

**PTWS Post-event Brief I:
15 January 2022, Hunga-Tonga-Hunga-Ha'apai Volcanic Eruption and Tsunami
20 January 2022 (virtual, GoToMeeting)**

CHAT

12:39 PM

Alessandro Annunziato (JRC EC) to Everyone

Why the Tonga tide gauge gave such a low alevel height if the reported height was in the order of 12-15m ?

12:41 PM

Yuelong Miao, Australia to Everyone

Power outage on the island Nuku'alofa caused the tide gauge from recording and communicating out, soon after 1m.

12:42 PM

Alessandro Annunziato (JRC EC) to Everyone

The largest height has been the first wave, probably. For 1h the level remained low

12:43 PM

Emily Lane to Everyone

Also my understanding is the 15 m run-up is on the north western side of the island Kanokupolu where the tsunami overwashed the ridge there

12:43 PM

Yuelong Miao, Australia to Everyone

Through close working together between Tonga and Australia, it's restored (power+comms), now relying on satellite to communicate data out.

12:45 PM

Conference User to Everyone

Thanks for the insights with regards to the difficulty faced during this event as it was not an earthquake trigering tsunami that all our warning system and SOPs have geared for.

12:48 PM

JATWC - Aust delegate Chantal Donnelly to Everyone

Do our volcano experts understand if the tsunami was generated because of gas suddenly displacing sea water around the volcano; or because of the sudden in-fill of water where volcano land mass suddenly disappeared, or a combination of both? Does the sequence and duration of waves indicate the type of forcing, or multiple forcings?

12:52 PM

Emily Lane to Everyone

The tsunami is almost certainly a combination of several mechanisms. The displacement of water due to the impulsive eruption, pyroclastic density current due to the collapse of the eruptive column and the caldera collapse probably all play a role in the local tsunami and then more energy being pumped into the system due to resonance with the pressure wave for the far field tsunami.

12:53 PM

JATWC - Aust delegate Chantal Donnelly to Everyone

Thanks Emily. Is this something we will learn more about as volcanologists have time to study this event?

12:55 PM

Emily Lane to Everyone

Yes but it might take a while. Bathymetris and seafloor surveys will give information about caldera collapse and PDC. My expertese is actually the volcanic tsunami side of things not the volcanology per se

1:03 PM

Patricio Catalan to Everyone

out of curiosity...could hydrophones be useful for detecting edifice collapses or other non-explosive tsunami triggers?

1:04 PM

Ocal Necmioglu to Everyone

Would it be possible to benefit from passive sonar systems integrated in submarines to be positioned nearby in a safe distance from an explosion but close enough to identify an activity? US/Australia Navy submarines?

1:04 PM

Ocal Necmioglu to Everyone

Recalling "On 15 November 2017 two CTBTO hydroacoustic stations detected an unusual signal in the vicinity of the last known position of missing Argentine submarine ARA San Juan. Hydroacoustic stations HA10 (Ascension Island) and HA04 (Crozet) detected a signal from an underwater impulsive event that occurred at 13:51 GMT on 15 November. Details and data were made available to the Argentinian Authorities to support the search operations."

1:07 PM

mike Angove to Everyone

great presentation Bill. Fully agree with need to incorp real-time obs into forecasts

1:07 PM

J rome auacan - SPC to Everyone

Why not use the sea level trigger based warning at tide gauges as well ?

1:09 PM

Ocal Necmioglu to Everyone

"National Oceanic and Atmospheric Administration (NOAA) Vents program at its Pacific Marine Environmental Laboratory was granted access to the system at the Naval Ocean Processing Facility at Whidbey Island in October 1990 to combine raw analog data from specific hydrophones with NOAA systems for continuous monitoring of the northeast Pacific Ocean for low-level seismic activity and detection of volcanic activity along the northeast Pacific spreading centers."

