

Contribution of tropical cyclone for the preconditioning of the Madden-Julian Oscillation during CINDY2011



Hisayuki Kubota, Kunio Yoneyama, Hamada Jun-ichi

(Research Institute for Global Change, Japan Agency for Marine-Earth Science and Technology)

Introduction

During the international field experiment “Cooperative Indian Ocean experiment on intraseasonal variability in the Year 2011 (CINDY2011)”, three Madden-Julian Oscillation (MJO) were generated over the Indian Ocean. The target of the experiment is to understand the preconditioning process of the MJO. In this study, the preconditioning process of the third MJO observed during CINDY2011 is investigated.

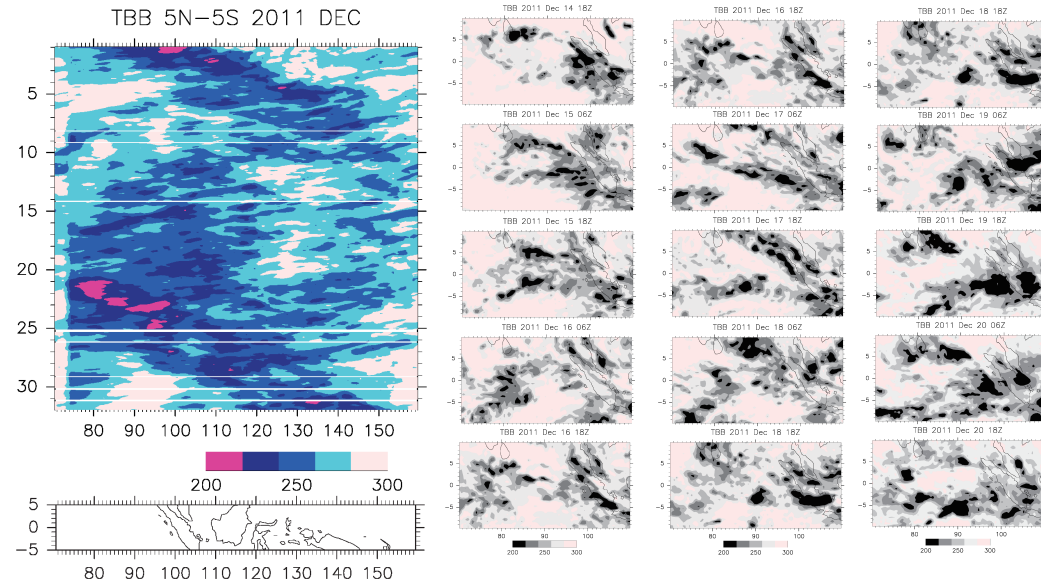


Fig. 1: Hourly IR cross section averaged 5°N-5°S from Dec. 1-31 2011 during 2nd and 3rd MJO.

Fig. 2: IR image over eastern Indian Ocean captured three westward propagating disturbances from Dec. 14 18Z to 20 18Z 2011.

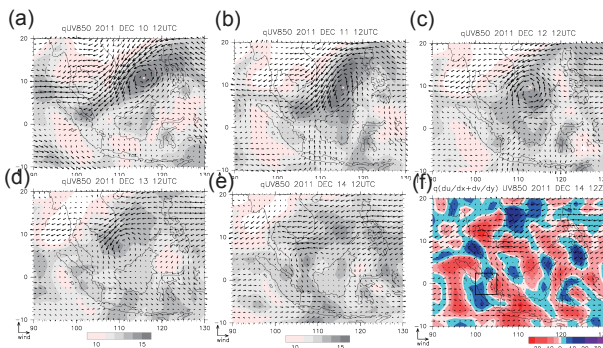


Fig. 4: Water vapor (contour) and horizontal wind (vector) at 850hPa from Dec. 10 12Z to 14 12Z 2011 (a-e) (JCDAS). Horizontal moisture advection (contour) and horizontal wind at 850hPa in Dec. 14 12Z (f). Box is the budget analysis area for Fig. 5.

