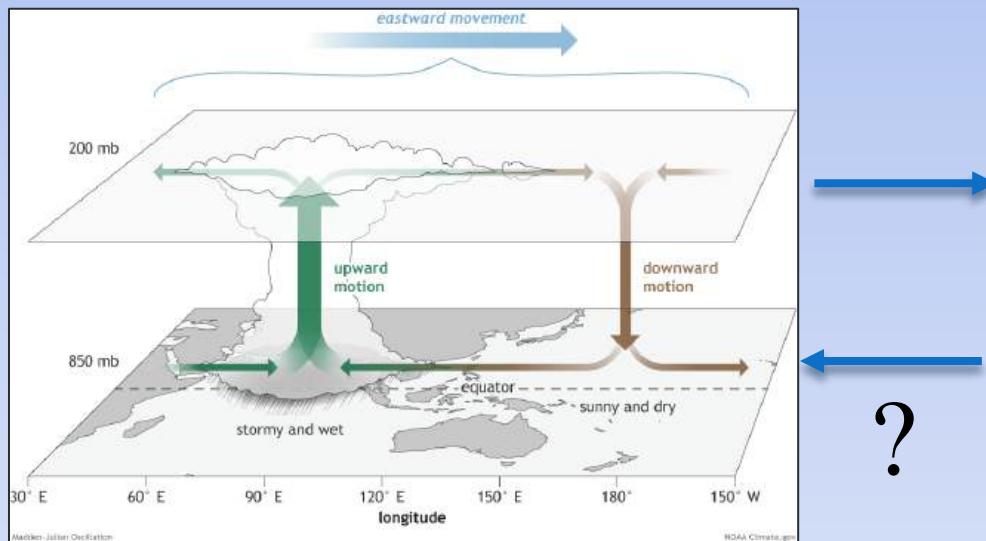


Impact of Indian Ocean tropical cyclones on the development of the Madden-Julian Oscillation (MJO)

Toshi Shinoda, Suyang Pei
Texas A&M University - Corpus Christi

Many previous studies (e.g., Liebmann et al. 1994; Maloney & Hartmann 2000; Sobel & Maloney 2000; Hall et al. 2001; Aiyyer & Molinari 2008; Camargo et al. 2008; Barrett & Leslie 2009, and many others)

MJO



Tropical cyclone



Satellite image of Cyclone Fani. (Photo: Twitter/NOAA Satellites)

