorial Pacific close to the date line. The easterly flow over equatorial Indian Ocean remained weaker than normal. In the extratropical regions, the STR's were dominated by propagating long waves giving rise to a more meridional flow than climatology.

VELOCITY POTENTIAL

[Figs 7a, 7b]

Velocity potential, which is a proxy for convergence, indicates a good vertical alignment of low-level convergence and upper level divergence associated with the near equatorial troughs and the SPCZ

region. The foci of implied vertical motion are located near the SPCZ and central Indian Ocean, rather than the maritime continent, implying a shift in the typical Walker circulation during the month.

OUT-GOING LONG-WAVE RADIATION (OLR)

[Figs 8a, 8b]

The OLR anomaly pattern for the month of November more or less coincide with the pressure anomalies and velocity potential indicating more convective areas in the Indian Ocean, the SPCZ area and equatorial areas close to the date line. The above average convection in the northwestern Pacific matches with the areas of cyclone tracks in the region. Equatorial areas between 90°E and 150°E including Australia had less than average convection during the month.

CROSS-EQUATORIAL INTERACTION

[Fig. 9]

The vertical cross-section of the meridional wind pattern across the equator is shown in figure 9. The cross equatorial flow pattern was close to normal at lower levels except near 80°E where a stronger than normal southerly flow prevailed, mainly due to the convective activity that prevailed in the southern Bay of Bengal during the month. The flow was close to climatology in the upper levels.

850 hPa WIND COMPONENTS AT DARWIN

[Figs. 10a, 10b]

A stronger than average southeasterly flow prevailed over Darwin during most of November. A few heavy rainfall events contributed to a total monthly rainfall of 105.2 mm. The median and mean rainfalls for the month of November are 140.5 mm and 141.2 mm respectively.

INTRA-SEASONAL VARIATIONS

[Figs. 11,12,13]

The first active phase of Madden-Julian Oscillation [MJO] during the northern hemisphere monsoon occurred over India and southeast Asia around late April to early May, extending to the northwest Pacific around the middle of May. The following active event impacted over much of south Asia around early June. A marked suppressed phase was then evident over Indian longitudes around the middle of June, extending eastwards to the northwest Pacific for the early part of July. The next active phase had its greatest influence on the Indian monsoon from the middle of July, extending eastward to the western Pacific for much of August. A weak MJO progressed across the Indian and the western Pacific from late August to early September. The stronger convection in the central Indian Ocean during late September was associated with another active MJO pulse and remained active over the SPCZ area during early October. The enhanced convection, which became apparent over the equatorial Indian Ocean during late October, was confined to the area for several weeks but waned as it approached the maritime continent, where convection in the near equatorial belt has been suppressed for the last couple of months. Another enhanced convection event appeared in the Indian Ocean during late November and convective activity soon after increased in the western Pacific, which may have been associated with a weak MJO event. Despite several active MJO events having progressed into the Pacific region in recent months they have not been a trigger for sustained active convection over the Pacific SST warm pool, which has been in place over the equatorial date line.