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Variations of convective systems in the different stages of the MJO in the southern tropical Indian Ocean during CINDY2011

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Cooperative Indian Ocean experiment on intraseasonal variability in the Year 2011 (CINDY 2011) was conducted to capture atmospheric and oceanic characteristics of the Madden-Julian Oscillation (MJO) in the central Indian Ocean. During CINDY, we deployed the research vessel MIRAI in the southern tropical Indian Ocean (STIO), at (8S, 80.5E), to occupy the southeastern corner of the CINDY/DYNAMO core sounding array for about two months. During the cruise, we captured two MJOs including convectively active event and period toward the active phase (pre-active phase). This study reports the convective systems and its activities, in addition to humidity profiles over Mirai, i.e. the southern tropical Indian Ocean.

Basically the convections (and the moist layer) appeared alternatively between at 8S (Mirai) and at equator. In October, the former half was characterized as convectively active at 8S and inactive at equator ("ITCZ-stage"), while the latter was active in Equator and inactive at 8S ("MJO-stage"). The similar alternation also appeared in November.

In the ITCZ-stage in both October and November events, the areal coverage of the radar echo appeared with 3- to 5-days cycle. The evolution of convective systems from shallow to deep convections is found in each cycle. The convective systems were just above Mirai in October, while shifted to north or south of Mirai in November. In October event, the vertical profiles of divergence from the radar data (by VAD analyses) (representing field around the convective systems in 100-km scale) resembles that from the radiosonde array representing the larger environmental field in 1000-km scale. On the other hand, the convections in MJO-stage in November was including relatively less shallow convections than in ITCZ-stage, and the radar-derived vertical profile of divergence differ from that by the budget analyses. This indicates that in the MJO-stage the convection in 8S did not dominate the divergent field in 1000-km scale. These results imply that the ITCZ with 3- to 5-day cycle was important "building-block" of the inactive and pre-active period of MJO.