

551, 555 (235, 243)

WINDS OVER MT. EVEREST

• *1. Introduction.* The failure of the recent Swiss post monsoon expedition (October-November 1952) to Mt. Everest, due to high winds draws attention to the fact that the wind hazard is one to be reckoned with in the dry weather season and is as important as the weather hazard in the monsoon season. High winds have also been reported by previous expeditions. A knowledge of the general wind system over the mountain during different seasons is thus of importance to Everest expeditions. Some of the characteristics of the wind circulation over the mountain are briefly discussed in the following paragraphs.

2. Winds during the dry season (October-May). An important feature of the wind circulation over North India during the dry months is the existence of a westerly jet stream, a belt of strong winds at high levels in the upper troposphere. Recent work by the authors has indicated that the mean westerly jet stream lies over North India at an altitude of 12 km along latitude $27\frac{1}{2}^{\circ}$ N approximately during all the dry months of the year, October-May. The mean velocity of the jet stream is nearly 50 mps (100 knots) in winter and 30 to 35 mps (60 to 70 knots) in the post monsoon and pre-monsoon seasons. The characteristics of the jet stream in winter on individual occasions as well as in the mean have been discussed in recent papers (Koteswaram 1953; Koteswaram, Raman and Parthasarathy 1953). The properties of the jet streams in the other seasons will be examined elsewhere.

The mean position of the jet stream seems to be almost above Mt. Everest (Lat. $28^{\circ} 05' N$, Long. $86^{\circ} 58' E$) during all the dry months. Though the jet may fluctuate from day to day, the mountain top being within 3 km of the core of the jet stream is likely to get the full blast of the winds unless the jet stream either weakens considerably or moves far away from its mean position. Computed

mean winds over India in different seasons at the latitude and altitude of Mt. Everest are 40 mps (80 knots) in winter and about 25 mps (50 knots) in post monsoon and pre-monsoon seasons. The mean winds estimated from pilot balloon normals of neighbouring stations are 35 mps (70 knots) in winter and 20 to 25 mps (40 to 50 knots) during the post monsoon and pre-monsoon seasons.

3. Winds during the monsoon season. With the establishment of the southwest monsoon over the country, the westerly jet stream weakens and disappears and there is a reversal of winds to easterlies over most of the country. The sub-tropical ridge shifts to the Eastern Himalayas in the upper troposphere. Winds over the Mt. Everest are, therefore, weak and variable, the most predominant directions over the Everest region being from east to south. The lessening of the wind hazards is, however, counteracted by the weather hazards over the mountain in this season.

4. Day to day variation of winds. Apart from the variation of mean winds mentioned above, a knowledge of day to day variations of winds is of great interest for mountaineers. The only data available on this subject are the daily pilot balloon observations over North India near the Himalayas. Observations at high levels like 10 km are not generally available on days of high winds due to loss of balloons at low angles and on cloudy days due to obscuration by clouds. Since the periods suitable for Everest expeditions are pre-monsoon and post monsoon seasons an attempt has been made to make a detailed study during these seasons of the daily variation of winds in this region for one year (1952). Daily upper wind charts over India at altitudes of 20,000, 25,000 and 30,000 ft were examined during the periods March-June and September-November 1952. Isotachs (lines of equal velocities) were drawn and the probable velocities of winds at these levels in Mt. Everest region were estimated from day to day. Winds reported at 0900 Z alone were taken for the purpose of this study.

