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15 January 2022, Hunga-Tonga Hunga-Ha'apai Volcanic Eruption and Tsunami

The Hunga-Tonga Hunga-Ha'apai (HTHH) volcano, located 60 kilometres northwest of Tongatapu, Tonga began erupting at 407 UTC on 15 January 2022 based on Himawari-8 satellite images, with a massive explosive eruption at 0414 UTC from seismic data. The eruption triggered a tsunami that caused damage locally, regionally, and across the Pacific. The local tsunami killed three people and caused major destruction to many low-lying coastal communities on Tongatapu, 'Eua and the Ha'apai Group of Tonga; runups up to 15 m and 500 m inundation were reported for Mango Island by the Tonga Geological Services (TGS).

Elsewhere waves up to 2 m in amplitude were reported by the Pacific Tsunami Warning Centre (PTWC). To save lives, countries issued warning and advisory alerts, and in some places evacuated coastal populations. Many countries experienced waves greater than 0.3 meter in amplitude, which typically triggers marine advisories recommending to citizens to stay out of the water as strong currents and/or unusual waves may occur. Damaging waves struck harbours and coasts in New Zealand, Rarotonga, Hawaii and the US west Coast, and as far away as Peru (additionally, two deaths occurred), Chile in the eastern Pacific, and Japan in the northwestern Pacific. Altogether, the PTWC issued 12 bulletins over a 20-hour time span and reported 117 tsunami wave measurements from 26 countries.

The gigantic eruption obliterated the volcanic cone-caldera complex that had grown connecting the two islands, generating an atmospheric disturbance that extended into the stratosphere and that was observed by international satellites. The multiple explosions were heard loudly not only on the Tonga islands, but also in Fiji and American Samoa. The resulting shockwaves were measured on barometers as they traversed the globe. The coupling of the air wave with the ocean surface generated small waves (meteotsunamis) observed in the Pacific and also on coastal gauges in the Caribbean and across the Atlantic in the Azores and Madeira, and as far as Cabo Verde as well as in the Indian Ocean in Mauritius.

Previous eruptions were in March 2009 and November-December 2014, but none of them generated tsunamis. The volcanic activity resumed in December 2021. On 13 January, a smaller eruption occurred for which the Tonga NTWC issued a tsunami advisory lasting about one day – the advisory was cancelled at 1102 local time. Unfortunately, while the potential for continued volcanic activity was expected, a massive explosion was not expected.

This is the first time that the PTWS has had to respond to a destructive volcanic event of these characteristics as the PTWS has primarily focused on earthquake-generated tsunamis that cause nearly 90% of the world's tsunamis. To move forward, the PTWS is immediately convening Post-Event Briefs to share information and experience, and provide interim guidance should another volcanic eruption occur.

Hunga-Tonga Hunga Ha'apai Eruption and Tsunami: Importance of Real-time Sea Level Data for Tsunami Warning Decision-making (Poster, [A4 low-res](#), [A0 high-res](#)) **NEW**
PTWS Post-event Brief I: 20 January 2022, 2200-2400 UTC (virtual)
PTWS Post-event Brief II: 03 February 2022, 2200-2400 UTC (virtual)
PTWS Post-event Brief III: 10 February 2022, 2200-2400 UTC (virtual)

Official Information, Media Release	• Media Release, 18 Jan 2022, Govt of Tonga (PDF 1.2 MB) • Media Release, 21 Jan 2022, Govt of Tonga (PDF, 396 KB) • Declaration of State of Emergency, 19 Jan 2022, Govt of Tonga (PDF 323 KB) • UN • Tongatapu Reference Map, UN OCHA (PDF 1.1 MB) • Tonga Hunga Volcano Location, UN OCHA (PDF 750 KB) • Media Release, 21 Jan 2022, UNDRR (PDF 513 KB)
1) Messages	• PTWC Messages (international PTWS) , incl wave measurements (DOC 77 KB) • PTWC Message (International CARIBE-EWS) (DOC 18 KB) • US NTWC Messages (US and Canada) (DOC 56 KB)
2) Sea Level	• Hunga-Tonga Hunga Ha'apai Eruption and Tsunami: Importance of Real-time Sea Level Data for Tsunami Warning Decision-making (Poster, PDF, A4 low-res, A0 high-res)(793 KB, 30 MB) MARIGRAMS AND DATA • Russia (PDF 3.7 MB - Marigrams) • Hawaii, Alaska, Washington, Oregon (PDF 121 KB - Marigrams) • California (PDF 223 KB - Marigrams)



IOC Tsunami Information Centres



ITIC CARIBBEAN OFFICE (ITIC-CAR)

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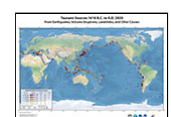
UNESCO IOC Tsunami Ready

Preparing communities to be ready for the next tsunami



Tsunami Awareness Poster

Available in English, Chinese, French, Japanese, Korean, Portuguese, Singalese.



Global & Regional Hazard Maps

Tsunami Sources, Significant Earthquakes and Significant Volcanic Eruptions. Also Tsunami Sources Icosahedron Globe.

