

# Analysis of the Stromboli Tsunami of 19 May 2021

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Vers. 1.1

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## 1 INTRODUCTION

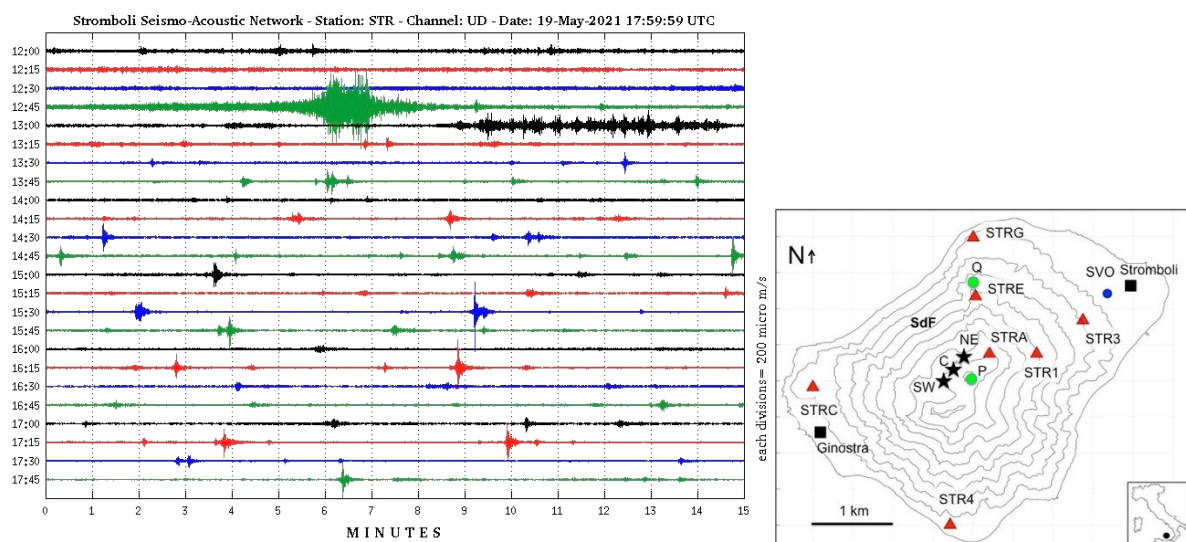
The paroxysm of the 19 May 2021, starting at 12:51-12:52 UTC, triggered a Tsunami, measured in at least 3 locations around the Stromboli Volcano. The highest on-shore measured height was about 70 cm in Ginostra (peak-to-peak amplitude). A floating instrument, closer to the source point, measured about 15 cm. Probably larger values were occurring on the coasts of the Volcano but no survey has been yet performed.

The comparison with a similar event, occurred on 3 Jul 2019 shows that, at least as far as regards the sea level measured in Ginostra and Strombolicchio, the two events are very similar.

## 2 DATA COLLECTED AND ANALYSED

### 2.1 SEISMIC SIGNALS

A large explosion was measured by the STRA seismic signal by INGV, starting at 12:51-12:52 and lasting a 1 min.



<http://www.ct.ingv.it/it/segnali-sismici-in-tempo-reale.html>

These signals allow to fix the initial time of the event, at least at 12:52 but there is no certainty of when the large part of the bulk of the material flowed into the water; the video sequence, obtained from the surveillance camera in the Sciara del Fuoco, courtesy of the Experimental Geophysics Laboratory of the Florence University, seems to confirm that the initial time is 12:52 or some seconds later, when a large blackish smoke rises from the contact with the sea level.

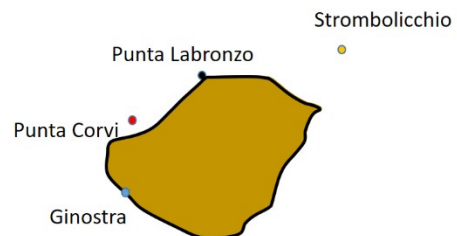


Just for comparison a similar sequence for the event of July 1919 is shown in the following figure.



