



IUGS International Commission on the History of Geological Sciences (INHIGEO)

“Anniversaries”: The 1868 Peru earthquake and its effect across the Pacific Ocean; a landmark in tsunami research undertaken by Ferdinand Hochstetter, born 190 years ago.

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“The powerful earthquake of 13 August this year caused flooding phenomena in the territories of the Pacific Ocean which had a devastating effect on the most remote coasts. The news from the vast areas of the southern seas have only arrived very gradually, and only a complete collection of all the associated facts will make it possible to form an overview of the extraordinary phenomenon of the devastation of Peruvian coast that was brought about by a wave movement in the sea. This seems to have spread its effect throughout the enormous territory of the Pacific Ocean.”
(Hochstetter, 1868: 837)

This was how Ferdinand Hochstetter (1829-1884) began his paper on the earthquake in Peru, which was to become a landmark publication in the history of tsunami-research. This came about because Hochstetter, then employed in Vienna, received news from his friend and fellow geologist Julius Haast in Christchurch about the extraordinary tidal waves on the east coast of New Zealand. He made a wise and important link that related the “Fluthwelle” (“tidal wave”) to some tectonic phenomenon.

We could ask, how did the Japanese word “Tsunami” become a scientific term? Japanese fishermen called the phenomenon a “Tsu-nami” (“a wave in the harbour”) when they had not seen any wave whilst at sea but found the harbour destroyed on their return to port.

The journey of the coming into being of a scientific phenomenon leads us to a German-born geologist, who studied Theology and Philosophy at the University of Tübingen (Germany). He then learned geology as a fieldworker with the Austrian Survey (founded in 1849) in Vienna, and subsequently had the opportunity to be selected as one of the scientists on the global “Novara Expedition” (named after the ship) and organised by the Austrian Academy in cooperation with the Habsburg Imperial Navy. After he had spent more like two years on the ship circumnavigating half the globe (1857-1858) Hochstetter was invited to stay in New Zealand, where he undertook geological surveys in the two main islands. His geological map of the surroundings of Auckland

(Fig.1) and the volcanoes of the Auckland Volcanic Field was part of the first systematic research into the geology of New Zealand. After spending the first nine months of 1859 in New Zealand he returned to Vienna where he was appointed professor at the Technical University of Vienna. He later became Rector and Director of the revamped Natural History Museum, in Vienna. This was a position he was to retain until his death on 18 July 1884.

Because of the widely held view at that time that quakes were linked to volcanic activity and after his travel experiences Hochstetter focussed on earthquakes and in particular the earthquake of 13 August 1868 on the Peruvian coast. Through his contacts he received information about “tidal waves” reaching as far as New Zealand and Australia. This tsunami was the most extensive one, reaching the coast of the Chatham Islands, 800 km east of the South Island of New Zealand, 15 hours after the earthquake. Hochstetter was the first to relate the waves with a tectonic event. He calculated its speed of travel and drafted out a mechanism as how a “Flutwelle” (tidal wave, today known as Tsunami) could be originated (Fig. 2.) The drawings were first discussed by Leonore Hoke.

For more information:

Ferdinand Hochstetter, F. Ueber das Erdbeben in Peru am 13. August 1868 und die dadurch verursachte Fluthwellen im Pacifischen Ocean, namentlich an den Küsten von Chili und von Neuseeland. In: *Sitzungsberichte der kaiserlichen Akademie der Wissenschaften*, mathemat-naturw. Kl., 2. Abt. 58 (1868), p. 837-860.

Ferdinand Hochstetter, Die Erdbebenfluth im Pacifischen Ocean von 13. bis 16. August 1868. In: *Mittheilungen aus Justus Perthes geographischer Anstalt über wichtige neue Erforschungen auf dem Gesamtgebiet der Geographie* 15 (1869), p.222-226.

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Hans P. Schönlaub, Die Sumatra-Andamanen-Katastrophe vom 26. 12. 2004 und andere Beben. <http://www.geologie.ac.at/Geologie.ac.at/de/GEONEWS/2004-12-26Tsunami.htm>

Leonore Hoke, Ferdinand von Hochstetter's comments on the tsunami waves affecting New Zealand in mid-August 1868, abstract in: *Geological Society of New Zealand, Annual Conference (2000)*, p. 75.