	Pacific Ocean (PPT 3.5 MB - Marigrams) Caribbean and Adjacent Regions (PPT 1.9 MB - Marigrams) Indian Ocean (PPT 1.3 MB - Marigrams) USA and DART® stations (Marigrams and Data) Canada (PDF 2.6 MB - Marigrams) China (PDF 3.3 MB - Marigrams, Data and Response) Fiji (PDF 2.6 MB - Marigrams, Data and Response) Central America (PDF 2.6 MB - Marigrams and Response) SEPR (PDF 4 MB - Marigrams, Data and Response) Mexico (PDF 4.4 MB - Marigrams, Data and Response; UNAM) MEASUREMENTS Runups, Interactive Map, website updated continuously (WDS/NCEI) Australia (Bureau of Meteorology, PDF) Chile (Hydrographic & Oceanographic Service of the Chilean Navy, PDF) Japan (Japan Meteorological Agency, PDF) New Zealand Coastal and SW Pacific, DARTs (NZ GNS Science, 30 Jan 2022, website) STATION MAPS Pacific Sea Level Station Map (PTWC/ITIC, PDF 893 KB) Caribbean Sea Level Station Map (PTWC/ITIC, PDF 293 KB) Atlantic & Mediterranean Sea Level Station Map (PTWC/ITIC, PDF 496 KB) Indian Ocean Sea Level Station Map (PTWC/ITIC, PDF 490 KB) NZ DART Station Map (JPEG 206 KB) Nuku'alofa, Tonga station photos, 2019 (PDF 967 KB)
3) Volcano	Hunga Tonga-Hunga Ha'apai (HTHH) Volcano (SI - Global Volcanism Program, website) Summary - HTHH Past Eruptions and Geological History (ITIC, Feb 2022) Geology, Petrography, and Geochemistry of the Volcanic Islands of Tonga (Bryan et al., Journal of Geophys Res, 1972) New Volcanic Island Unveils Explosive Past (Cronin et al., EOS AGU, 2017) The Story of Hunga Tonga Hunga Ha'apai Island in the Kingdom of Tonga (Garvin et al., Apogeo Spatial, 2017, 2 yr evolution from NASA satellite imagery) Why the volcanic eruption in Tonga was so violent, and what to expect next (Cronin, The Conversation 15 Jan 2022)
4) Seismic	M 5.8 Volcanic Eruption, 15 January 0414 UTC (USGS Website)
5) Model Simulations	- Tsunami simulation, regional (NZ GNS.30 Jan 2022) (MP4) - Tsunami simulation (without air-sea waves), 2022/01/15 HTHH submarine volcanic explosion (IriDES, Tohoku Univ, 31 Jan 2022) (PPT, simulations) - Tsunami simulation (with air-sea waves) (Univ of Southern California, 14 Feb 2022) (visualization High-res, Low-res)
6) Data and Information Sites	TWITTER (Science) #HungaTongaHungaHaapai #HungaTonga #Tsunami
7) Media	Matangi Tonga (online newspaper) - Natural Events 22 January 2022 (wave impact, 1st article after internet restored) 24 January 2022 (2nd article summarize 18-21 Jan 2022)
8) Photos, Satellite Imagery	SATELLITE - EVENT EUMETSAT satellite imagery Himawari-8, JMA Geostationary Satellite NOAA GOES 17 NOAA NESDIS (14 Jan smaller eruption, previous day) SATELLITE - DAMAGE ASSESSMENT UNOSAT Emergency Mapping Service International Charter Space and Major Disasters Open Data Response to the Volcanic Eruption in Tonga (BLOG, Maxar) LIGHTNING, xxx
9) Videos	WAVE ARRIVAL https://twitter.com/MundoEConflicto/status/1482225279171022849?t=8NGx2EFUtTcXvUttLshGjw&s=08 https://m.facebook.com/story.php?story_fbid=10226069805948204&id=1128661183 https://fb.watch/ayecQSSgjc/ https://fb.watch/ayegOiVGqP/ https://fb.watch/ayeI76fPOj/



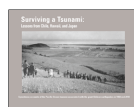
Tsunami, The Great Waves

Available in English, Spanish, French and Chinese.



Tsunami Glossary 2019

Available in English, Arabic, Spanish, French and Bahasa.



Surviving a Tsunami - Lessons from Chile, Hawaii, and Japan

Available in English, Spanish.



Where the First Wave Arrives in Minutes

Available in English, Bahasa, Spanish and French.



TsunamiTeacher

DVD copies for computers available from the ITIC (itic.tsunami@noaa.gov).



TsunamiTeacher USA Tsunami Basics

Also on YouTube  (w/closed captioning)

Learn the basics of tsunamis. Available in English and Samoan.

	PRESSURE • Pressure Wave crossing USA (Iowa State University) • Waves captured visually at Maunakea, cloud cam video (International Gemini Observatory/NOIRLab/NSF/AURA)] SOUNDS • Sound of Volcanic Eruption from Ono Island – Fiji • Sound of Volcanic Eruption from Lakeba – Fiji
10) Post-Tsunami Surveys	
11) Situation Reports	• Tonga NEMO Situation Reports, Govt of Tonga • SitRep1, 14 January 2022 (PDF 919 KB) • SitRep2, 15 January 2022 (PDF 87 KB) • SitRep3, 15 January 2022 (PDF 67 KB) • SitRep4, 17 January 2022 (PDF 1.1 MB) • SitRep5, 17 January 2022 (PDF 1.1 MB) • SitRep6, 19 January 2022 (PDF 630 KB) • SitRep7, 20 January 2022 (PDF 126 KB) • SitRep8, 21 January 2022 (PDF 150 KB) • SitRep9, 22 January 2022 (PDF 848 KB) • SitRep10, 24 January 2022 (PDF 1.8 MB) • Emergency Telecommunications Cluster • Sitrep 1, 15-20 January 2022 (PDF 176 KB) • UN • OCHA Sitrep1, 25 Jan 2022, UN OCHA (PDF, 210 KB)
12) Other	Additional Information - articles, papers, reports