Through anomalous large scale circulation and convection

Purpose of this study

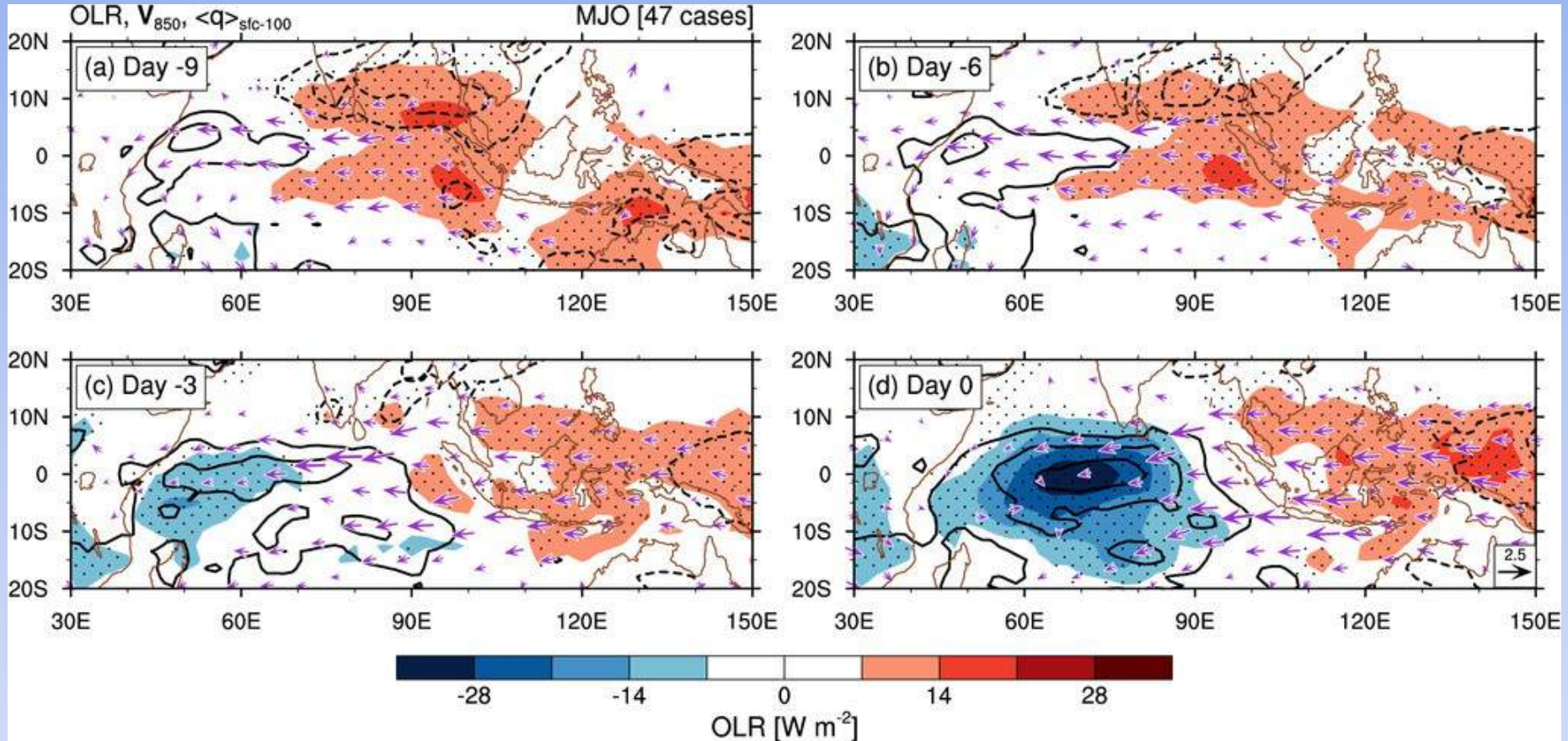
Investigate the impact of tropical cyclones on the MJO initiation over the Indian Ocean.

