# METEOROLOGY

## ALONG THE EASTERN FRONT

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Now that Father Doucette has arrived, and our year of actual forecasting has so quickly come to an end, we can afford to sit back for a moment and reflect how far expectations with reference to the adaptability of Norwegian methods to the Philippines have been fulfilled.

In brief, the fundamental Norwegian ideas are these: a) There exist large bodies or masses of air which have almost the same fundamental characteristics throughout. b) Large cyclonic storms and typhoons occur only along the dividing line or front between these different air masses.

What are the different air masses to be expected in the Philippines? A study made at Washington of Werenskiold's "Mean Monthly Air Transport over the North Pacific Ocean," (Geofysiske Publikationer, Vol. II, No. 9) brought the conviction that there should be three main air masses:——1) the northeast monsoon in autumn, winter and spring, coming from the Asiatic high pressure area, and reaching the Islands in directions varying from north to east; 2) the trade wind, coming originally from the tropical high pressure area near California and swinging westward all the way across the Pacific, and reaching our coasts on and off even during the autumn, winter and early spring, dominant in the late spring and early summer, and a frequent visitor for the rest of the year when not ousted by the SW monsoon; 3) the so-called SW monsoon, being simply the SE trade wind of the southern hemisphere which, on crossing the equator from May to October, takes on usually a SW direction due to the effect of the earth's rotation.

The main characteristics of these three air masses are: 1) the NE monsoon originally is very dry and cold when it comes from the Asiatic deserts, but it rapidly picks up moisture in its lower layers as it rushes down the Pacific towards our Islands. This moisture is precipitated copiously along the eastern shores of our Islands, as it is forced aloft along the mountainous shore line. Manila usually gets the northers already "washed out" and hence during the winter months enjoys a dry season, but if the NE monsoon should reach the city from an easterly direction, the city is not protected by mountains, and "dirty" weather results. 2) The trade wind is only pleasantly moist at the base, gets a bit wetter as we go aloft to the height of the lower cumuli, and then, in the region of the antitrade, it turns decidedly dry. Hence it generally gives fine but warm weather, although in the late spring and summer months its moisture is precipitated during the frequent, practically daily thunderstorms.



3) The SW monsoon is very moist on reaching us. It probably originally had a structure like our trades, but due to the heavy convection it is subjected to in crossing the equatorial regions it becomes by the time it reaches us wet as far up as airplane flights in Manila have reached, i. e., some four kilometers. It therefore usually gives abundand rains, and as it rushes towards a typhoon it produces many squalls due to its moist instability. We see, therefore, by experience, that the predicted qualities of our three air masses have been verified.

What about fronts and the storms that arise along them? First, let us take the front between the trade and the northeast monsoon. A favorite place for this front is just outside the east coast of Japan and the Loochoos Islands, and then either through the Philippines or just north of it over to Indo-China. In the winter months, in the vicinity of Formosa, very many depressions start, since the trade is warm and the northeast monsoon cold. These depressions travel rapidly along the front, increasing in intensity as they go, in a northeast or easterly direction towards the Aleutian low pressure area near Alaska. We do not mention, as being outside our scope, the depressions that come either from Europe or mid-Asia and cross Japan and thence run on to the Aleutian deep.

With regard to the front between the trades and the SW monsoon, it now seems quite certain that most typhoons originate therein somewhere to the east or south of the Caroline and Ladrone Islands. It is too early yet to state the exact nature of a typhoon, but it seems very probable that in the beginning the SW monsoon forms a V-shaped wedge or sector, upside down, with the corner at or near the center of the typhoon. It also seems quite certain that the main energy for the typhoon comes from the latent heat of condensation of the moisture of the SW monsoon. While I was in Norway, the eminent Norwegian meteoroligsts thought that this wedge or sector should point the opposite way with the trade wind inside, but this does not seem to be true. Their reason was that they considered the trade warmer than the SW monsoon, but apparently the temperature difference, if any, at the *surface*, is too slight to be of importance compared with the moisture-energy of the monsoon. In fact, with the release of the warmth of the latent heat of condensation, it may well be that *aloft* the SW monsoon is the warmer air mass. In the beginning, therefore, we have a long front, the tropical or equatorial front as it is called, with trade wind to the north and SW monsoon to the south. As the typhoon travels westward, this front can be distinctly traced in the Philippines. Should the typhoon recurve, then near the Loochoos Islands an interesting change takes place. The