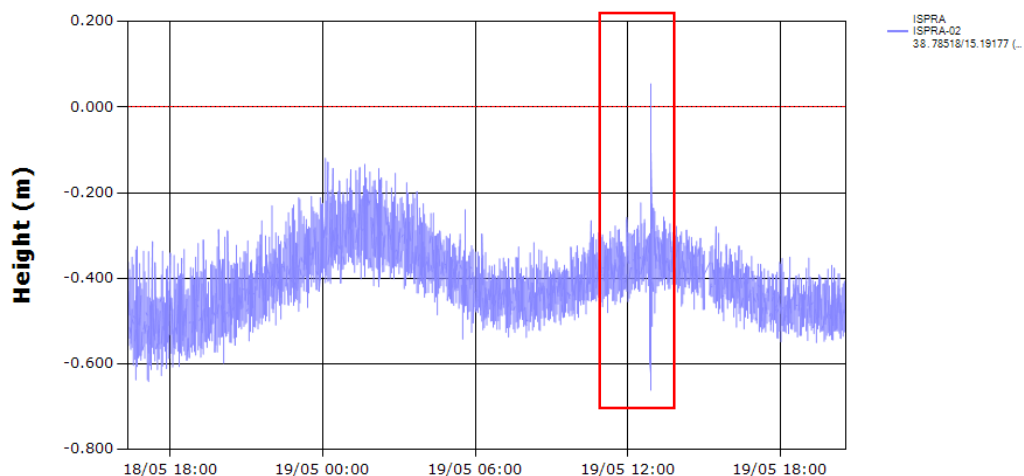
## 2.2 SEA LEVEL SIGNALS

Around the Stromboli volcano 4 sea level stations are present, 2 provided by University of Florence and funded by the Italian Civil Protection, of the type elastic beacon, and 2 provided by Istituto Superiore per la Protezione e Ricerca Ambientale (ISPRA).



The data by University of Florence, are not yet available. However, in a brief report, published in social media<sup>1</sup>, they indicate that the measured signal did not exceed 15 cm. This means that the peak-to-peak amplitude could have been 30-40 cm.

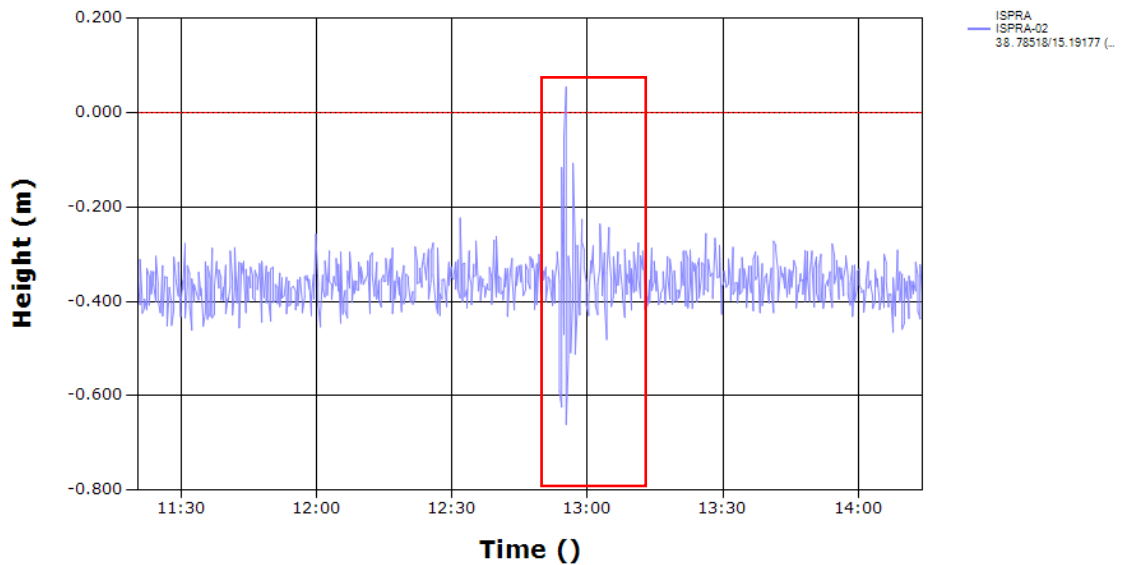
The signals measured in the tide gauges of ISPRA are shown in the following figures.



