3. Why do the greatest number of atmospheric waves occur during northeasterly winds, and the least number with southwesterly winds ?

A stratum of lower air, set in motion from the northeast towards the southwest, would be moving in an opposite direction to the upper or poleward stratum, therefore, the greater the velocity of the lower layer towards the westward, caused by the differences of atmospheric pressure, over the earth's surface, the greater will be the opposing forces at the boundary surfaces of the two strata, where great atmospheric billows may be found, especially when the densities vary greatly, caused by large differences of temperature between the two strata. The result would be similar to a high wind blowing against a strong surface current of water.

The minimum number of waves recorded during southwesterly winds is due to the lower stratum of air moving in the same direction as the upper, or poleward stratum.

4. Why do the greatest number occur during the winter months ?

The winter being the time of the greatest differences of temperature between the equator and the poles, and consequently a more rapid movement of the poleward current, slight changes of velocity of the lower atmosphere tend to set up waves along their boundary surfaces, where, in all probability, greater differences of temperature exist than in summer. As in the case of an important storm centre moving northeasterly from the Gulf of Mexico, bearing large quantities of heat and moisture, while pronounced anti-cyclonic conditions, attended by great cold, prevail in the northern portions of the continent.

5. How can these atmospheric waves, which correspond to only a few hundredths or thousandths of the barometric inch at the earth's surface, cause such rapid and extreme oscillations as appear upon the tidal records ?

The peculiar configuration of the coast line and varying depths of water, being the main causes of the different heights of the tides at separate stations, may we not apply the same to account for these peculiar oscillations, by asserting that the atmospheric waves or billows, in passing over the surface of the sea (in this case in the vicinity of Halifax harbour), tend to form minute undulations upon the surface, corresponding to the length of these billows, which, as they move farther into the bay, become magnified as they reach narrower and shallower portions, until finally they assume the proportions as found upon the tide gauge, a distance of about nine miles from the entrance to the harbour. That these oscillations do become more pronounced the farther one enters a long bay, have been noted by those in connection with tidal work. (7)

In conclusion, if the above explanations are correct, would it not be of great scientific and commercial value, in place of eliminating these secondary undulations, when tabulating the primary ones, to increase the amplitude of these secondaries, by lengthening the cylinder, use one sheet per day to prevent confusion of traces, and make a special study of them, respecting their intensity and time interval, in conjunction with synoptic charts during different types of weather ? It appears as if these gauges are extra sensitive barometers, locally forewarning the approach of important storm centres many hours previous, in fact, during a rising or stationary barometer and before the shift of wind.

Improved tidal gauges of such construction are likely to be of incalculable value at all coast stations, more particularly by those on a western seaboard, such as that of the British Isles.

(7) Among others by Major Baird, R.E., F.R.S., Manual for Tidal Observations, 1886.