VERTICAL DISTRIBUTION OF AIR CURRENTS IN DIFFERENT PARTS OF CYCLONES AND ANTICYCLONES.

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[Translated from the German by EDGAR W. WOOLARD.]

Under the designation "Group B" will be included those types of vertical distribution of winds characterized by constancy of wind direction with increase of height. Such a condition implies that no temperature changes are going on in the air currents involved.

Type B is that along the edges of stationary or slow-moving anticyclones when no region of low pressure is in the neighborhood; it is characterized by low velocities and constant direction up to great heights. Type B_0 occurs along the edge of anticyclones when there is a more or less marked cyclonic area near by; the influence of the latter is manifested in a gradual increase of velocity with height. Type B_1 is that which exists in the right section of cyclones, and is distinguished by strong winds (of unchanging direction) in the higher as well as in the lower strata; Type B_2 occurs in the right section of secondaries and differs from Type B_1 in having a maximum at the height of 500 to 2,000 meters.

The significant feature of the types of Group B is the absence of temperature changes in the given currents. The observations made at Dickson Island (latitude 73° 30′ 28″ N., longitude 80° 23′ E.) when such conditions prevailed, give for the mean temperature change (at the surface) during the following 54 hours 0° with a mean deviation of $\pm 0.5°$ and for the mean pressure change in the following 24 hours 1.4 ± 2.6 mm. Precipitation occurs on Dickson Island only with southerly winds. Accordingly, the meteorological conditions attending Type B may serve to characterize the climatology of a region. Types B_0, B_1, and B_2 have an importance for synoptic meteorology, because the associated cyclonic region travels in the direction of the given wind circulation. If such a distribution of winds is observed in a direction other than that in which the cyclone is progressing, we may confidently count on a change of direction of the cyclone and its motion according to the observed circulation.

If a warm current is raising the temperature in the free air, then there is a gradual turning to the right of wind direction with increase of elevation; the velocities are moderate (8–10 m/sec.). These winds will be designated as belonging to Group A.

Type A occurs in the rear (west section) of anticyclones, associated with warm, uniform, weather. The approach of a cyclone is heralded by a strengthening of the winds in the upper strata; the stronger the upper wind, the deeper and more energetic the advancing cyclone. The distribution of winds on the forward side of an ordinary cyclone is characterised by an increase in the turning to the right and an increase in velocity up to 2,000 meters. The temperature changes which give rise to this group manifest themselves in the retarded rate of fall of temperature with increase of elevation, often accompanied by inversions or isothermal stretches. The observed clouds are usually of the layer or stratus forms; the diurnal variation of the wind ceases. The observations during such régimes at Dickson Island give the mean pressure change during 40 hours as 13 ± 9 mm., and the mean temperature change during 46 hours as $9.5° \pm 6.0°$.

On the other hand, a fall of temperature is associated with a turning to the left, Group C. In cold waves from the north, this turning develops, often markedly, in the lower layers (Type C'); but in most cases, since cold waves lack anticyclonic structure, the turning takes place in the upper layers. Because of the rapid movement of cold waves, tremendous velocities often develop in the upper air (40–50 m/sec.). At Dickson Island the mean pressure change in cases of this group during 44 hours was 8.4 ± 4.5 mm., and the mean temperature change during the same time, $-5.4° \pm 4.0°$. In this type there is a strong decrease of temperature with height, the winds are gusty, and the clouds of the heaped-up types.

Type D occurs on the left side of cyclones; the lower wind (ordinary east wind) becomes, at 3 or 4 km., the general circulation with which the cyclone moves. In the forward parts of troughs there develops a wind distribution characterized by the change of the turning to the right in the lower layers to a turning to the left in the upper air, at 3 to 4 km.

FREE-AIR WINDS AT BAYONNE.[1]

By J. ROUCH.

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About 180 observations with pilot balloons were made at Bayonne in 1918. All of these reached 4,000 meters, but above that level the number decreased rapidly, being only about 40 at 9 and 10 kilometers. The data have been classified in various ways for the purpose of showing for example, the diurnal variation, frequency of different directions, clockwise and counterclockwise turning, etc. The seasonal variation is not discussed, however, nor are we informed as to the distribution of the observations through the year, whether good or poor. Tables and figures bring out well the various points discussed. The principal features are:

1. At the surface easterly winds are nearly as frequent as are westerly winds; at 1 and 2 kilometers the prevailing directions are S. and SW., but NE. and E. are also well represented; above 2 kilometers westerly winds predominate, the percentage frequency of NW. to SW. being 55 per cent at 4 kilometers and 69 at 8 kilometers.

2. Velocities increase on the average 100 per cent, from 3 to 6 m. p. s., in the first kilometer; there is a further increase, but less decided, from 1 to 4 kilometers where the average value is 10 m. p. s.; from this level to 10 kilometers the increase is slight, amounting to only 2.5 m. p. s.

3. The observations were regularly taken at 7 and 12 o'clock, G. M. T. When considered separately, they show the characteristic diurnal variation at the surface, where the velocities at 12 o'clock are about 2.5 m. p. s. higher than at 7, and the reverse variation above 200 m. At 400 m. the velocities in the morning are about 2 m. p. s. higher than at noon. The difference decreases from this height to about 3 kilometers, above which there appears to be no diurnal effect.

[1] *Etudes sur la haute atmosphère en France: Le vent en altitude à Bayonne.*