Sea level measured in Ginostra (ISPRA-02)

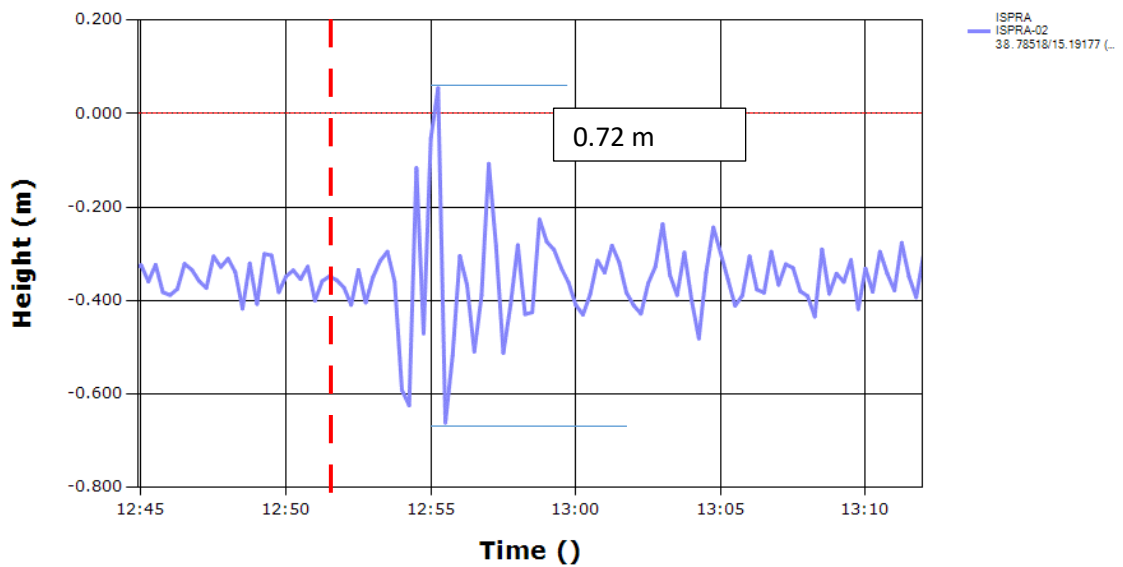
<sup>1</sup> <https://www.facebook.com/149752428725845/posts/1370098096691266/> : L'impatto del Flusso piroclastico sulla superficie marina ha generato uno tsunami con onda pari a 15 cm di ampiezza positiva (che non ha superato le soglie di allerta), tramite la quale è stata stimata la massa impattante in circa 60000-70000 mc.

**Buoy readings ISPRA  
ISPRA-02  
38.78518/15.19177 (100037)**



Sea level measured in Ginostra (ISPRA-02), detail between 11:20 and 14:30

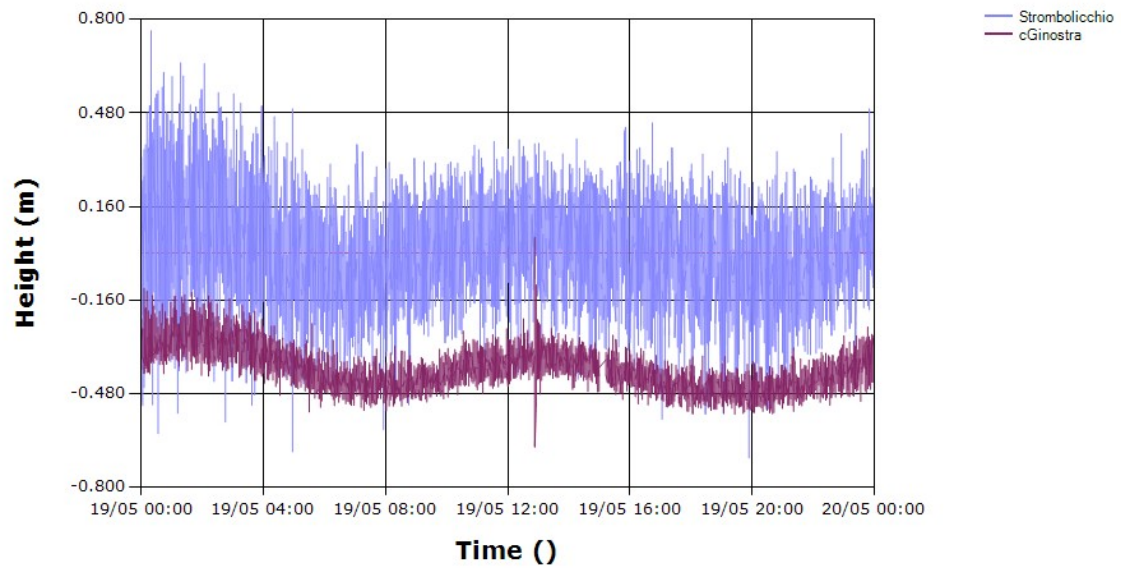
**Buoy readings ISPRA  
ISPRA-02  
38.78518/15.19177 (100037)**



