Coastal Heavy Rainband Formed along Sumatera Island during CINDY/DINAMO
- Overview of the HARIMAU2011 Campaign and Its Data Inventory -

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1. Introduction

+ Diurnal variation is one of the fundamental modes of convective activity in Tropics as well as intraseasonal variation (ISV) incl. MJO.
+ Diurnal land-sea migration of convective activity over Sumtera Island, Indonesia (Mori et al. 2004, Fig.1) is supposed to produce a significant land-sea contrast (imbalance) of rainfall especially in the southwestern coastline of the Island and maintain a coastal heavy rainband (CHeR).
+ A campaign observation was conducted with X-band dual-polarimetric and Doppler radars, intensive soundings incl. UAV flight, and dense surface observation network around the western coast of Sumatera Island to investigate structures and dynamics of diurnal migrating convections across the coastline and formation process of CHeR.

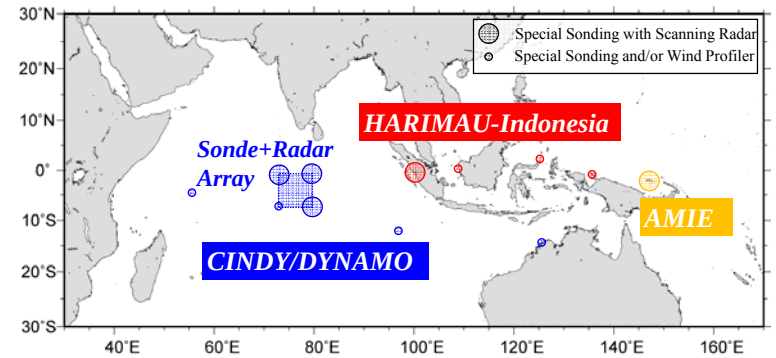

Fig. 2 Location of observation site during HARIMAU2011 in collaboration with CINDY, DYNAMO, and AMIE.

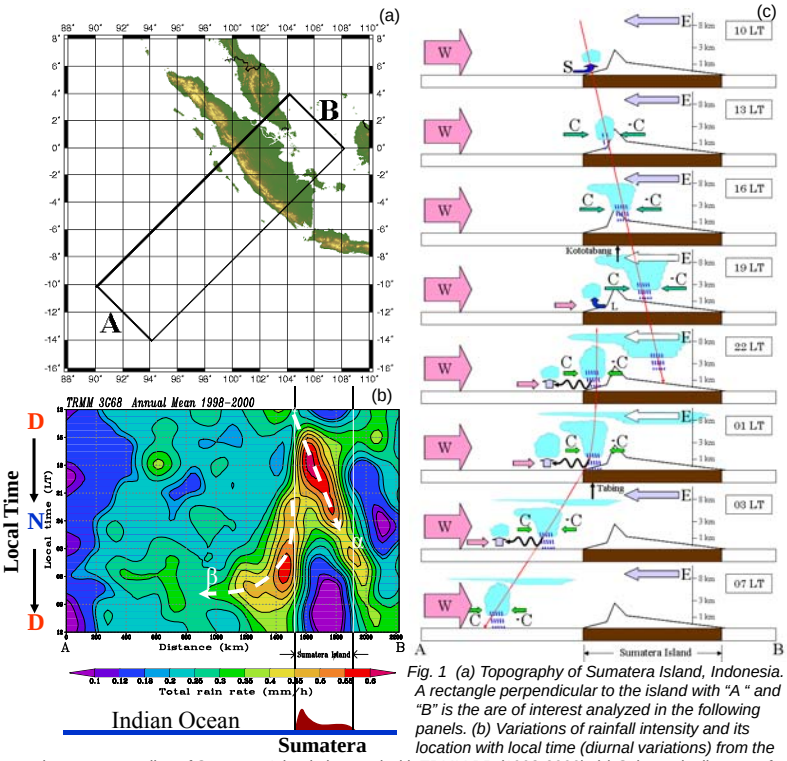

Fig. 1 (a) Topography of Sumatera Island, Indonesia. A rectangle perpendicular to the island with "A " and "B" is the are of interest analyzed in the following panels. (b) Variations of rainfall intensity and its location with local time (diurnal variations) from the southwestern coastline of Sumatera Island observed with TRMM PR (1998-2000). (c) Schematic diagram of diurnal land-sea rainfall peak migration and circulations related to the migration. (Mori et al. MWR 2004)

