Dry air from the subtropical region has been pushing into the DYNAMO domain from the south-southeast, which seems to suppress the convection in the southern ITCZ that had been active in mid-November 15-17 (observed during the P-3 science mission #3 on November 16). The convection has been alternating between the northern and southern ITCZs from 15-21 November. The southern ITCZ is now suppressed by the advection of subtropical dry air from the south. The main convective active seems to shift toward the equator rather quickly on November 21-22.

The NOAA P-3 Mission #5 took place on 22 November when the deep convection start to develop near the equator between Gan and Revelle (Figure 1). The large-scale circulation is characterized by a strong meridional water vapor gradient as seen on the TPW image (Figure 2). The dry air is associated with the low-level easterly and southeasterly flow as shown in the ASCAT wind fields in the southern part and to the east of the DYNAMO domain (Figure 3).

The P-3 takes off from Diego Garcia at 0200 UTC and landed at 1200 UTC on November 22. The main science objectives are to observe 1) the 3D structure of the large-scale atmospheric water vapor across the meridional gradient using the GPS dropsondes deployed from 20,000-22,000’, 2) the convective systems and air-sea fluxes in the equatorial region with LF and TA radars as well as dropsondes and AXBTs, and 3) freshwater input into the ocean and deploy AXCTDs upstream of the R/V Revelle. The flight track for the entire 10-hrs mission is shown in Figure 4.

The vertical cross section of the GPS dropsonde measured RH and wind fields in the southern part of DYNAMO domain, from Diego Garcia (72.7E, 7.0S) to (77.0E, 6.0S), shows extremely low RH values from the upper-mid troposphere reaching into the top of the atmospheric boundary layer with RH value close to 30% (Figure 5). The wind is predominately deep tropospheric easterlies from the surface to 7-km level. The P-3 then turns to the north across the strong WV gradient along 77E to near the equator at (77.0E, 0.7S). A sharp horizontal WV gradient is located near 5S from 1.5 km to as high as the P-3 flight level close to 7 km. The low-level moist layer depends from 6-4S. The low-level wind changes from easterly to westerly north of the RH gradient zone. It is interest to note that westerly is elevated from about 3-4S and decent toward the surface near the equator (Figure 5).
From 0300-0800 UTC, the new growth of deep convection is on the north side of a group of the 208 K cloud clusters as indicated on the METEOSAT7 IR images (Figure 6 and Figure 7). The P-3 descents to 3,000’ and begins the convective module on two convective systems (RCE1 and RCE2). Dropsondes are deployed at 2-3 min interval in locations perpendicular to the convective lines in both cases. RCE1 developed a leading line with a small stratiform rain region to the north (Figure 8). The LF radar shows dBZ values ranging from 45-50 in the convective line and 20-40 in the mixture of convective and stratiform region. The dropsonde at the northern-most location (0500 UTC) shows a relatively unstable environment (Figure 8) that later become the initial location of the second convective line RCE2 (Figure 9). Notice that the convective line in RCE1 developed and collapsed in situ rather quickly within 60 minutes (Figure 10).

RCE2 contains one of the most convective cells observed in this mission. LF radar shows 50-60 dBZ values (Figure 9). The dropsondes indicate that the surface winds are mostly southerly while mid-low winds are west-northwesterly. Convective cool pools are relatively weak to moderate in both cases varying from 25-26 C, while the environmental sondes that are not near convective cool pool are 26-27 C (Figure 10).

ABXTs deployed in RCE1 and RCE2 show very small variation in SST (less than 0.5 C) and throughout the depth of the ocean from surface to more than 800-m depth (Figure 10). The P-3 tracked toward the Revelle and deployed three AXCTDs at 30, 15, 5 nm west of Revelle before ferry back to Diego Garcia. The cloud clusters have maintained 208K or less during the P-3 sampling period from 0400-0800 UTC (Figure 11). It mostly dissipated by 1200 UTC (Figure 12). From 0100-1200 UTC, the main convective activity has from south to the equatorial region west of the DYNAMO domain.

![Figure 1 METEOSAT7 IR imagery of Tbb at 0130 UTC on 22 November 2011.](image1)
Figure 2 Total Precipitable Water (TPW) at 0300 UTC on 22 November 2011 (UW-CIMSS).

Figure 3 ASCAT surface winds and METEOSAT7 IR imagery at 0400 UTC 22 Nov. 2011.
Figure 4 The NOPP P-3 flight track from 0200-1200 UTC on 22 November 2011. Locations and times of the GPS dropsondes are indicated by “green” dots.

Figure 5 Vertical cross section of NOPP P-3 dropsonde measured RH and wind fields from Diego Garcia (72.7E, 7.0S) to (77.0E, 6.0S) and turning to the north across the strong WV gradient to near the equator at (77.0E, 0.7S).
Figure 6 METEOSAT7 IR imagery of Tbb at 0300 UTC on 22 November 2011.

Figure 7 METEOSAT7 IR imagery of Tbb at 0630 UTC on 22 November 2011.
Figure 8 The NOPP P-3 LF radar reflectivity (color in dBZ), flight track, and dropsonde measurements of temperature and dewpoint temperature 0500-0530 UTC 22 November 2011.
Figure 9 The NOPP P-3 LF radar reflectivity (color in dBZ), flight track, and dropsonde measurements of temperature and dewpoint temperature 0700-0730 UTC 22 November 2011.
Figure 10 The NOPP P-3 LF radar reflectivity (color in dBZ) at 0600 UTC and flight track (upper right), the GPS dropsonde measurements of temperature and dewpoint temperature 0500-0730 UTC 22 November 2011, and AXBTs in convective modules in the equatorial region of 3S-2N and 75-79E from 22-24 November 2011.
Figure 11 METEOSAT7 IR imagery of Tbb at 0800 UTC on 22 November 2011.

Figure 12 METEOSAT7 IR imagery of Tbb at 1200 UTC on 22 November 2011.