

Relationships among Lightning, Precipitation, and Hydrometeor Characteristics in Equatorial Indonesia

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1. Introduction

Knowledge of the lightning activity is an important tool to the meteorologists. Many literatures have discussed on lightning activity for different regions. However, the studies pertaining to the variability of lightning occurrences in the equatorial Indonesia are scanty, except a few studies. Hence, in the present study, the variability of lightning activity in the equatorial Indonesia is examined, particularly at Kototabang (KT; 100.32E, 0.20S), Pontianak (PT; 109.37E, 0.00S), Manado (MN; 124.92E, 1.55N) and Biak (BK; 136.10E, 1.18S).

2 Data and Methodology

Lightning activity are observed from the World Wide Lightning Location Network (WWLLN) data. Following the advice of the WWLLN developers, only those lightning locations that triggered at least five sensors and that had residuals < 30 ms are included in this analysis [1]. The surface precipitation and the profiles of hydrometeors and latent heating are obtained from the products of the Tropical Rainfall Measuring Mission (TRMM) satellite. The aerosol data are retrieved from the Moderate Resolution Imaging Spectroradiometer (MODIS). Raindrop size distribution (DSD) at the surface is from a network of Parsivel disdrometers. 1.3 GHz wind profiler data at the four sites are used to determine the precipitating cloud type.

3 Results

The evidence of regional variation of precipitation microstructure (e.g., DSD) is clearly observed, and become more obvious during heavy rain. The composite spectra of PT and KT were much broader than Marshall-Palmer distribution, in contrast to the DSD at MN and BK, where the DSDs were narrow. This characteristic is consistent with the lightning activity. Figure shows regional variability of percentage occurrence of flashes. The convective storms are more intense at PT than other three sites and produce larger raindrops. Detailed analysis regarding the relationships among lightning, precipitation, and hydrometeor characteristics in equatorial Indonesia will be presented in the meeting.

References

[1] Abarca, S. F., Corbosiero, K. L., and Galarneau Jr., T. J.: An evaluation of the Worldwide Lightning Location Network (WWLLN) using the National Lightning Detection Network (NLDN) as ground truth, *J. Geophys. Res.*, 115, D18206, doi:10.1029/2009JD013411, 2010.

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