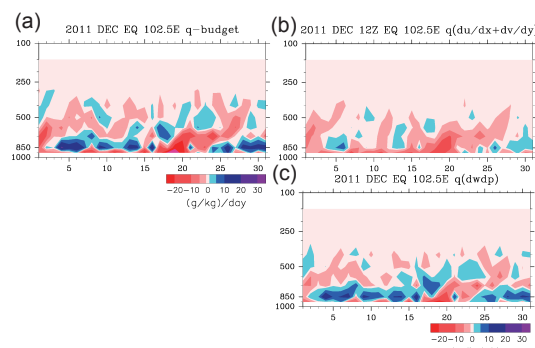


Fig. 5: Water vapor budget profile using JCDAS at EQ102.5° E of 5° x 5° box from Dec. 1 12Z to 31 12Z 2011 for total budget (a), horizontal advection (b), and vertical advection (c).

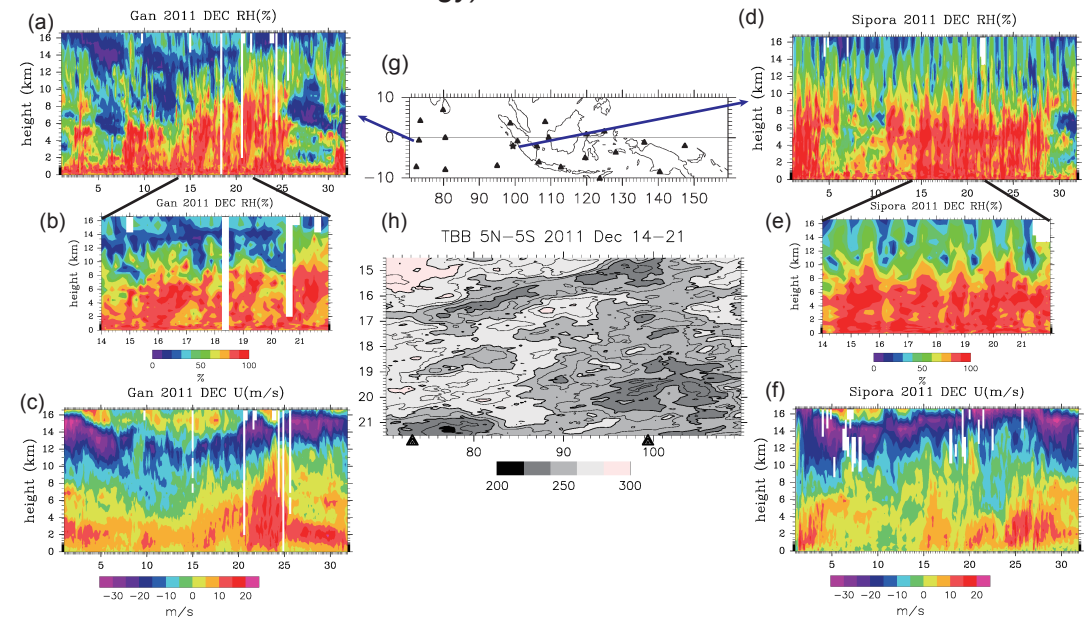


Fig 3: Time series of relative humidity and zonal wind profile in Gan Island (a-c) and Sipora Island off coast of Sumatera Island (d-f) respectively. Locations of radiosonde observations during CINDY 2011 (g). IR cross section averaged 5° N-5° S from Dec. 14-21 2011 during the westward propagating disturbances were observed (h). Triangles are the locations of Gan and Sipora (h).

Proposed steps of the preconditioning process of the MJO

Moist air mass originated from tropical cyclone reached Sumatera Island (Dec. 14) (Fig. 4,5)

Diurnal cycle of convection was activated over Sumatera Island (Dec. 15-25) (Fig. 3d,e)

Two-day period of westward propagating disturbances was observed from Sumatera Island to central Indian Ocean (Dec. 15-21) (Fig. 2,3h)

Moistening process was observed at Gan Island (Dec. 16-21) (Fig. 3a,b)

Third MJO convection was generated over central Indian Ocean (Dec. 21) (Fig. 1)

Indonesian convection originated from tropical cyclone plays a role of the preconditioning of the MJO. The relationship within each steps needs to be solved in the future study.