Leonore Hoke, L., G.L. Downes, G.L., Ferdinand von Hochstetter's publications on the 1868 August 13 South American tsunami. In: Cochran, U. (comp.) Programme & abstracts: the International Workshop, Tsunamis in the South Pacific: research towards preparedness and mitigation, 25-27 September, 2003, Wellington, New Zealand. *Institute of Geological & Nuclear Sciences information series* 58, p.33.

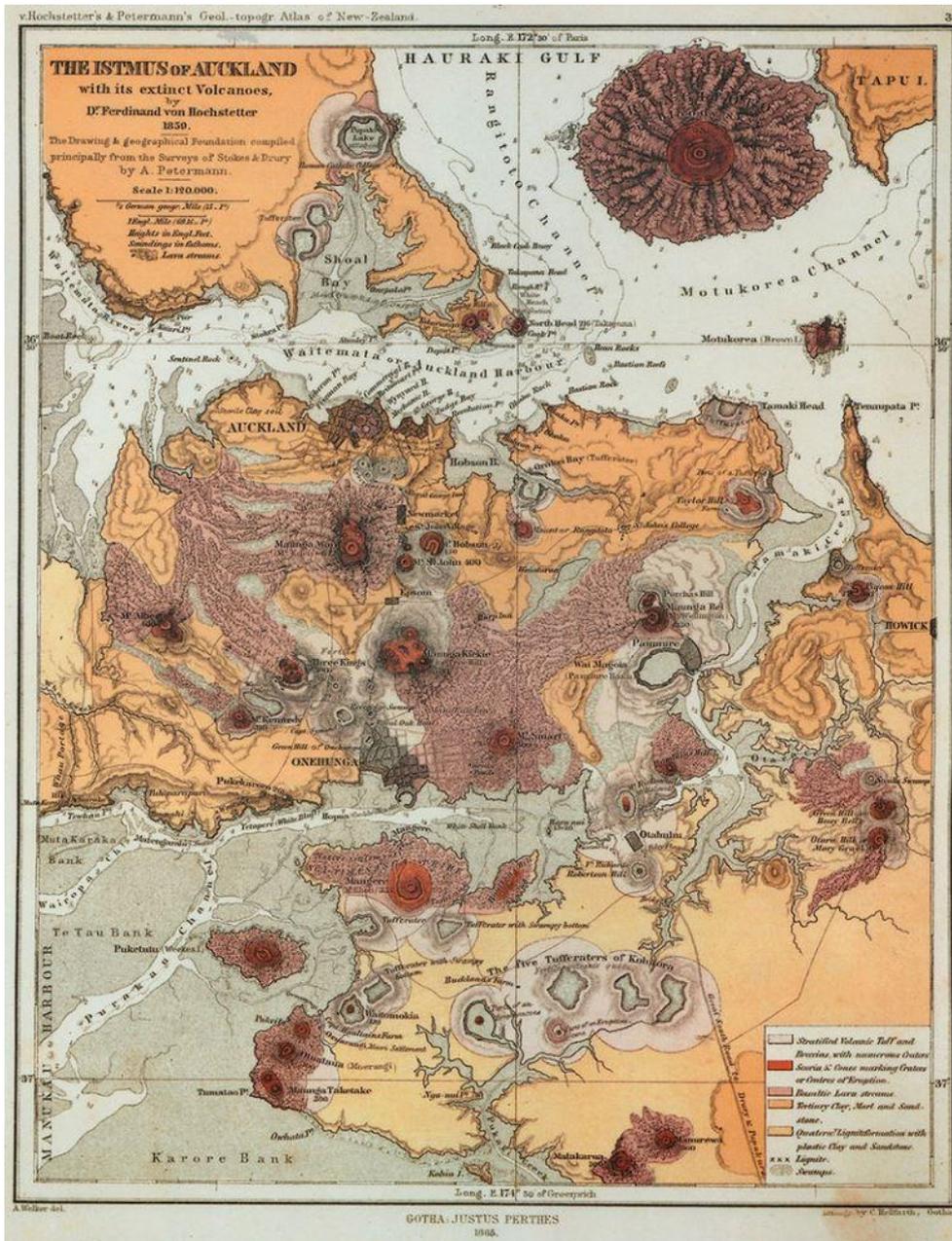


Fig. 1 - Geological map of the Auckland Volcanic Field by Ferdinand von Hochstetter, 1864. Originally published in Hochstetter and Petermann, Geologisch-topographischer Atlas von Neu-Seeland, 1863, in Engl. 1864). Wikicommons.