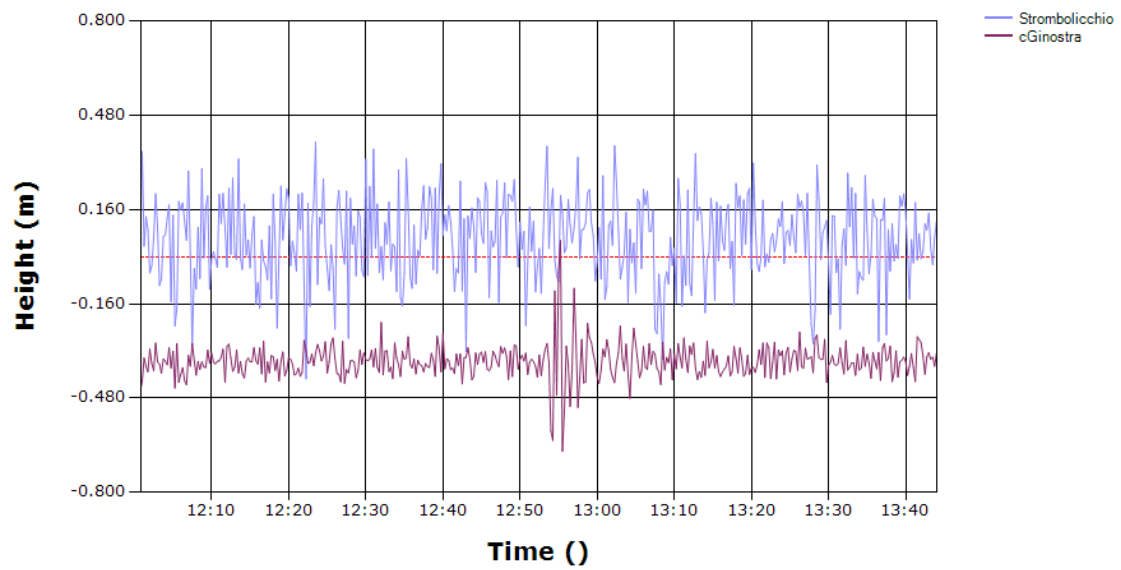
Sea level measured in Ginostra (ISPRA-02), detail between 12:45 and 13:15

The plot above indicates that the first peak starts at 12:53 with a small rise of about 5 m, followed by a drop of about 20 cm and a series of follow-up oscillations that continue until at least 13:05, then the oscillations are within the normal noise of the signal.