- Case study: MJO event during DYNAMO, December 2011

Data

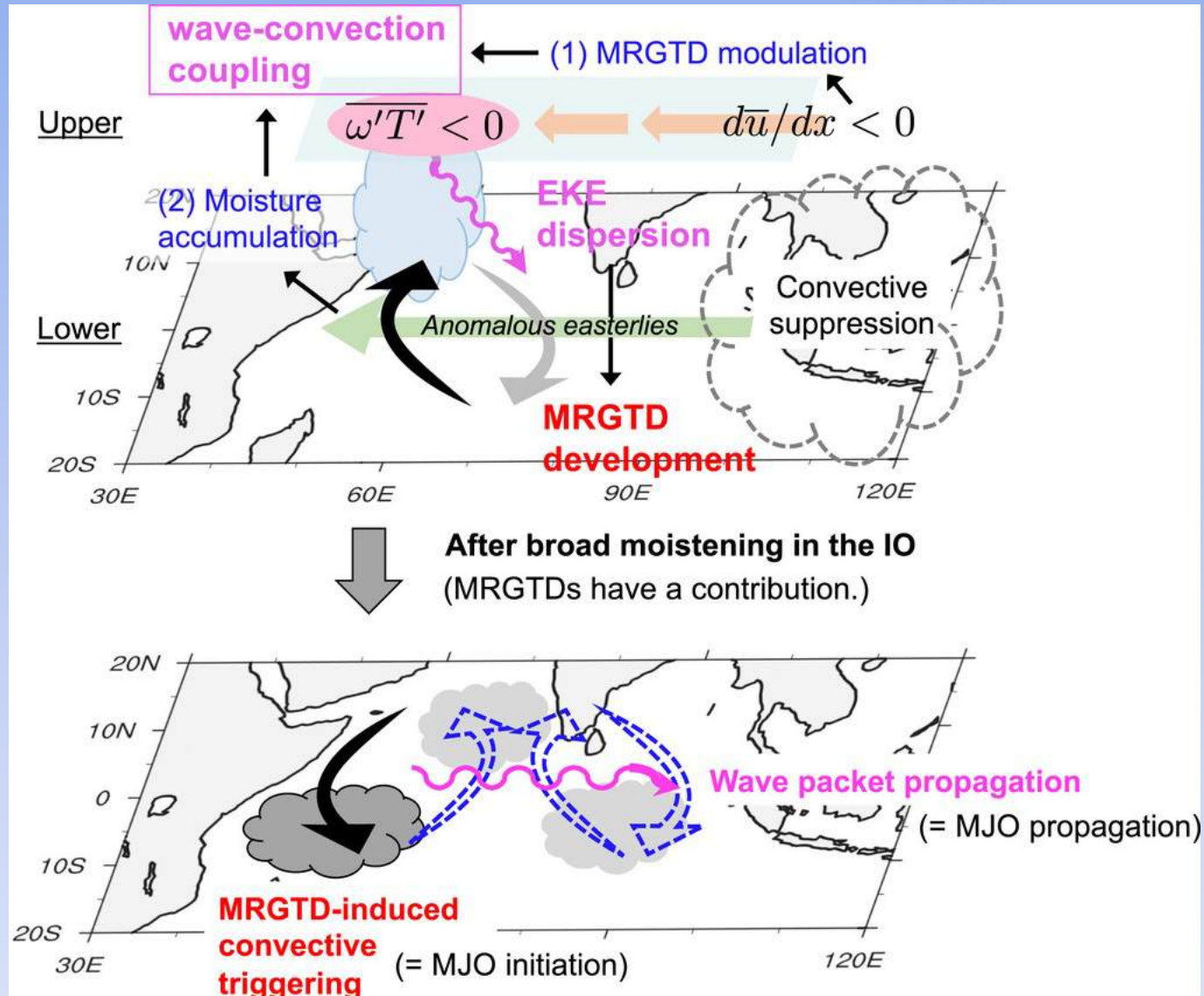
- CCMP winds
- CMORPH precipitation
- Circulation and moisture from ERA 5
- DYNAMO sounding
- SST (OI SSTv2)
- TC track from International Best Track Archive for Climate Stewardship (IBTrACS)

MJO initiation over the Indian Ocean



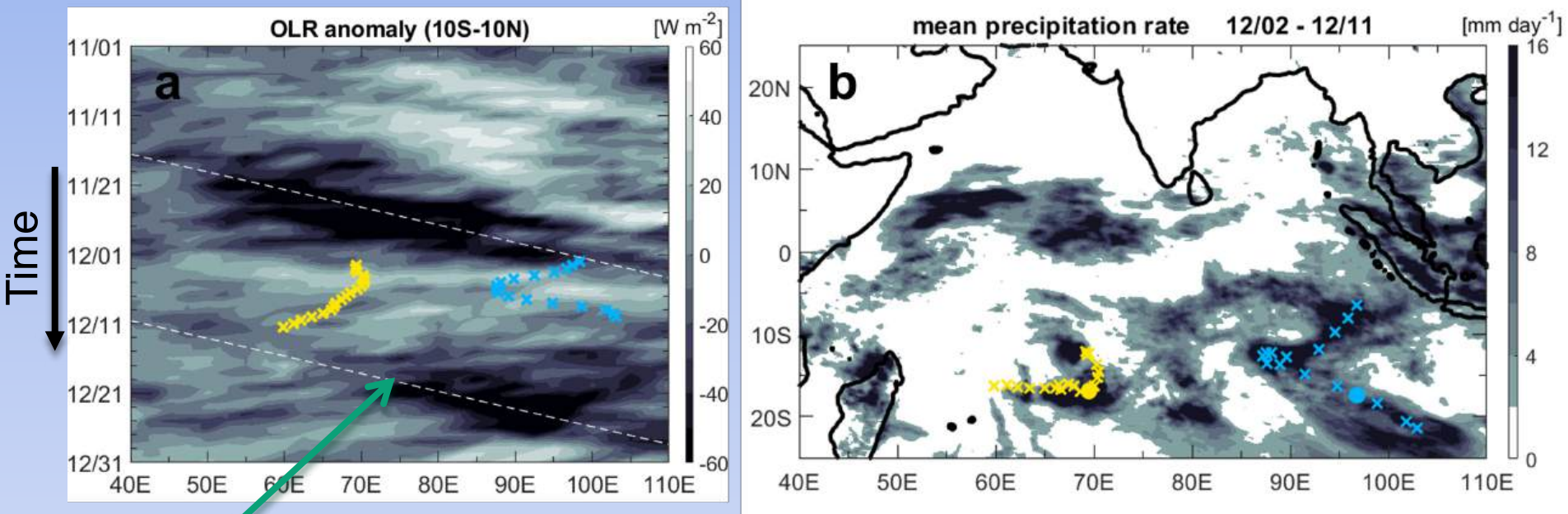
Takasuka and Satoh (2020)

