

(30.) In the view we have taken of the production of the trades, the immediate verticality of the sun acts as a disturbing force. In its passage from solstice to solstice it causes an annual fluctuation or oscillation to and fro of this medial line, and of the northern and southern limits of the wind-zones ; which, where those limits cross the ocean, is but of moderate amount, because the medium temperature of the intertropical seas varies but little with the seasons. But where they cross extensive tracts of land, their oscillations to and fro may become very considerable, owing to the high temperature which the land is capable of acquiring. Now in this case, so soon as the autumnal equinox is passed, the vertical sun enters on the full breadth of this vast continental tract ; and commences throwing up torrents of vapour and intensely heated air, the latter being far in excess of what it would be over an equal area of sea ; while at the same time, owing to the sun's then rapid motion in declination, the limits of the wind-zones retreat southward, and their regularity is disturbed and broken ; which cannot but give rise to great temporary confusion and disturbance in the winds themselves. As to the "atmospheric wave" which recurs periodically at this season, it results most probably from the operation of the more general of the causes above mentioned, by which a large amount of extraneous air and vapour is thrown into the atmosphere *of the North Pacific* ; causing the south-west wind of that ocean to sweep with increased force up the western slope of that vast range of lofty mountains which fringes the North American continent ; and to be thrown up