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UNUSUALLY EARLY AND HEAVY SNOWFALL OVER THE PUNJAB HIMALAYAS DURING 20-22 SEPTEMBER 1962

In a paper published in this Journal, Datta (1966) has presented synoptic charts for sea level and 500 mb for some days between 12 and 21 September 1962 and stated that the snowfall in the Punjab hills occurred due to the following reasons.

There was synchronisation of recurvature of a monsoon depression from the Bay of Bengal with the cold air outbreak associated with southeastwards extension and breaking up (weakening and spreading) of the sea level Ukrainian high of cold air between 20 and 21 September, the cold air advancing southeastwards from the Ukrainian anticyclone arrived over northwest India between 20 and 21 September as shown by sudden fall in day and night temperatures there, and it acted as a wedge lifting and replacing the moist air associated with the monsoon depression at the lower levels giving rise to snowstorm.

It is difficult to understand how cold air from the sea level Ukrainian high protruding southeastwards and breaking up between 20 and 21 September, could reach northwest India *simultaneously* and cause fall in temperature, there being barriers of 1 to 3 km height extending eastwards from the Pontine mountains in north Turkey to the Hindukush in north Afghanistan and thence southwards to the hills of southeast Baluchistan across its path. The cold air from the breaking up of Ukrainian sea-level high while flowing east or southeastwards, would stagnate on the windward side of the barriers and not be able to enter northwest India below about 2 km. Datta has not given wind directions in any of his sea level charts but it is seen from an examination of the Bombay Regional Centre charts that winds over the Punjab (Pakistan) would not show any flow of air from the west at least upto 3·0 km either on 20 or 21 September. Further, the stations whose temperature data are given in Table 1 of his paper, are all to the east of 74°E and most of them actually in and near the western Himalayas. As such, it is not correct to say that the southeastwards advancing cold air from the breaking Ukrainian sea level high acted as a wedge and lifted the moist air associated with the monsoon depression at the lower levels.

According to the detailed isohyetal study for 20-22 September 1962 (India met. Dep. 1963) widespread and locally heavy rain had occurred in connection with the movement of the depression. It is considered that the fall in temperature over

northwest India between 20 and 22 September mentioned by Datta, was due to the rainfall and *not* associated with the arrival of cold air from the west. The occurrence of snowfall so early was presumably due to lower than usual temperatures occurring over the region. The recurvature of the Bay depression after the 19th was, as it happens generally (Pisharoty and Desai 1956), under the influence of a trough in the westerlies moving eastwards.

Datta (1966) has considered the influence of the Urals on the pressure systems moving towards them from the west. Those arguments also apply to the barriers referred to earlier regarding the flow of cold air from the Ukrainian anticyclone to north India; it is, however, surprising that Datta has not considered the blocking effect of the same. Discussion of systems over Scandinavia and Russia to explain early snowfall over the Punjab hills, has confused the issues from the point of forecasting.

In view of what has been stated above, it can be concluded that Datta's explanation for unusually early and heavy snowfall in the Punjab Himalayas between 20 and 22 September 1962, cannot be accepted.

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