MJO initiation over the Indian Ocean



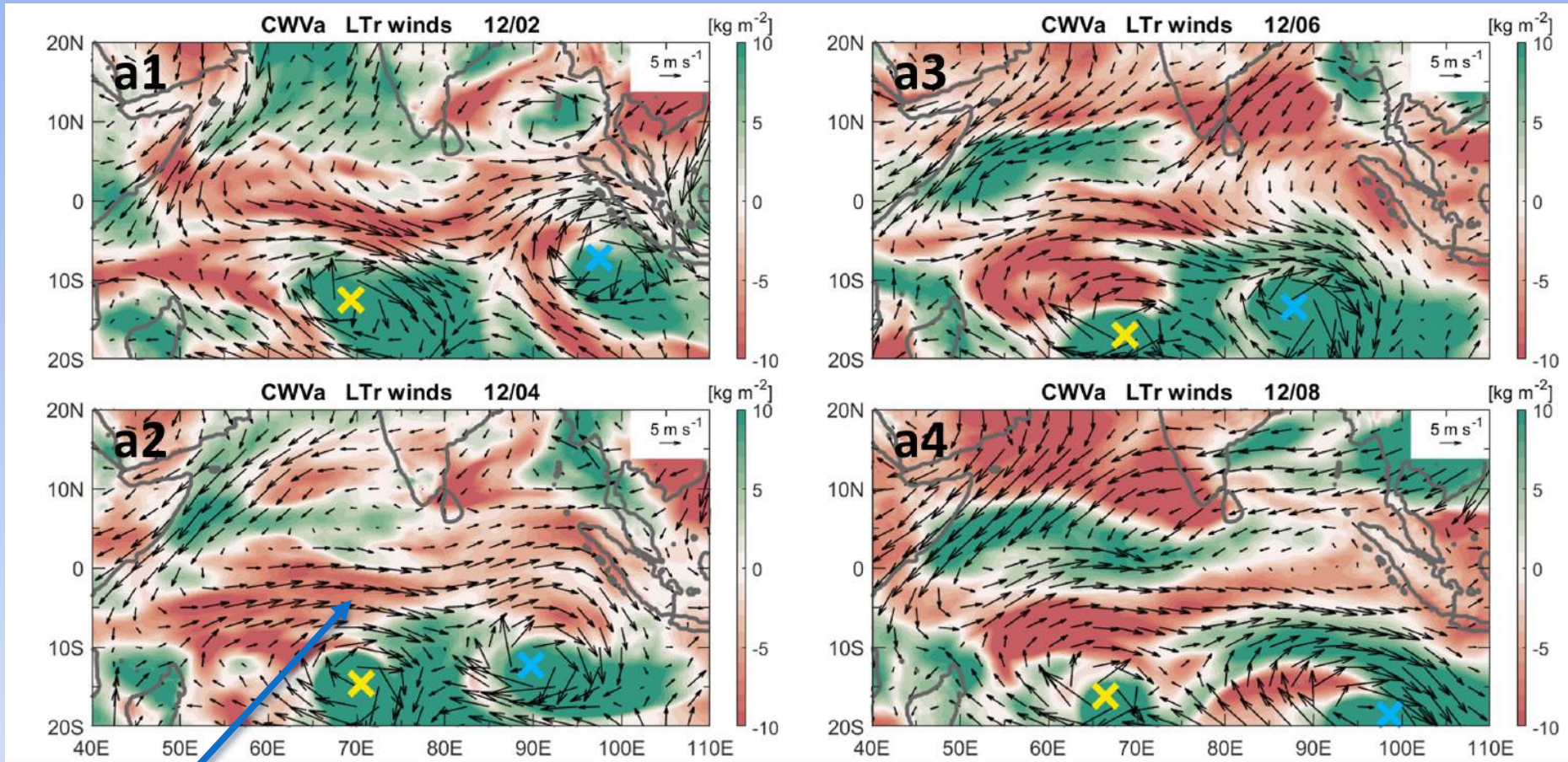
Takasuka and Satoh (2020)

