

Spatial and seasonal variation in rainfall over Sarawak, Malaysia

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In general, Borneo is located in the humid tropical region, which has no distinct seasonal variation in rainfall. The recent study, however, showed that some part of the southeast Asian humid tropical region had an obvious seasonal variation in rainfall and the variation had different patterns from site to site (ex. Kuraji and Ichie, 2005).

In this study, daily rainfall data observed for 41 years (1963 - 2003) at 17 sites in Sarawak was analyzed for understanding the spatial and seasonal variation in rainfall. Long-term pentad mean rainfall data set was made and its anomaly was calculated for site classification. The following 2 classification was applied to the rainfall anomaly. Classification 1 was by the amplitude value of fluctuation in pentad mean rainfall anomaly (0.7 or above, 0.4 - 0.7 and 0.4 or below). Classification 2 was made by cluster analysis. With the combination of these classifications, the seasonal rainfall variations of the 17 sites were classified into 5 groups (Fig.1). The range of amplitudes of seasonal fluctuation in the anomaly was above 0.7 for Group1, between 0.4 and 0.7 for Group 2 - 4 and below 0.4 for Group 5.

Chang *et al.* (2005) defined 4 seasons (DJF, MAM, JJA, SON) explaining rainfall seasonality associated with seasonal transition of the intertropical convergence zone (ITCZ). Fig.2 showed seasonal variation in pentad mean rainfall for the 5 groups. It was found that 5 groups have similar seasonal variation from May to November but different seasonal variation among groups in other months. Since Chang *et al.* (2005) used monthly data, it was not enough to apply his simple definition of 4 seasons to analyze the results shown in Fig.2.

In this study, we defined the following 5 seasons (Fig.2) and examined seasonal rainfall variations of 5 groups in each season. (1) Season I (2 Dec. - 31 Dec., 1 Jan. - 9 Feb.): The northeast monsoon over Sarawak. The largest rainfall was observed for all groups except group 5 which is located far from the coast. The northern boundary of the ITCZ was in the vicinity of the equator and northeast monsoon wind arrived Sarawak from the South China Sea. (2) Season II (10 Feb. - 31 Mar.): The first half of the transition of northeast monsoon to southwest monsoon. Group 1 rainfall decreased in this season, while rainfall stopped decrease and started increase after that for group 2 - 5. Rainfall of the group 3 and 4 showed minimum value in this season. (3) Season III (1 Apr. - 19 Jun.): The latter half of the transition of monsoon. Group 1 rainfall decreased, while group 3 and 4 rainfall increased. As a result, the differences in rainfall among 5 groups became smaller. (4) Season IV (20 Jun. - 13 Aug.): The southwest monsoon over Sarawak. All groups had a little rainfall and the differences among groups were small. The southwest monsoon was originated by the dry southeast wind from Australia which turned into southwest in the vicinity of the equator. (5) Season V (14 Aug. - 1 Dec.): The transition from the southwest monsoon to northeast monsoon. Rainfall increased for all groups. The difference of variation in rainfall among 5 groups was still small.

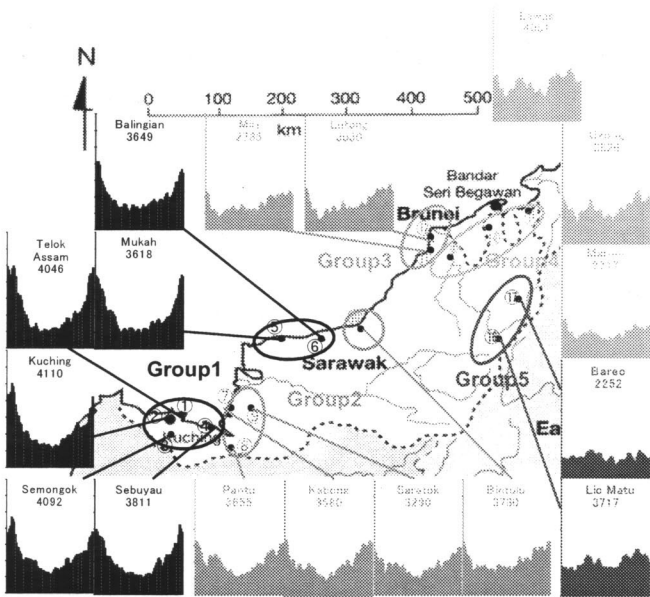


Fig.1 Location of 17 stations in Sarawak and long-term pentad mean rainfall. The number on the graph is annual mean rainfall (mm), the x-axis is pentad number and the y-axis is pentad mean rainfall with the max divisions of 35mm/day.

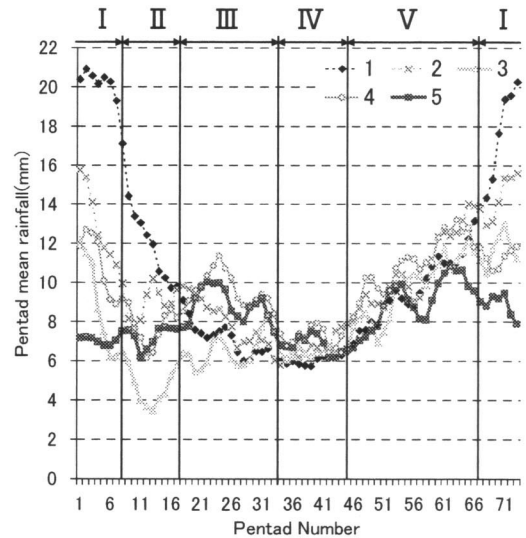


Fig.2 Seasonal variations of pentad mean rainfall for the 5 groups.

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