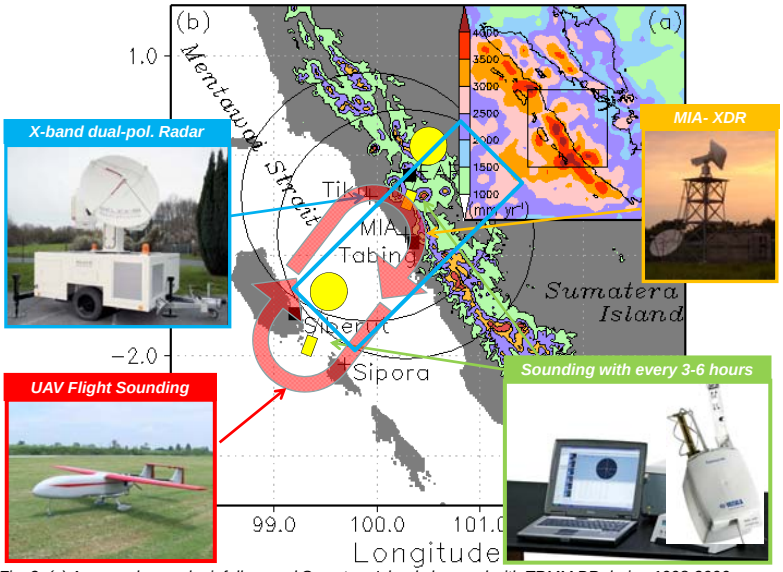

Fig. 3 (a) Averaged annual rainfall around Sumatera Island observed with TRMM PR during 1998-2006. (b) Location of x-band dual polarimetric and Doppler radars, sounding stations, and a flight pattern of UAV during HARIMAU2011 campaign observation. A blue rectangle shows the area of analysis in Fig.3.

2. Overview of HARIMAU2011

+ Campaign period: 01-31 December 2011 (one month)
+ Two MJO (MJO-2 and 3) passed over Sumatera Island during the period and brought moderate westerly wind in the lower troposphere.
+ CHeR along the strait was confirmed both in MJO active and inactive phases, however, process of development was different each other.

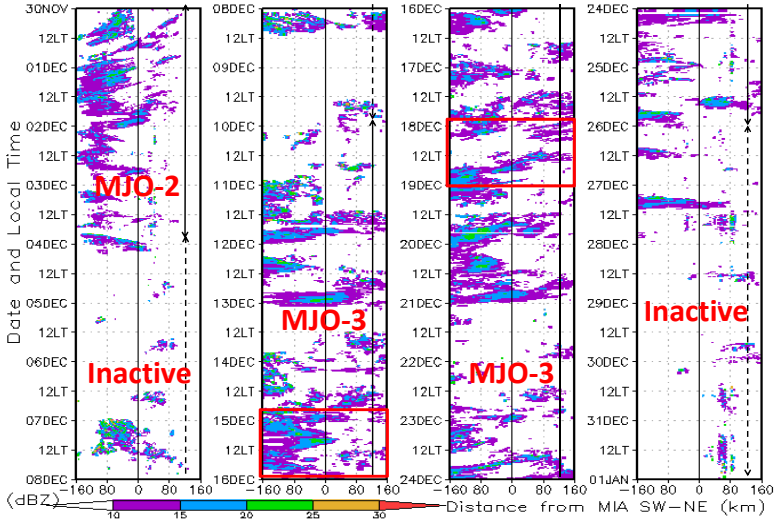

Fig. 3 Sequential variation of radar reflectivity in the blue rectangle depicted in Fig.3 observed with MIA-XDR. Reflectivity at 2 km above MSL was averaged over the short axis of the rectangle. Vertical solid lines at 0 km, which is the location of MIA-XDR, roughly corresponds to the coastline of Sumatera Island.

3. Development of coastal convection observed with DPR

+ Convections developed over coastal land in the evening and migrated westward with weakening both in MJO active and inactive phases.
+ During MJO active phase, convections originated from coastal land encountered eastward MJO convections over the sea and redeveloped.
+ ZDR showed heavy rainfall with large raindrops generated below the anvil cloud with ice crystals or wet snow originated convections from costal land when those two convections were merged into one.
+ Results suggest cloud microphysical processes, e.g., "seeder-feeder", have important role for the formation of CHeR along Sumatela Island.

CASE-I (Dec.15): Redeveloped convection over coastal sea after a westward land echo merged with eastward echo of MJO

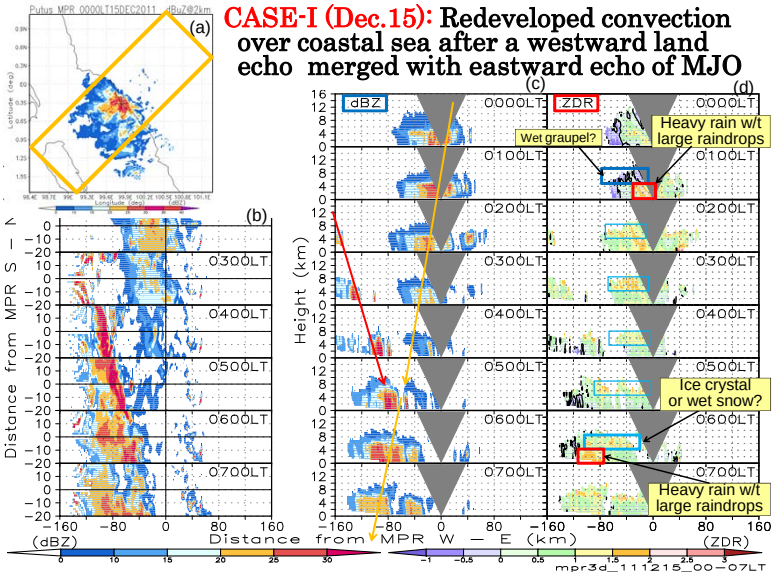

Fig. 4 Reflectivity and ZDR observed with DPR on 15 December 2011. (a) CAPPt at 2km observed with DPR at 0000LT. (b) Sequential variation of reflectivity at 2km in the yellow rectangle of panel (a). (c) Sequential variation of vertical cross-section of reflectivity along the rectangle in panel (a). (d) Same as panel (c) but for ZDR.