THE EQUATIONS OF MOTION IN THE EQUATORIAL REGION.

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ABSTRACT.

The purpose of this monograph is to estimate the magnitude of the various terms of the equations of motion in the equatorial region, and thus: 1) come to some conclusions as to the limits of usefulness of the usual meteorological formulae in the tropics; and 2) point the way if possible to new formulae or new methods of approach to tropical problems.

In pursuance of this purpose handy tables are presented showing the magnitude of the different equation terms with varying parameters. Special attention has been given to practical formulae for the friction terms, both vertical and lateral. These tables are then applied: 1) to actual data concerning Philippine typhoons to test their coherency; interesting conclusions as to the relative values of the friction, pressure, geostrophic and vertical convection terms in tropical typhoons are drawn; 2) to the general tropical circulation. The prominent part played by vertical friction at the surface, and possibly by lateral friction aloft is stressed. The limits of use of the geostrophic terms are indicated.

Other problems peculiar to the tropics concerning typhoons, daily barometric oscillation, etc., are discussed. Finally there are indicated the limitations in the tropics of such aids in forecasting as the thermal wind equation, advective pressure tendency, "isobaric channel" formulae, the basic equations of the "slice" method, and isallobaric formulae.

Within the last few years, some very convenient approximate methods and formulae have been introduced facilitating the construction of weather charts, especially where sparcity of data exists. In them the geostrophic wind figures prominently, and its use has been particularly helpful. Unfortunately, as we approach the equator, we become suspicious as to the applicability of many such formulae in that region, especially of those which (like the geostrophic wind) contain the sine of the latitude. It is the purpose of the present paper to attempt first to estimate the magnitude of the various terms of the equations of motion in the tropics, and thus arrive in a position to test the limits of the fields of usefulness of the usual meteorological formulae and methods in the tropics, and to point the way, if possible, for substitutes thereto.

This article is suggestive rather than definitive, since there appears at present a lack of both theoretical and practical knowledge concerning some