ISSN 8755-6839

SCIENCE OF TSUNAMI HAZARDS

Journal of Tsunami Society International

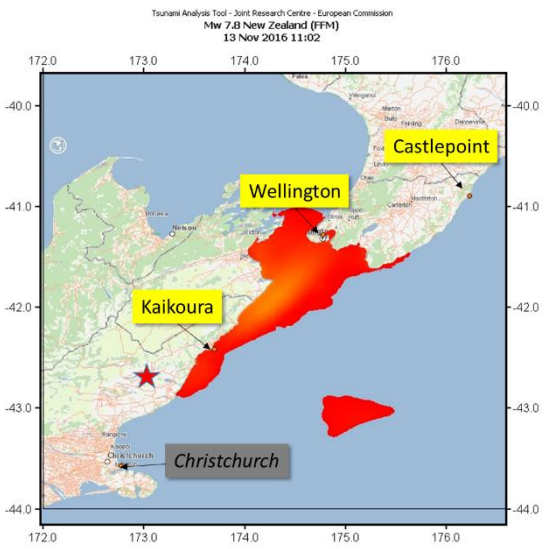
Estimation of Coseismic Deformation from the Sea Level Measurements during the Mw 7.8 Earthquake of 13 Nov 2016 in New Zealand

A. Annunziato

Letter to the Editor, 15 Nov 2016

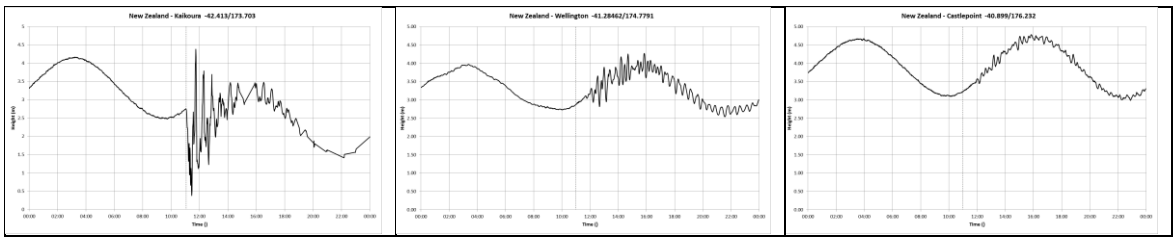
Dear Dr. Pararas-Carayannis

I would like to inform you that as a consequence of the large Earthquake and following Tsunami Mw. 7.8 that occurred two days ago in New Zealand, a phenomenon, that was already identified in the case of Mw. 9.0 Tohoku Tsunami has occurred again. Infact the sea level measurement present in the area of the larger deformation has shown a behaviour typical of an uplift of about **0.95 m**. In the case of the Japan event, instead, the sea level demonstrated a subsidence on the coasts of Japan, confirmed by GPS measurements.



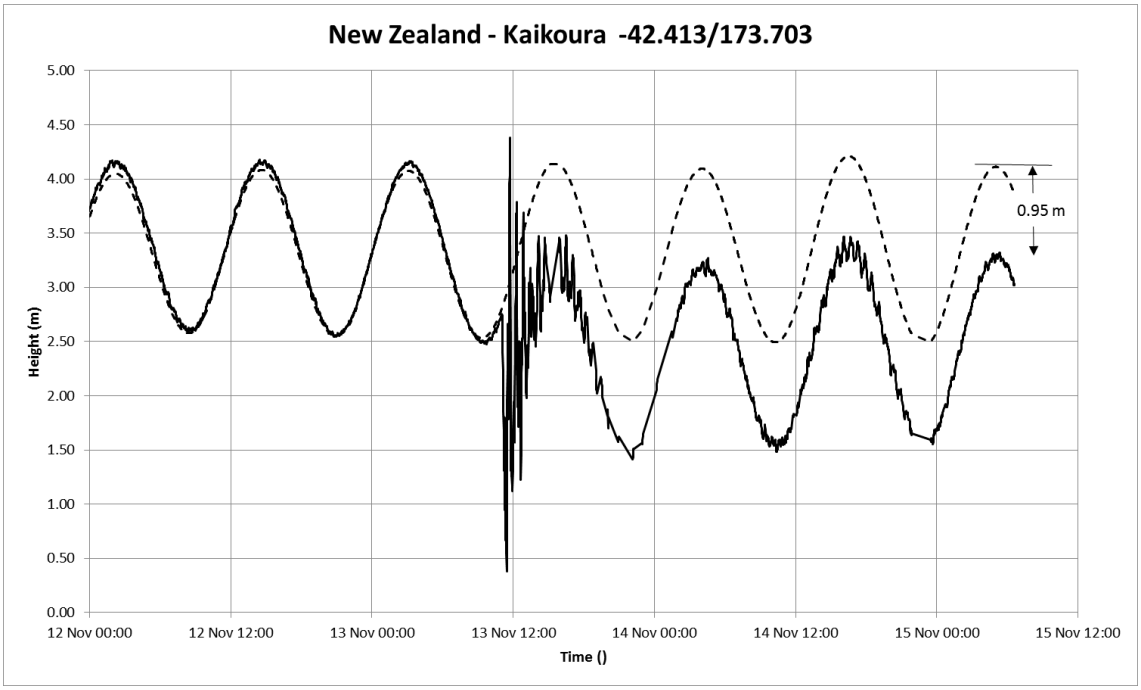
On 13th November at 11:03 UTC a Mw 7.8 earthquake occurred in New Zealand with epicentre 42.757°S 173.077°E. As a consequence a Tsunami was generated that was measured by all the sea level stations in the area. The closest stations in the area are indicated in the map aside and are: Kaikoura, Wellington and Castlepoint. The tide gauge of Christchurch was unavailable at the time of the event.

