

the observing network, suggest they had already developed some extra-tropical characteristics. The right-front quadrant may well have contained an incipient warm-front.

Deppermann⁴ considered the rainfall distribution in four late-season (October–December) typhoons crossing the mountainous Visayas of the central Philippines. In every case the left semicircle was wetter than the right, and in three cases the right-front quadrant was wetter than the right-rear quadrant. Since each storm followed a track between west and west-northwest, and the Visayas lie northwest-southeast, the right-rear quadrant was the last to reach the observing network. Rainfall from this quadrant must have been greatly reduced by the progressive weakening of the circulation, an invariable occurrence in a storm crossing this region.

The distribution of rain in tropical storms

By C. S. RAMAGE

Royal Observatory, Hong Kong

13 February 1953 and 18 March 1953

Mr. Hughes¹ has made a most valuable contribution to the climatology of tropical storms. His generalized pattern closely resembles actual patterns in a majority of cases.

His computation of the divergence field is of particular interest, since it confirms observations of storm rainfall made in widely scattered regions throughout the tropics.² Results published by Cline³ and Deppermann⁴ are in disagreement with this pattern, and Mr. Hughes postulates in explanation the sudden change in surface friction when storms move from water to land. Should this be generally true, south China would receive more rain from the forward parts of typhoons. However, the mean observed distribution in 73 typhoons⁵ closely corresponds to that deduced from Mr. Hughes' computations, and examination indicates that neither Cline's nor Deppermann's storms can be classified as legitimate exceptions.

Cline³ analyzed rainfall recorded at United States stations of average latitude 29.7°N during the passages of four tropical cyclones (one in August, three in September). Distance from the tropics, and the fact that three of the storms were recurving as they crossed

¹ L. A. Hughes, "On the low-level wind structure of tropical storms," *J. Meteor.*, 9, 422–428, 1952.

² C. S. Ramage, "Analysis and forecasting of summer weather over and in the neighborhood of south China," *J. Meteor.*, 8, 289–299, 1951.

³ I. M. Cline, "Tropical cyclones," New York, Macmillan, 301 pp., 1926.

⁴ C. E. Deppermann, "Wind and rainfall distribution in selected Philippine typhoons," Manila, Bureau of Printing, 38 pp., 1937.

⁵ G. S. P. Heywood, "Hong Kong typhoons," *Tech. Mem. roy. Observ., Hong Kong*, No. 3, 23 pp., 1950.