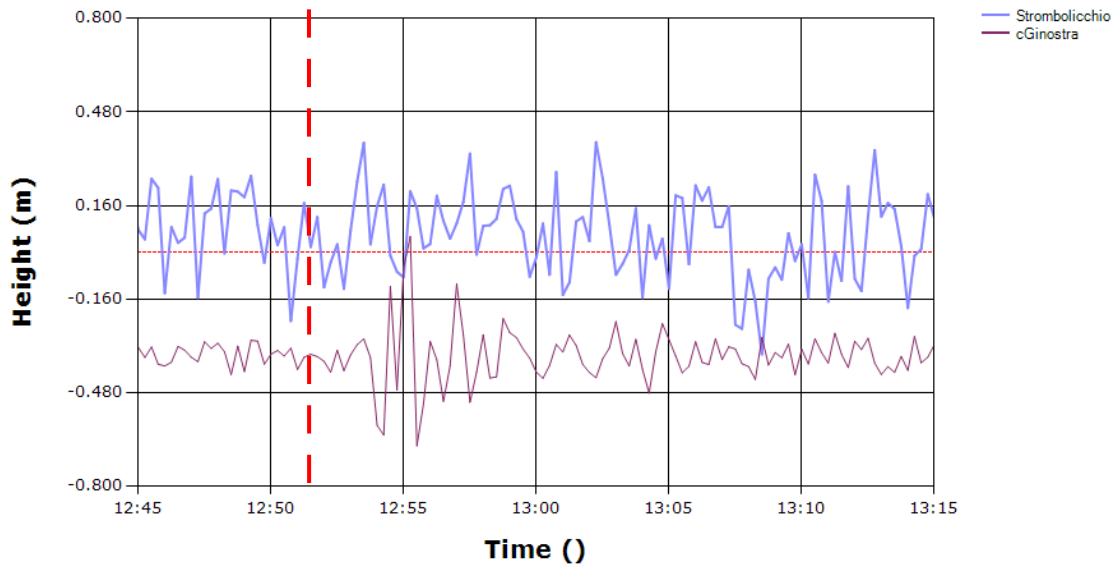
The maximum peak-to-peak amplitude is 0.72 m obtained with the third wave oscillation



Sea level measured in Strombolicchio (ISPRA-01). The signal of Ginostra is also included, in order to provide a reference time



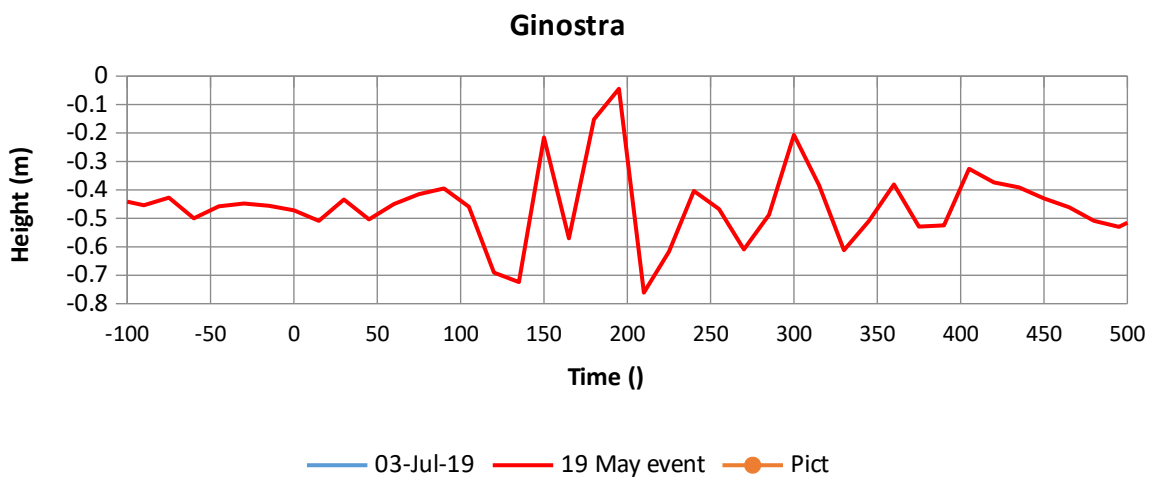
Sea level measured in Strombolicchio (ISPRA-01), detail between 12:00 and 13:45. The signal of Ginostra is also included, in order to provide a reference time

