

1837 was felt on a line 500 miles in length by 90 in breadth\*: more than 6000 persons perished; deep rents were caused in solid rocks, and new hot springs burst out at Tabereah.

*Chili — Valdivia, 1837.*—One of the latest earthquakes by which the position of solid land is known to have been permanently altered is that which occurred in Chili, on November 7th, 1837. On that day Valdivia was destroyed by an earthquake, and a whaler, commanded by Captain Coste, was violently shaken at sea, and lost her masts, in lat.  $43^{\circ} 38'$  S. in sight of the land. The captain went on the 11th of December following to a spot near the island of Lemus, one of the Chonos archipelago, where he had anchored two years before, and found that the bottom of the sea had been raised more than eight feet. Some rocks formerly covered at all times by the sea were now constantly exposed, and an enormous quantity of shells and fish in a decaying state, which had been thrown there by the waves, or suddenly laid dry during the earthquake, attested the recent date of the occurrence. The whole coast was strewn with uprooted trees.†

*Chili — Concepcion, 1835.*—Fortunately we have a still more detailed account of the geographical changes produced in the same country on the 20th of February, 1835. An earthquake was then felt at all places between Copiapo and Chiloe, from north to south, and from Mendoza to Juan Fernandez, from east to west. "Vessels," says Mr. Caldeleugh, "navigating the Pacific, within 100 miles of the coast, experienced the shock with considerable force."‡ Concepcion, Talcahuano, Chillan, and other towns were thrown down. From the account of Captain Fitz Roy, R.N., who was then employed in surveying the coast, we learn that after the shock the sea retired in the Bay of Concepcion, and the vessels grounded, even those which had been lying in seven fathoms water: all the shoals were visible, and soon afterwards a wave rushed in and then retreated, and was followed by two other waves. The vertical height of these waves does not appear to have been much greater than from sixteen to twenty feet, although they rose to much greater heights when they broke upon a sloping beach.

According to Mr. Caldeleugh and Mr. Darwin, the whole volcanic chain of the Chilian Andes, a range 150 miles in length, was in a state of unusual activity, both during the shocks and for some time preceding and after the convulsion, and lava was seen to flow from the crater of Osorno. (See Map, fig. 52.) The island of Juan Fernandez, distant 365 geographical miles from Chili, was violently shaken at the same time, and devastated by a great wave. A submarine volcano

new principle, I cannot insert them, as they would enlarge too much the size of my work. The late Von Hoff published from time to time, in Poggendorf's *Annalen*, lists of earthquakes which happened between 1821 and 1836; and, by consulting these, the reader will perceive that every month is signalized by one

or many convulsions in some part of the globe.

\* Darwin, *Geol. Proceedings*, vol. ii. p. 658.

† Dumoulin, *Comptes Rendus de l'Acad. des Sci.*, Oct. 1838, p. 706.

‡ *Phil. Trans.* 1836, p. 21.