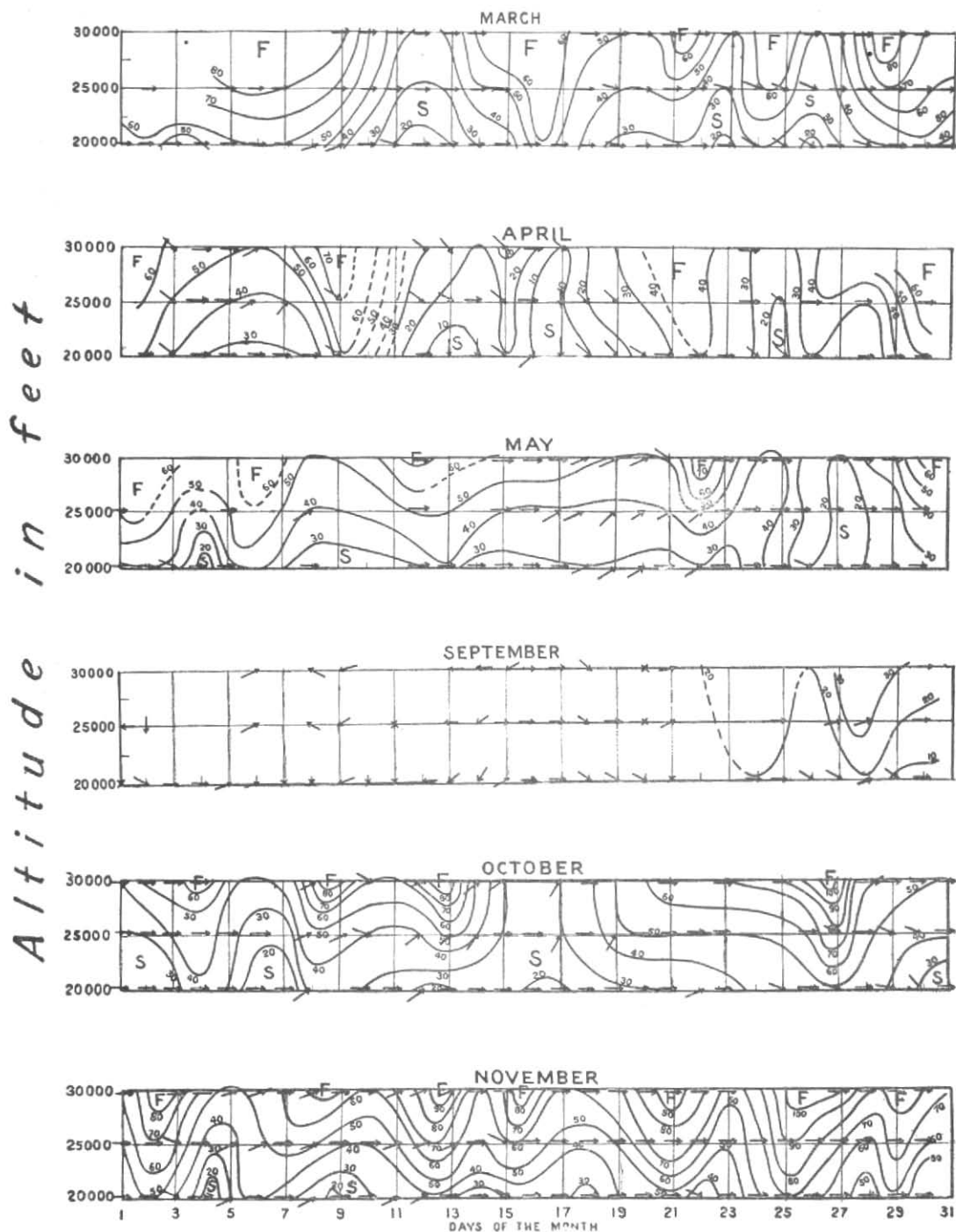


Fig. 1. Day to day variation of winds around Mt. Everest
 Solid lines indicate lines of equal velocity at 10 knot intervals
 and dotted lines when such winds are extrapolated
 Arrows : Direction of winds from the charts
 Crosses : When winds are small and varying
 F and S : Periods of fast and slow winds

Fig. 1 gives the time altitude cross sections of estimated wind velocities for the months March, April, May, September, October and November 1952. Solid lines have been drawn when the estimate is based on available data from neighbouring stations and dashed lines, when no such data are available and the isotach has been extrapolated in the cross section. The following are some of the salient features.

(i) At levels between 25,000 and 30,000 ft the directions of winds were generally southwest to northwest, but predominantly west to northwest both in the pre-monsoon and post monsoon. A few occasions of northerlies or southerlies occurred with the passage of western disturbances, but these winds were very light. Wind speeds at 30,000 ft were generally 60 to 80 knots in March, and 30 to 60 knots in April, May and in the first week of June. A reversal of winds to easterlies took place during the monsoon season and by the middle of September, the easterlies once again changed to westerlies. The speeds at 30,000 ft were generally below 30 knots in September and increased to 50 to 80 knots during October and November.

(ii) Fluctuations in wind speeds occurred periodically as can be seen in the figure. Winds were strong during first ten days of April with velocities ranging from 50 to 80 knots at 30,000 ft. The speed at these levels diminished rapidly and remained as low as 20 to 30 knots during the next ten days. During the rest of the season they again strengthened and were of the order of 50 to 60 knots except during the last week of May when they weakened to 20 to 30 knots. By the end of the month there was a rise to 60 knots which weakened during the first

week of June. The jet stream thus appears to have weakened during the first week of June.

In the post monsoon season, winds at 30,000 ft increased from 25 knots on 30 September to about 60 knots on 4 October. This may be taken to be the onset of the jet stream in this region. They continued at 40 to 70 knots upto the 14th after which there was a lull due to a western disturbance. With the moving away of the disturbance there was a rapid strengthening of the winds to 95 knots on the 26th. Winds fluctuated from 50 to 100 knots during the remaining days of October and November. The highest velocities seem to have been attained between 25 and 27 November.

It thus appears that winds in the pre-monsoon season over Mt. Everest region are comparatively less strong than those of the post monsoon season and also that the number of lulls with less strong winds are more in pre-monsoon season than in the post monsoon.

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