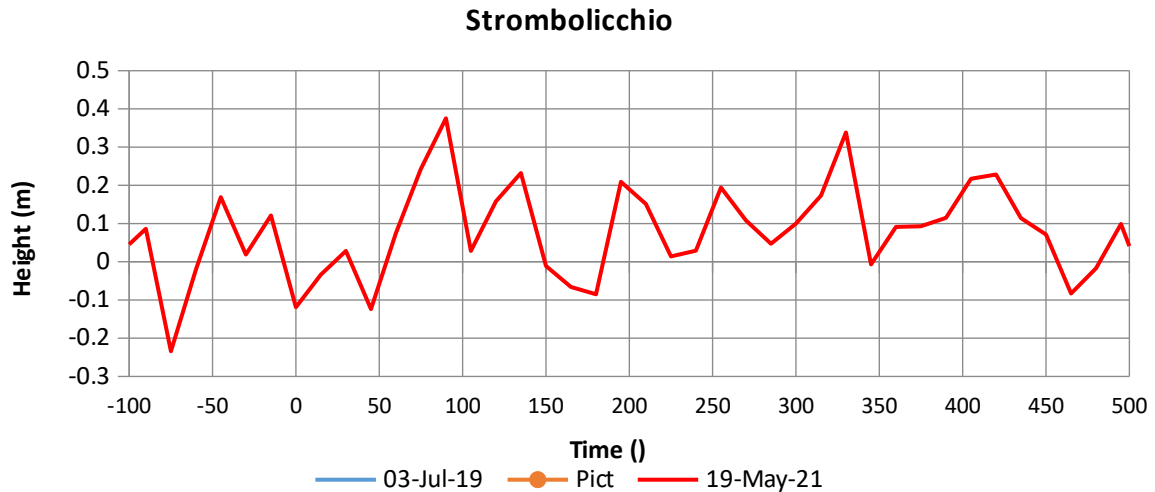


Sea level measured in Strombolicchio (ISPRA-01), detail between 12:45 and 13:15. Also in this figure the plot of Ginostra is included.

In the case of Strombolicchio is not easy to identify the wave due to very strong noisy signal, caused by the normal meteorological wave oscillations.

In order to have a comparison with the 2019 event the curves of 2019 and 2021 have been super imposed, considering for the 2 events the zero time as 14:46 for the 2019 event and 12:52 for the 2021 event: those are the timing of the explosion recorded by the seismic signals.





According to this comparison, the arrival time for the 2021 event occurs about 30-40s earlier than for the 2019, which means that the zero time could be anticipated respect to the 2019 event. This seems to be confirmed also from the comparison concerning Strombolicchio where the sea level seems to rise about 30-40 s earlier.

In terms of amplitude and oscillation frequency the two events appear very similar both for Ginostra and for Strombolicchio.

Below are the videos containing the images taken by the cameras installed on the stations of Strombolicchio and Ginostra. In order to monitor the event, image acquisitions were brought from hourly cadence to cadence at 15min.

- *Strombolicchio*

Start image acquisition at 15 min from 19/05/2021 at 3:45 pm.

[https://drive.google.com/file/d/1BAhdh7xckISUZUWYFL7GD\\_MEt620Nhan/view?usp=sharing](https://drive.google.com/file/d/1BAhdh7xckISUZUWYFL7GD_MEt620Nhan/view?usp=sharing)

At the following link it is possible to view the station tab and the data collected during the event:

[http://tsunami.isprambiente.it/TAD\\_Server/Device/31](http://tsunami.isprambiente.it/TAD_Server/Device/31)

developed by European Commission Joint Research Centre - Ispra - Space, Security and Migration Directorate ([JRC](#))

- *Ginostra*

Some nocturnal images were not included in the video and the start of the acquisition at 15 min began from 19/05/2021 at 3:30 pm (UTC + 2 Local Time).

<https://drive.google.com/file/d/1FzJz7VXCgAZ6Spp4gxYTKp6HsJ0flLn4/view?usp=sharing>

At the following link it is possible to view the station tab and the data collected during the event:

[http://tsunami.isprambiente.it/TAD\\_Server/Device/37](http://tsunami.isprambiente.it/TAD_Server/Device/37)

developed by European Commission Joint Research Centre - Ispra - Space, Security and Migration Directorate ([JRC](#))