

take place at more complicated periods than those found by Saussure and myself), and its variations in the different seasons of the year, at different distances from the equator, and in the different relations of continental or oceanic surface.

The electric equilibrium is less frequently disturbed where the aerial ocean rests on a liquid base than where it impends over the land; and it is very striking to observe how, in extensive seas, small insular groups affect the condition of the atmosphere, and occasion the formation of storms. In fogs, and in the commencement of falls of snow, I have seen, in a long series of observations, the previously permanent positive electricity rapidly pass into the negative condition, both on the plains of the colder zones, and in the Paramos of the Cordilleras, at elevations varying from 11,000 to 15,000 feet. The alternate transition was precisely similar to that indicated by the electrometer shortly before and during a storm.* When the vesicles of vapor have become condensed into clouds, having definite outlines, the electric tension of the external surface will be increased in proportion to the amount of electricity which passes over to it from the separate vesicles of vapor.† Slate-gray clouds are charged, according to Peltier's experiments at Paris, with negative, and white, red, and orange-colored clouds with positive electricity. Thunder clouds not only envelop the highest summits of the chain of the Andes (I have myself seen the electric effect of lightning on one of the rocky pinnacles which project upward of 15,000 feet above the crater of the volcano of Toluca), but they have also been observed at a vertical height of 26,650 feet over the low

* Humboldt, *Rélation Historique*, t. iii., p. 318. I here only refer to those of my experiments in which the three-foot metallic conductor of Saussure's electrometer was neither moved upward nor downward, nor, according to Volta's proposal, armed with burning sponge. Those of my readers who are well acquainted with the *quæstiones vexatæ* of atmospheric electricity will understand the grounds for this limitation. Respecting the formation of storms in the tropics, see my *Rél. Hist.*, t. ii., p. 45 and 202-209.

† Gay-Lussac, in the *Annales de Chimie et de Physique*, t. viii., p. 167. In consequence of the discordant views of Lamé, Becquerel, and Peltier, it is difficult to come to a conclusion regarding the cause of the specific distribution of electricity in clouds, some of which have a positive, and others a negative tension. The negative electricity of the air, which near high water-falls is caused by a disintegration of the drops of water—a fact originally noticed by Tralles, and confirmed by myself in various latitudes—is very remarkable, and is sufficiently intense to produce an appreciable effect on a delicate electrometer at a distance of 300 or 400 feet.