

(iv) **Polar Easterlies**—The polar easterlies are those winds which move out of the polar highs towards the subpolar low pressure belt. There are no regular winds blowing from the north polar region. And polar high is also not a permanent feature of arctic circulation. The winds in polar regions in the northern hemisphere generally blow from various directions, and they are largely controlled by local weather disturbances.

The polar easterlies of the southern hemisphere are more well defined. Here Easterly winds blow from the anticyclone formed over the high plateau of eastern Antarctic.

Monsoons

The word 'monsoon' is used to indicate the winds in the areas where they change their direction twice in a year. The word 'monsoon' has been derived from Arabic word 'mausim' or Malayan word 'monsin' meaning season. It refers to such an act of atmospheric circulation which reverses its direction completely every 6 months or say during summer and winter. The word first used by Arab navigators for the winds blowing over the Arabian Sea between Arab and India wherein they blow from north-east to south-west for 6 months during winter season and from south-west to north-east during summer season. On this basis the word monsoon was applied to all those winds of the globe which show directional change from summer to winter and vice-versa. But only directional change is not the only criterion of monsoon. Since there are regions lying between 60°–70° latitudes in the northern hemisphere is characterised by north east polar winds during winter season and by south-west westerlies during summer season. Infact monsoon are surface convective systems which originate due to differential heating and cooling of land and water and thermal variation. This type of monsoon climatic region is more developed in Indian Sub Continent, South east Asia, parts of China and Japan, Southern USA & northern Australia.

According to Chang-Chia Cheng "Monsoon is a flow pattern of the general atmospheric circulation over a wide geographical areas in which there is clearly dominant wind in one direction in every part of the region concerned, but in which this prevailing direction of wind is reversed from winter to summer and from summer to winter".

(For more details please refer Geography of India Section. Unit-9)

Jet streams—The jet streams are defined as swift geostrophic air streams in the upper troposphere that meander in relatively narrow belts. These are strong cores of upper level westerly winds which follow a meandering path.

It was discovered during the last phase of second world war when the American bomber pilots tried to fly towards Japan at an altitude of about 13,000 meters, they encountered strong head winds which greatly reduced their ground speed (sometimes to zero). But while returning to their bases in the east they found that speed became much faster and at times it even doubled because of a high velocity tail wind. Ultimately this experience led to the discovery of jet stream.

However, it is believed that there were certain clues to the existence of the jet streams as early as 1904. The early investigators while studying the high-speed cirrus clouds pointed out the existence of high velocity winds in upper troposphere.

According to **Trewartha**, the jet streams are relatively narrow bands of stronger winds bounded by slower moving air, jet stream is also described as a westerly air current in the form of a flattened narrow core or tube, thousands of kilometres in length, a few hundred kilometres in width, and two or more kilometres in vertical thickness.

Jet streams are also characterized by a great seasonal variation. During the colder part of the year they migrate towards the equator and their velocity also increases. In summer the wind speeds in the jet streams are reduced to about half of what it is in winter because of smaller horizontal temperature gradients. In winter, the jet streams extend far into the tropics. The mean velocity of the jet stream winds is about 144 km per hour. But at times, the wind velocity in the inner cores of the jet stream may be as high as 480 km per hour or even more. During the cold season, generally the wind travels at a speed of 160–240 km per hour at the core of the jet stream.

Jet stream and surface weather—It plays a very significant role in controlling the behaviour of terrestrial atmosphere. Now it is an established fact that the so-called polar front jet streams are closely related to the middle latitude weather disturbances. The meanders of the more northerly upper tropospheric jet stream determine the location of the surface polar front. Besides, the paths followed by the Cyclones are also largely controlled by these upper level high velocity westerlies. Meteorologists are also of the view that