The largest sea level change occurred in Kaikoura whose measurement level toped to about 1.5 m above the normal tide level.

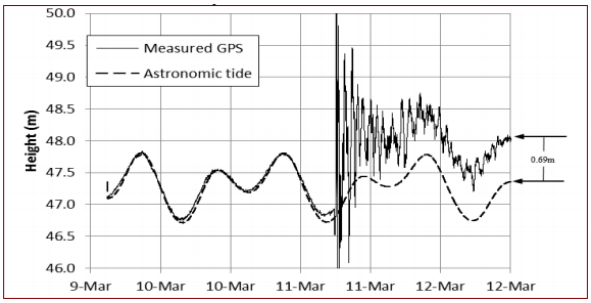


What is interesting is that following the sea level measurements in Kaikoura before and much later after the event it is possible to recognize that the station shows a sea level change corresponding to about **0.95 m**. As it can be seen on the next figure the sea level in the long term is about 0.95 m lower than it was before the event: the dash curve represents the expected sea level, following the normal tide , if the event had not occurred. This means that the sensor of the tide gauge has been lifted by the

same amount (i.e. coseismic uplift). The measurement in the other tide gauge locations did not show any significant long term deformation.



In the case of Japan event a similar behaviour was present in several Japanese tide gauges and measurement sites, as shown in Annnunziato (2012)[1]. In that case the sea level increase after the event identified a subduction, confirmed by GPS measurements in the area.



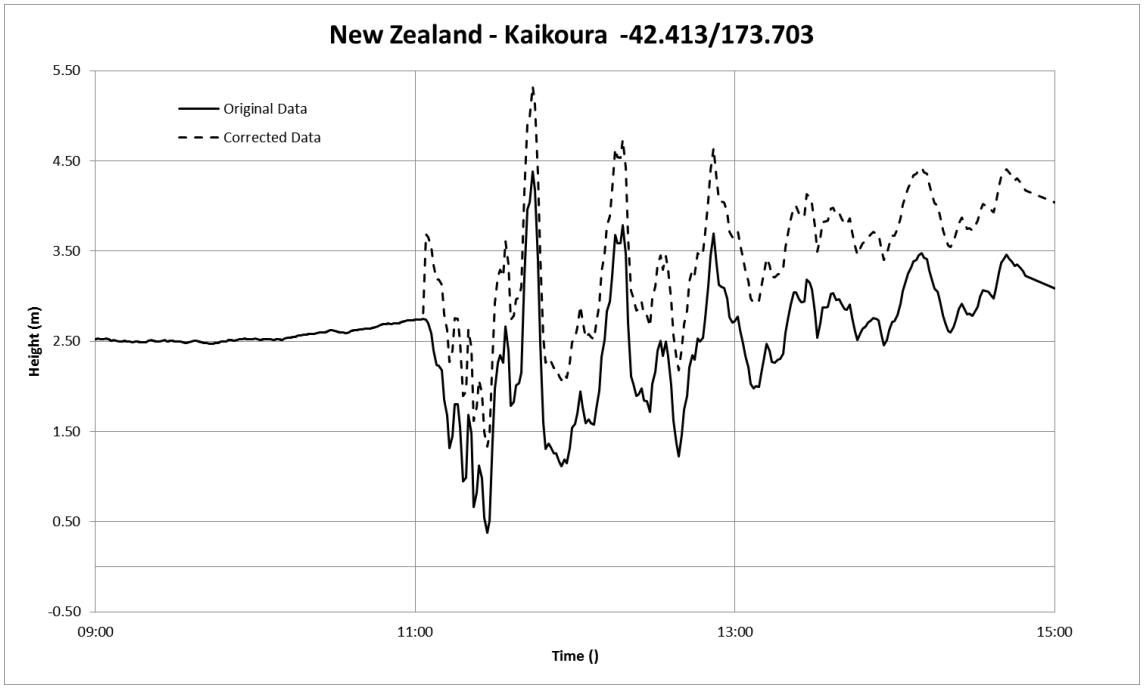
North Myagi sea level measurement after the Tohoku event of 2011 in Japan