1:12 PM

Alessandro Annunziato (JRC EC) to Everyone

If next time another volcano erupts in a different zone, the procedure could not work if the closer DART is too far and could be misleading. So the distance from the source should be included in the procedure, taking into account how far the DART is triggering the alert

1:15 PM

Ocal Necmioglu to Everyone

<https://pmel.noaa.gov/sites/default/files/atoms/files/oceanacoustics2.pdf>

1:16 PM

JATWC - Robert Greenwood to Everyone

@Alessandro my understanding is that this proposal is only for a future eruption at the same volcano.

1:17 PM

Grant Wilson to Everyone

What is the location of the dart buoy? and which Pacific Islands countries are closer to the volcano than this buoy. Can you please discuss this limitation.

1:18 PM

Ken Gledhill (NZ) to Everyone

Correct, we are looking short term based on the enhanced probability of tsunami from the same source.

1:23 PM

gs prasetya to Everyone

Comparing to earthquake generating tsunami - the volcanic tsunami warning is more simple to address since the volcano location is fixed - so if there is an activity of the volcano that has historically generated tsunami then watch and serious attention and monitoring should be in place. Monitoring can be on Volcanic eruption processes and also by from sea level monitoring station.

1:24 PM

Raymond Mohammed (Fiji) to Everyone

The challenge with monitoring or monitoring gap in the South-West Pacific needs to be discussed in terms of how best to address this in the interim as well as long-term

1:24 PM

Suci Dewi Anugrah_Indonesia to Everyone

based on the timeline of events, the tsunami generation was happened 11 minutes after the eruption. Is it the nature of tsunami generated by volcano? Not immediately generate a tsunami.

1:25 PM

Ken Gledhill (NZ) to Everyone

The delay must be source related.

1:27 PM

Ken Gledhill (NZ) to Everyone

But many volcanoes are very poorly monitored now, and the old problem of coverage in the SWP for seismic and sea level comes into play as well.

1:27 PM

Grant Wilson to Everyone

How close is NZ wave buoy 01003 to Hunga volcano?

1:28 PM

Bill Fry to Everyone

01003 (NZG) is about 30 minutes travel time away from Hunga Tonga Hunga ha'apai

1:28 PM

Stuart Weinstein to Everyone

Volcano generated tsunamis like the Hunga Tonga are not simple. There are different source mechanisms in play

1:30 PM

Suci Dewi Anugrah_Indonesia to Everyone

What was the tool that you used to estimate the arrival time? was that the tsunami modeling application tool as usual? it is also interesting that the PTWC could make a text message manually as soon as possible. Anyone could explain this process?

1:31 PM

Sakaraia to Everyone

PIC's will need to explore all possible options in order to get timely data from the source. Ensure Seismic Network is operational at all times, etc...

1:31 PM

Ken Gledhill (NZ) to Everyone

Agree with Bill - observation (empirical) based is very important in the short term

1:31 PM

Eslina Garaebiti to Everyone

Hydrophone network may need to be considered for monitoring systems as well.

1:32 PM

Ken Gledhill (NZ) to Everyone

Agree Eslina

1:33 PM

Ocal Necmioglu to Everyone

<https://www.ctbto.org/fileadmin/snt2013/posters/T3-P131.pdf>

1:34 PM

Alessandro Annunziato (JRC EC) to Everyone

In Krakatoa case and La Palma case, JRC installed IDSL devices with sea level and cameras; IDSL has software onboard to provide alerts based on the sea level data measured. The IDSLs installed in Indonesia have issued alert as soon as the wave reached their location. The system is described here: <http://www.tsunamisociety.org/382AnnunziatoEtAl.pdf>

1:35 PM

SHOA (CHILE) to Everyone

few years ago it was developed by Universidad de Chile a web app which use twitter inputs for identifying earthquakes. A similar tool can be designed for tsunamis. That would be a great heads-up alert.

1:35 PM

Eslina Garaebiti to Everyone

There are more submarine volcanoes in the Pacific that may become active soon after a long time of quiescence so having volcano SOPs in short term is important....

