

Not My Fault: The Tonga eruption - a three-week perspective

Lori Dengler/For the Times-Standard
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January 15th and the Tonga tsunami seem a long time ago. I was asked if I thought the outcome of this tsunami was fortunate considering how powerful the eruption was. My answer was yes, especially in terms of the relatively low level of damage and loss of life compared to other memorable tsunamis.

We now have a clearer picture of impacts. The double whammy of eruption and tsunami was devastating for the small island nation of Tonga. The remote 169 island archipelago has had few major natural disasters in its history. Prior to this year, only four of the country's 23 named volcanoes had documented eruptions and only one eruption had caused fatalities.

The official death toll from the eruption currently stands at five – three in Tonga and two in Peru. Twenty injuries were also reported. All of the deaths are attributed to the tsunami. Considering the scale of the eruptive blast, that number is fortunate. However, Tonga by no means emerged unscathed.

The main island of Tongatapu was covered in more than an inch of ash, contaminating water supplies and damaging crops. Much of the waterfront was destroyed by the tsunami and many fishing boats, a mainstay of the economy, were lost. Smaller islands were more heavily damaged and almost no structures remain on Mango, Fonoifua and Nomuku islands. More than 2000 people are still homeless.

The eruption severed the ocean communication cables, limiting communication and further complicating recovery efforts for a country now dependent upon international aid for water and food. But supplying that aid has brought new problems. Tonga was one of the few countries in the world where the COVID-19 had not penetrated. There was concern that outside relief workers would introduce it to an unprotected population. Great pains were made for quick offloading of aid and isolation of off-islanders.

On February 1 two port workers tested positive for COVID-19 and a national lockdown was imposed, slowing delivery of needed aid items. Schools, which had just reopened the day before, were again closed, exacerbating the psychological impact of the tsunami on children. Sixty-six cases had been documented by February 10 and there is concern that COVID could wreak a greater toll than the eruption/tsunami.

The tsunami caused two deaths in Peru and injuries in California and Japan. In Peru, six-foot tsunami surges damaged boats and beachfront properties. A truck was pulled into the ocean and two women were unable to escape. Peruvian Civil Defense reported an oil spill when the tsunami ruptured a line while a tanker was off loading crude oil at a refinery.

In Japan, one person was injured due to a fall during evacuation. One small ship capsized and at least 30 fishing boats were destroyed. Damage to boats and coastal structures was also reported in Fiji, Hawaii, and Chile.

In California some people ignored the Tsunami Advisory and continued normal beach activities. Four fisherman in San Mateo County were rescued after being swept into the ocean by the tsunami surges and two required medical treatment. The Coast Guard and SF Fire Department rescued three surfers and a beach walker in San Francisco. Damages caused to infrastructure at Santa Cruz harbor are estimated at \$6.5 million. We may learn more when the California Geological Survey completes their field investigation.

The impacts are a snapshot of what could have been much worse had the tsunami been larger and illustrates the vulnerability of coastal development and difficulty of getting people to understand and respect tsunami alerts. We were lucky on the North Coast where flooding was less than from King Tides earlier last month.

Why was Tonga so much less damaging than the 2011 tsunami? The explosion may have been huge, but explosions are much less effective at displacing the ocean than a great submarine fault. The megathrust fault offshore of Japan was hundreds of miles across and produced a 30+foot high tsunami along more than 300 miles of Japanese coastline.

By the time it got to California, the Japan tsunami was two to three times larger than what hit us in January. Larger amplitude means much stronger currents and the currents are what caused the damage. In 2011, a Tsunami Warning

was in place – resulting in evacuations in many areas of the North Coast. On January 15th, we were placed in a Tsunami Advisory, and evacuations were unnecessary. The terminology is confusing, and the names may change next year. It is important to listen to the whole message to learn what actions you need to take.

The Tonga tsunami coincided with a high tide raising the water level just enough to cause the California flooding. We are very fortunate that the largest surges (8.2 feet) during the 2011 tsunami arrived at low tide and meant little flooding in most areas. Had the situations been reversed, the maximum water level in Crescent City would have been over 16 feet, only a few feet below the inundation in 1964 and the impacts much worse.

There is one similarity between the 2011 and 2022 tsunamis. They both lasted a long time. We often focus on the arrival time of the first surge, but it's never the largest and on the California coast, tsunami energy can continue to oscillate for days. In 2011, the signal persisted for six days. In 2022, the Tonga tsunami lasted for four days and, if I squint, I think I can still see it for five.

The Tonga tsunami has also generated media interest in tsunamis locally and internationally. I consider this fortunate as well. Tsunamis are relatively rare events that as years pass, become easier to dismiss. If this modest event can get us talking, thinking, and planning for future tsunamis, it will be fortunate indeed.

To learn more about the Tonga eruption, tsunami, and impacts, visit our new 'Recent Tsunamis of Interest' web page (<https://rctwg.humboldt.edu/most-recent-tsunami-interest>). It includes a survey where you can input your observations and pose questions.

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