Two tropical cyclones in the south tropical Indian Ocean during the development of MJO event



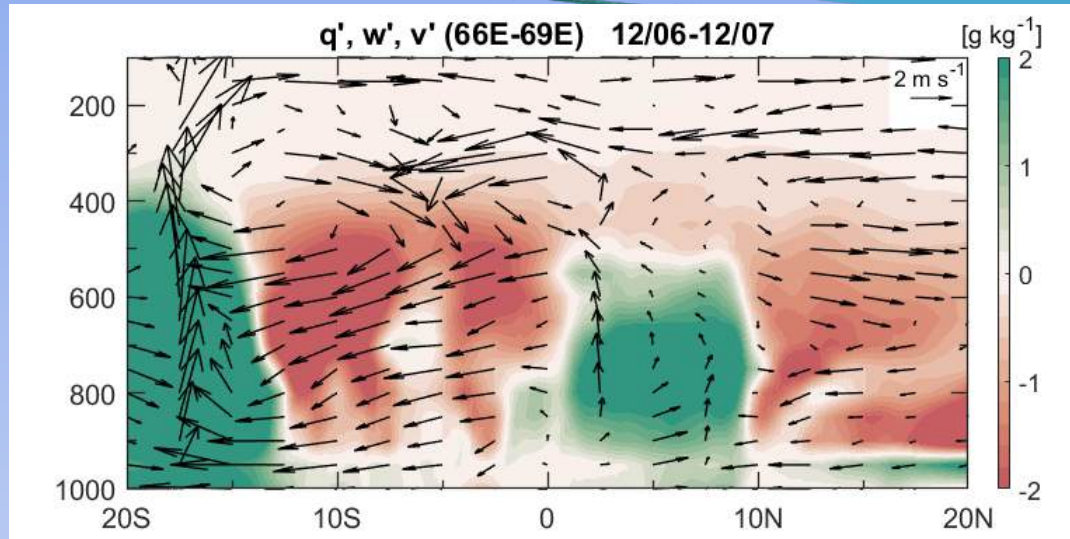
Convection is initiated in the central Indian Ocean