1:36 PM

SHOA (CHILE) to Everyone

<https://twicalli.cl/aplicacion>

1:37 PM

gs prasetya to Everyone

Based on Krakatau 1883 - there are more than 10 processes that are capable to generate tsunami (Latter 1981) - 4 main causes that had been believed to generate a significant tsunami are a combination of pyroclastic surge, flank collapse combined with lateral blast, caldera collapse and submarine explosions. However, the 2018 shows that the flank collapse and lateral blast is the main cause of tsunami as the size and dimension of the Anak Krakatau is just 1/3 of the Krakatau in 1883. So

monitoring of the volcanic growing process is important for potential tsunami in the future for Tonga Volcano.

1:37 PM

Esline Garaebiti to Everyone

Volcano triggered tsunami SOPs are indispensable

1:37 PM

Silvia Chacón-Barrantes (Costa Rica) to Everyone

the problem with twitter input is that Tonga went out of comms, so it wouldn't have worked in this case

1:37 PM

SHOA (CHILE) to Everyone

another idea it is to develop a dedicated chat room for tsunami - eq information, among all the NTWC.

1:37 PM

Ocal Necmioglu to Everyone

Hydrophones are the key Esline, fully agree...

1:38 PM

Department of Mineral Policy to Everyone

The workable solution for us in the PICs is to densify tide gauges.

1:38 PM

JATWC - Robert Greenwood to Everyone

I think there was a potential undersea volcano in the Kermadec in Dec 2017 associated with a Mag 6.3 earthquake where there some tsunami signals in NZ / Norfolk Island

1:38 PM

Zulfi- SPC to Everyone

Also to look into encouraging tide gauge operators to integrate with GLOSS/SONEL and improve accessibility to these observing systems for real time monitoring

1:39 PM

Iman to Everyone

If we look at the sea level observation data, the hieght of tsunami is not so high, but the duration is long enough (several days) as well as wide spreading. .

1:41 PM

Jorge Gaete (SHOA) to Everyone

Technical support for those countries that stil can't share their sea level stations data with IOC Sea Data Facility website, would be highly useful.

1:42 PM

Emily Lane to Everyone

The Dec 2017 event was a significant non-double couple earthquake (Ring fault - possibly magma moving up). It was between Curtis and Havre. The tsunami was measured on Raoul Isl and North Cape and Tauranga in Aotearoa. Interestingly there was a similar event in a similar location around 10 years early and similar sorts of event have been seen in Japan

1:47 PM

Christa von Hillebrandt to Everyone

Will these interim messages be sent over the GTS? How will other stakeholders (eg. ships at sea, NAVAREAs) be informed of these new procedures and products?

1:47 PM

Yuelong Miao, Australia to Everyone
interim sounds good to me

1:50 PM

JATWC - Aust delegate Chantal Donnelly to Everyone
Thank you for sharing this proposed procedure. This gives us some ideas on how we can do similar in our own national service to prompt a better response.

1:51 PM

J rome aucan - SPC to Everyone
Thanks Chip. We noted the message for the Samoa sea level anomaly. This type of messages will be very useful

1:51 PM

Department of Mineral Policy to Everyone
Agree with proposal from Chip. need to have something in place soonest.

1:51 PM

Iman to Everyone
I think in term of tsunami warning, we can not rely on email only, we need another dissemination moda which can give an alert to the on duty.

1:52 PM

Alessandro Annunziato (JRC EC) to Everyone
IDSLs use SMS and email

1:56 PM

Suci Dewi Anugrah_Indonesia to Everyone
Also we need to discuss the bulletin format and mechanism for atypical tsunami.

1:56 PM

Charles McCreery to Everyone
The new procedure will include dissemination by all the normal methods -- GTS, AFTN, email, and fax. Messages will also appear on the website but may show an earthquake magnitude of 1 unless we can get the website changed for volcanic events.

1:58 PM

JATWC - Aust delegate Chantal Donnelly to Everyone
Thanks Laura and others involved for organising today's debrief. The agenda for today was very useful. I'm sorry I'll have to sign out now, a little early. Let's hope we don't have to meet again in a hot debrief situation in the near future.

2:01 PM

Silvia Chac n-Barrantes (Costa Rica) to Everyone
can you ensure we all get the msgs? Central America did not receive the first 6 messages for the weekend event

2:04 PM

Silvia Chac n-Barrantes (Costa Rica) to Everyone
I did not receive them even through TBB