(From Annunziato 2012 paper)

It will be interesting in the case of New Zealand, to compare this value obtained by the sea level with values obtained by other measurements, as GPS ones or satellite radar spectrometry, when available.

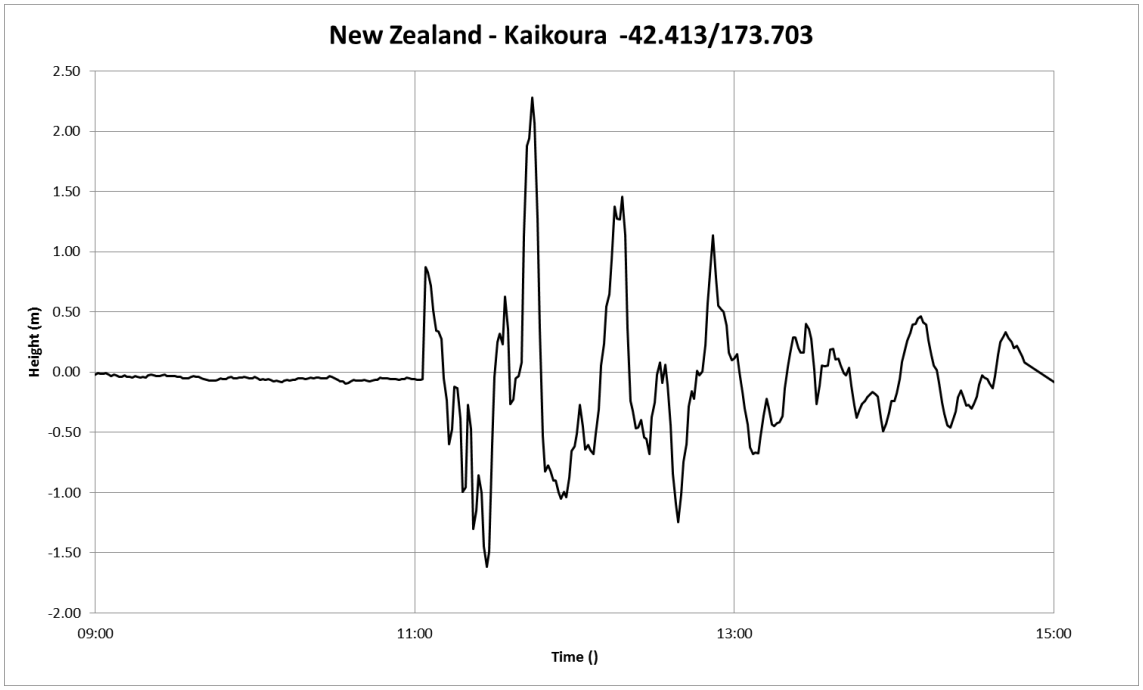
Applying the correction factor of 0.95 m to the measurement signal after the event, the resulting final curve of the sea level is shown below.

[1] A. Annunziato – 'SEA LEVEL SIGNALS CORRECTION FOR THE 2011 TOHOKU TSUNAMI' - http://tsunamisociety.org/312Annunziato.pdf (2012)



Measured (solid line) and Corrected data (dash line) for Kaikoura

The next figure indicates the difference with the expected tide, i.e. the net sea level increase above the expected tide level. The sea level therefore increase was about **2.3 m** above the normal sea tide.



Net sea level increase over the expected tide, after the correction of 0.95 m after time 0