the middle of the seventeenth century, the number which took place in winter and spring has been to that of those which broke out in summer and autumn as 7 to 4. In Japan, also, the greater number of recorded eruptions have taken place during the cold months of the year, February to April.[36]

There may be other causes besides atmospheric pressure concerned in these differences; the preponderance of rain during the winter and spring may be one of these. According to Mr. Coan, previous to the great Hawaiian eruption of 1868 there had been unusually wet weather, and to this fact he attributes the exceptional severity of the earthquakes and volcanic explosions. The greater frequency of Japanese volcanic eruptions and earthquakes in winter has been referred in explanation to the fact that the average barometric gradient across Japan is steeper in winter than in summer, while the piling up of snow in the northern regions gives rise to long-continued stresses, in consequence of which certain lines of weakness in the earth's crust are more prepared to give way during the winter months than they are in summer.[37] The effects of varying atmospheric pressure, however, can probably only slightly and locally modify volcanic activity. Eruptions, like the great one of Cotopaxi in 1877, have in innumerable instances taken place without, so far as can be ascertained, any reference to atmospheric conditions.

Kluge has sought to trace a connection between the years of maximum and minimum sun-spots and those of greatest and feeblest volcanic activity, and has constructed lists to show that years which have been specially characterized by terrestrial eruptions have coincided with those marked by

[36] J. Milne, Seismol. Soc. Japan, IX. Part ii. p. 174.
[37] J. Milne, loc. cit.