

by the united influence of which I still believe the principal revolutions in the meteorological state of the atmosphere at different geological periods have been brought about. The Gulf Stream was particularly alluded to by me as moderating the winter climate of northern Europe, and as depending for its direction on temporary and accidental peculiarities, in the shape of the land, especially that of the narrow Straits of Bahama, which a slight modification in the earth's crust would entirely alter.

Mr. Hopkins, in a valuable essay on the causes of former changes of climate,* has attempted to calculate how much the annual temperature of Europe would be lowered if this Gulf Stream were turned in some other and new direction, and estimates the amount at about six or seven degrees of Fahrenheit. He also supposes that if at the same time a considerable part of northern and central Europe were submerged, so that a cold current from the arctic seas should sweep over it, an additional refrigeration of three or four degrees would be produced. He has speculated in the same essay on the effects which would be experienced in the eastern hemisphere if the same mighty current of warm water, instead of crossing the Atlantic, were made to run northwards from the Gulf of Mexico through the region now occupied by the valley of the Mississippi, and so onwards to the arctic regions.

After reflecting on what has been said in the thirteenth chapter of the submergence and re-elevation of the British Isles and the adjoining parts of Europe, and the rising and sinking of the Alps, and the basins of some of the great rivers flowing from that chain, since the commencement of the glacial period, a geologist will not be disposed to object to the theory above adverted to, on the score of its demanding too much conversion of land into sea, or almost any amount of geographical change in post-pliocene times. But a difficulty of

* Hopkins, Geological Quarterly Journal, vol. viii. p. 56, 1852.