ABSTRACTS (MASTER THESIS)

Characteristics of tropical convection from a coordinated observation campaign in Indonesia

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A coordinated observation campaign was carried out using an X-band Doppler radar, GNSS (Global Navigation Satellite System) receiver network, balloon sonde, and AWS (Automatic Weather Station) from January to March 2013 in the Bandung basin, West Java. Although Bandung is situated at an altitude of about 700 m and surrounded by mountains with summits elevated over 1500 m above sea level, moist convections frequently take place within the basin. The objective of this study is to investigate the mechanisms of deep moist convection and moisture supply in Bandung by analyzing the observation data as well as referring to high resolution numerical model data simulated by Japan Meteorological Agency Non-hydrostatic Model (JMANHM).

Satellite cloud images showed that convections occurred around mountain slopes of Bandung almost every day during the coordinated campaign and the X-band radar data showed that cumulonimbi as tall as 15 km altitude were observed almost every day that cloud reach tropopause. In addition, clear diurnal variations of GNSS-derived PWVs (Precipital Water Vapor) were observed in many days during the campaign. We conducted detailed analysis about the case on 16 March 2013, in which large diurnal variations of PWVs and torrential rainfall inside the basin were observed (Figure 1). The points we want to clarify in this analysis were “cause of the diurnal variations of PWVs” and “mechanisms of convection initiation”.

As a result, it was found that moist air originated from the Indian Ocean was intruded into Bandung from the western basin (Figure 2), resulting in the large diurnal variations of PWVs. The convections inside the basin were initiated by low-level wind convergence at the southern basin. In addition, there was also a convection initiated by topographical forcing of moist air from the Indian Ocean at a mountain slope outside the basin. A sensitivity experiment using 10 times lower model topography showed largely different time variations of PWVs and rainfall distributions. These results suggest that, complicated topography of Bandung strongly influences on the diurnal variations of PWVs, the convection initiations and the rainfall distributions inside the basin.

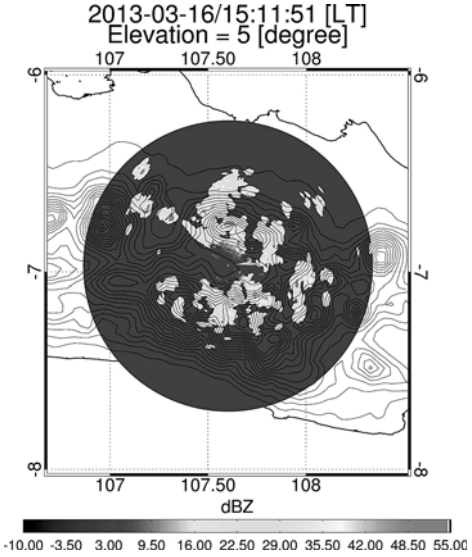

Figure 1. Map of radar refractivity at 1511 LT on 16 March 2013 observed by X-band radar.

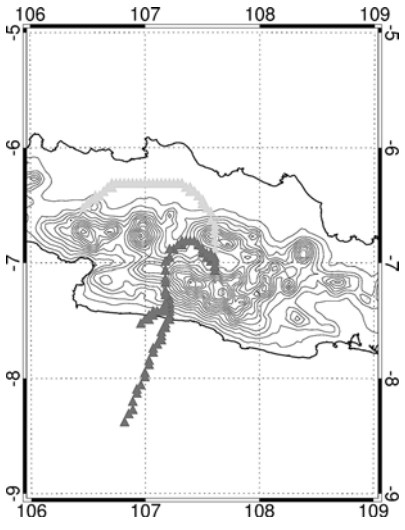

Figure 2. Trajectories of moist air parcels from 0800 LT to 1600LT on 16 March 2013.