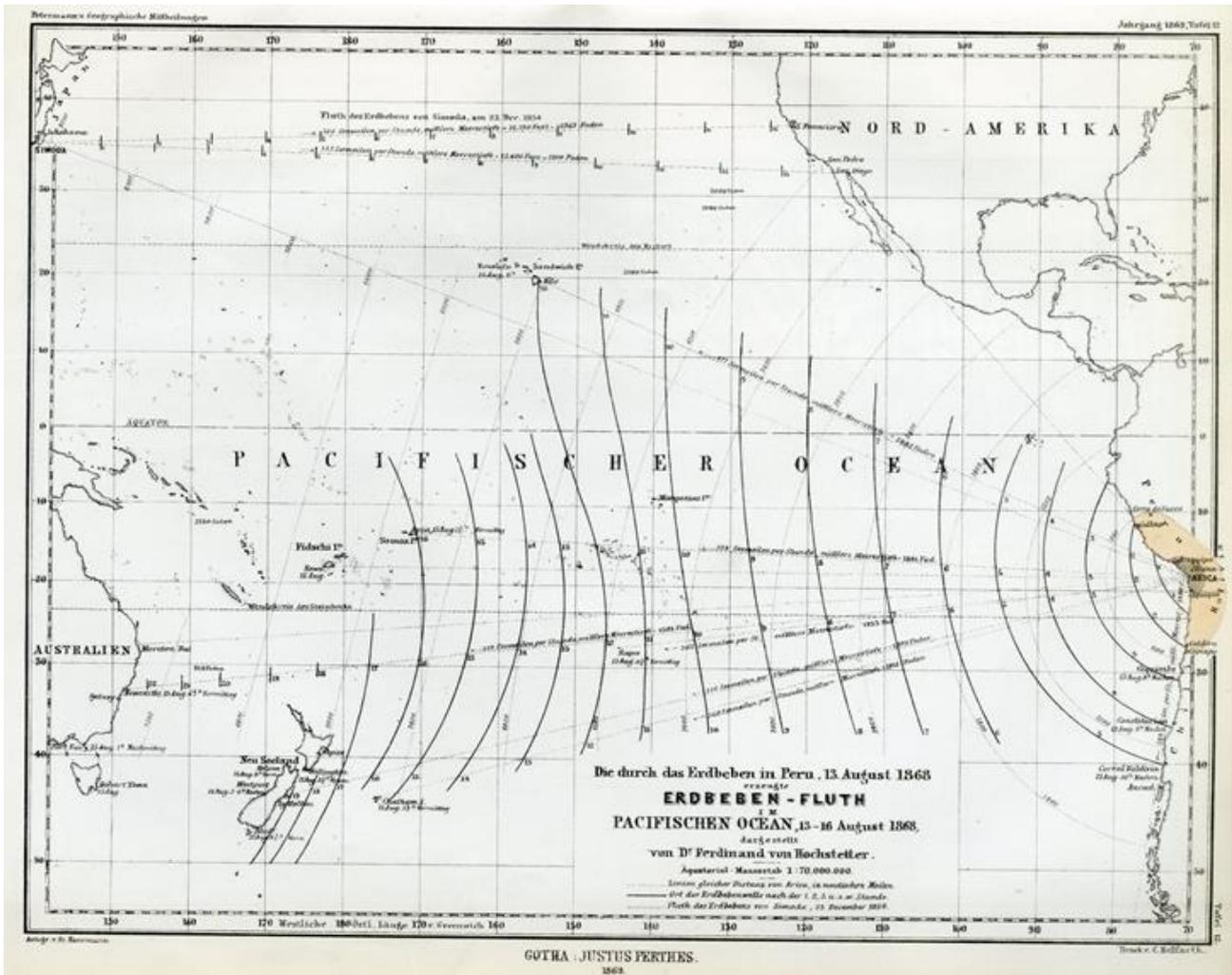


Fig. 2 - Drawings by Ferdinand Hochstetter about the spread of the waves after the earthquake in Peru, August 13, 1868. Published in: Mittheilungen aus Justus Perthes (1869), permission of the Geological Survey of Vienna (Geologische Bundesanstalt, Archiv und Bibliothek).