Circulation and moisture associated with TCs

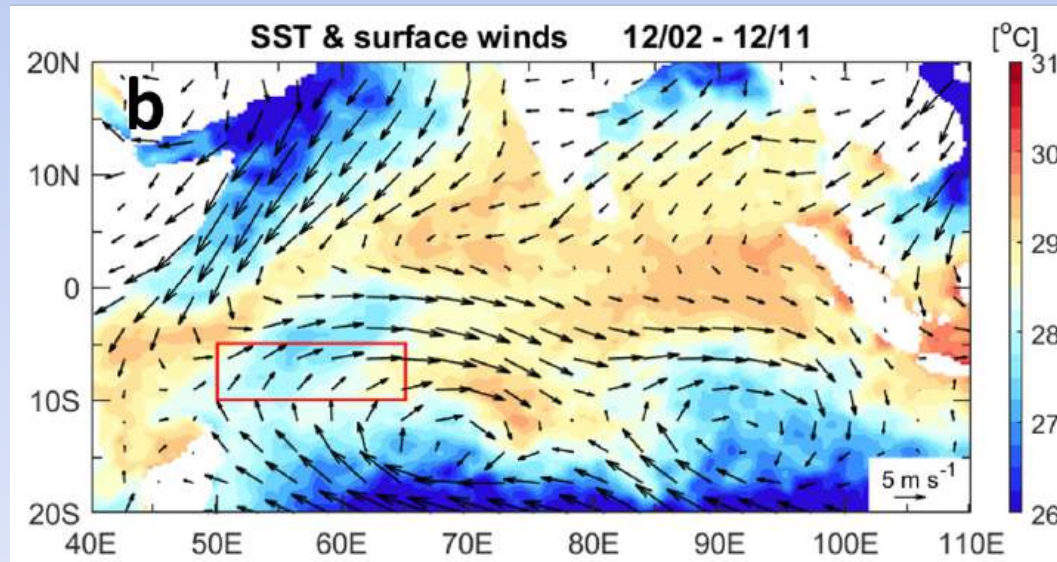


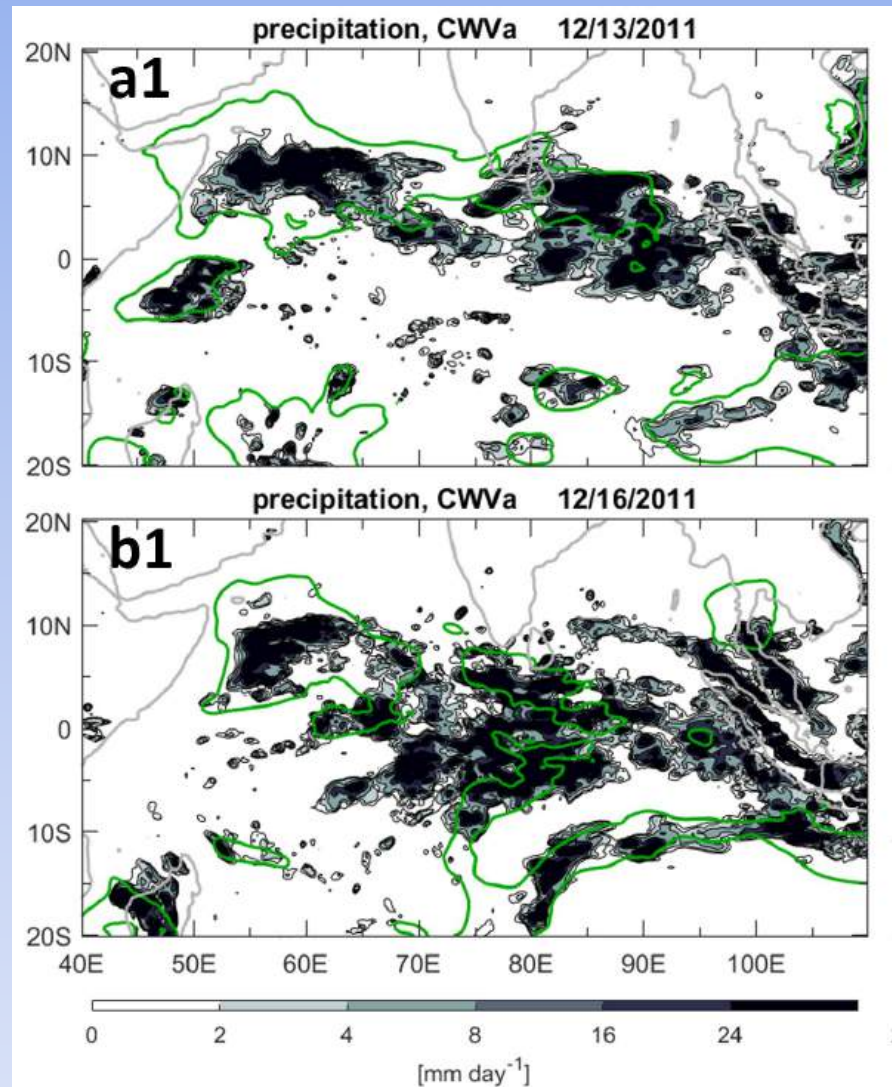
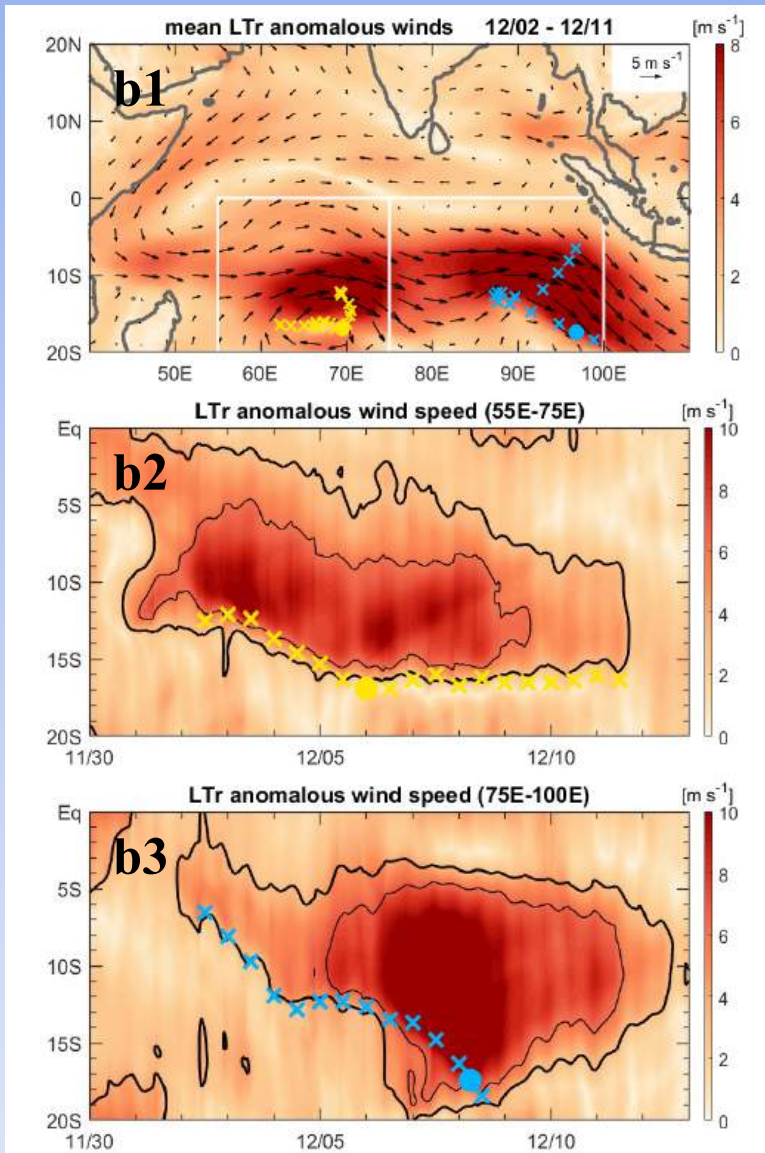
dry air band

Meridional circulation



SST cooling in the southwest IO





Summary

- The 2011 Dec. MJO initiation differs from most other MJOs due to the modulation by two southern Indian Ocean (IO) tropical cyclones (TCs).
- TC-induced dry air advection and subsidence along with cold SSTs sustain a dry air band in 10°S -Eq, inhibiting convection in the southern equatorial IO.
- After TCs dissipate, convection develops in 10°S -Eq. in the central IO and organizes into the MJO.