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AN OPERATIONAL PROBLEM IN WEATHER FORECASTING

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ABSTRACT

The weather forecaster has to get ready his forecasts at definite hours of the day on the basis of isopleths. Provided the observations from most of the main stations had been received, the deduction that could be had by decreasing the plotting time and studying the chart at greater leisure was often better than if the plotting time had not been decreased. A consideration of the weather chart plotted for a given forecast would also help the subsequent forecasts, due account having been taken of the diurnal changes.

Weather forecasting depends on observations taken at definite times. These observations are transmitted either directly or through a central collecting organisation to the forecast centre where they are plotted. The forecaster then draws the isopleths and gives out his inferences which have to be communicated to the public, the shipping interests, aviation, the ports and the like in a certain way. Many of the recipients including the shipping ones would like to tune in their receivers at only definite hours for weather. The time interval between the time of observation and that of dissemination is fixed. The recipients would normally expect the best possible service which is usually associated with the full possession of observations by the forecaster. Even during ordinary times, sometimes the latter condition is not fulfilled. During war-time the incoming and outgoing messages have often to be cyphered decreasing the time available to a forecaster. The communication bottle-necks reduce the number of observations available. To render service without delay, the forecaster has to make some *modus operandi* to overcome the delays due to (1) observation, (2) communication, (3) plotting and (4) deduction.

The following is based on the author's experience during 1942-45 when he worked at the Weather Section of the Meteorological Office (India Met. Dept.), Poona. That office was responsible for issuing weather broadcasts to the Fleet for the N. Indian Ocean and for detailed weather diary for a good portion of the Arabian Sea and the Persian Gulf, at least twice a day in ordinary weather and more often in disturbed weather. The information was telephoned to Bombay and later disseminated.

The India Meteorological Department made arrangements to see that the time taken for actual observations, for coding them and for their being delivered at the telegraph office was reduced as much as possible. The priority category of many of the telegrams was raised and the delay at the exchange offices minimised by personal discussion and correspondence. However, due to other priority messages there was bound to be delay in the transmission of weather telegrams. For about ½ hour after the time of observation, no message would probably be received. Then the rate of receipt of messages would increase rapidly. Between 1 to 1¼ hr. and at times 1 to 1½ hr. after time of observation, the peak period would have been reached and after that time the rate of receipt of weather messages would fall off

slowly. By the time the last few messages were received it would be some hours. For a given station model, the rate of plotting of the observations is practically constant. The distribution curve of receipt of observations with time has only to be displaced laterally to get that of observations ready for use of the forecaster with time. As in the beginning, the number of observations available for plotting were less than the optimum number, the second distribution curve might be slightly flatter.

The dead line for sending out messages for cyphering before despatch was (say) 12 hrs. It was possible to allow all observations to be plotted right upto 1145 hrs. and then to take up actual drawing isopleths and to draw deductions. The other possibility was to plot observations only upto an earlier time, say 1130 hrs., and devote the extra time for a more detailed study of the plotted observations. Every forecaster tries to take account of the observations received after the plotting was ceased and isopleth drawing was commenced if they relate to some, as he thinks, crucial regions. Provided that observations from most of the main stations had been received, the deduction that could be had by decreasing ten minutes for plotting observations and studying the chart at greater leisure was not inferior to and often better than if the ten minutes of plotting time had not been knocked off. The variables involved are time for plotting observations when the rate of incoming messages has decreased and the time required by the brain to draw conclusions. Often one has a tendency to decrease the latter. It has to be avoided.

There is a related problem, which under the particular circumstances, the author had the advantage of knowing. The plotted weather charts had been removed before all observations were plotted. It would be necessary to see the chart again after most of the observations were received. For example the evening chart (12 G.M.T.) would have been completely charted by next morning. The observations that had not been received even then would take several days thereafter. The isopleths on the 12 G.M.T. charts were drawn and studied in detail. Though in the tropics the kinematic prognostication of isopleths is disturbed considerably by the diurnal changes it is possible to assess the weather to be noticed in the next morning's (0230 G.M.T.) chart. When the 0230 G.M.T. chart is brought for forecasting, it would not be complete as stated earlier. But, one can notice how much the anticipated entities had varied from the already plotted observations. It would not be wrong to assume that in the wanting observations similar departures would occur and deduce the subsequent forecast. In the evening hours similar use of the morning charts could be made due account having been taken of the diurnal changes.