

# Further Challenges for Warnings of Tsunamis Learnings from recent tsunamis generated by non-seismic and complex sources

## *Lessons learnt from Tonga 2022 tsunami event*



**unesco**

2021 United Nations Decade  
2030 of Ocean Science  
for Sustainable Development

Safe Ocean Laboratory Satellite Activity:

### FURTHER CHALLENGES FOR WARNINGS OF TSUNAMIS

**ZOOM WEBINAR** 6 - 7 April 2022

**Session A:**  
Learnings from recent tsunamis  
generated by non-seismic and  
complex sources  
6 April 2022, 00:00-02:30 UTC  
Registration: [bit.ly/Further\\_Challenges\\_A](https://bit.ly/Further_Challenges_A)

**Session B:**  
What do we know and need  
to know to warn for?  
7 April 2022, 07:00-09:30 UTC  
Registration: [bit.ly/Further\\_Challenges\\_B](https://bit.ly/Further_Challenges_B)

for detail information: <https://oceanexpert.org/event/3422>

## *Unexpected Events - Importance of Community Awareness and Preparedness*

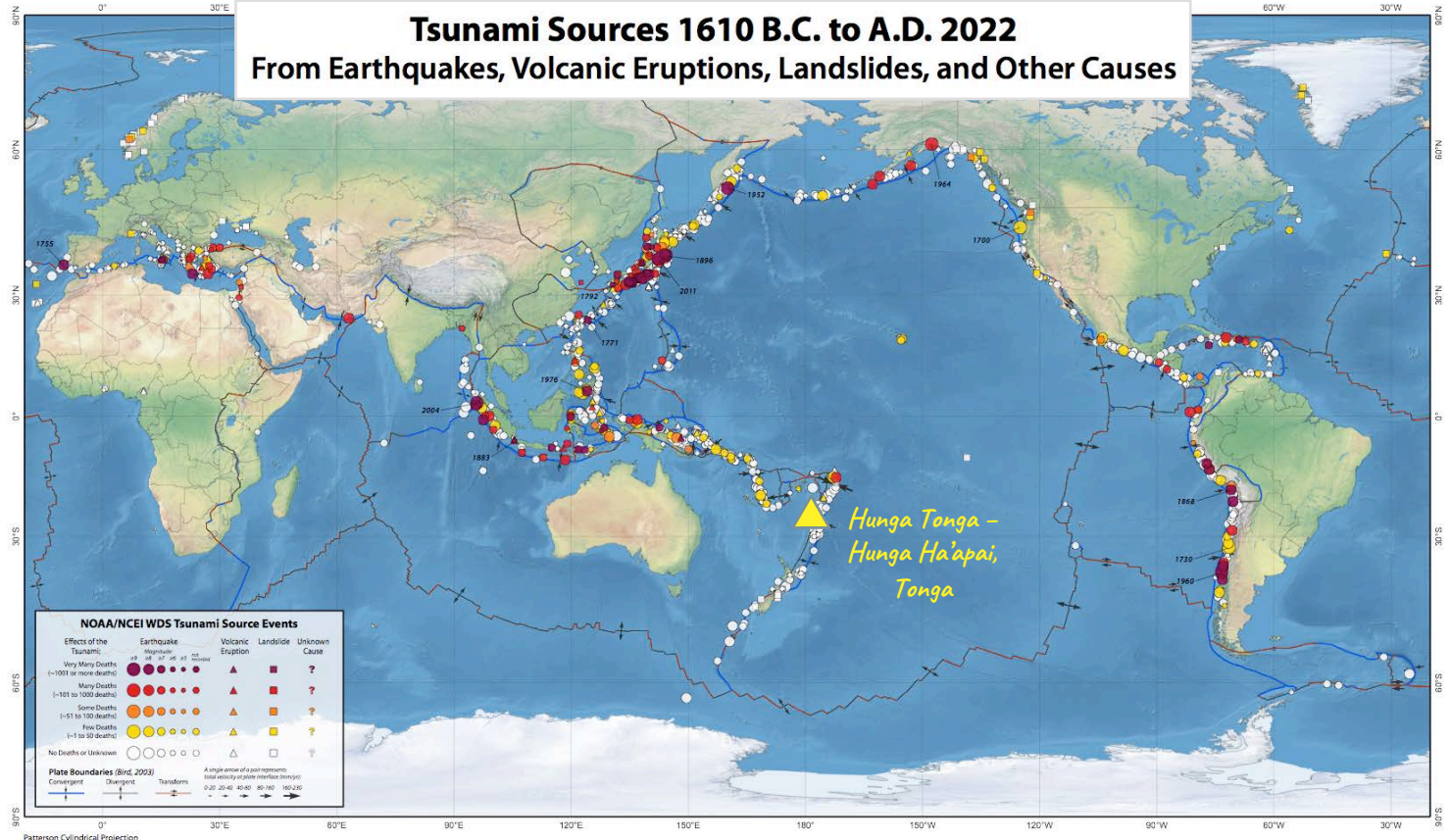
**Dr. Laura Kong**

Director, International Tsunami Information Center

UNESCO/IOC – NOAA Partnership

# Tsunamis – what, when, where, how

**Tsunami Sources 1610 B.C. to A.D. 2022**  
 From Earthquakes, Volcanic Eruptions, Landslides, and Other Causes



*Hunga Tonga -  
 Hunga Ha'apai,  
 Tonga*

Patterson Cylindrical Projection  
 Symbol drawing order: more deaths on top of fewer deaths;  
 volcanoes and landslides on top of earthquakes;  
 lower magnitude earthquakes on top of higher magnitude.

# Tsunamis – what, when

## WHAT IS A TSUNAMI?



A series of ocean waves caused by an earthquake, landslide or volcanic eruption. Waves can be 10 metres or higher.

## WHEN DOES IT OCCUR?



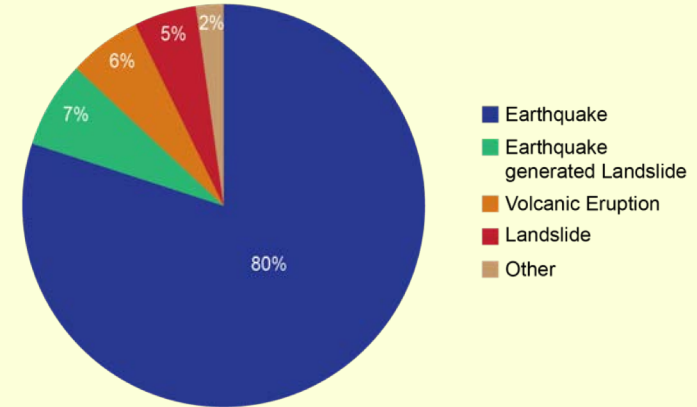
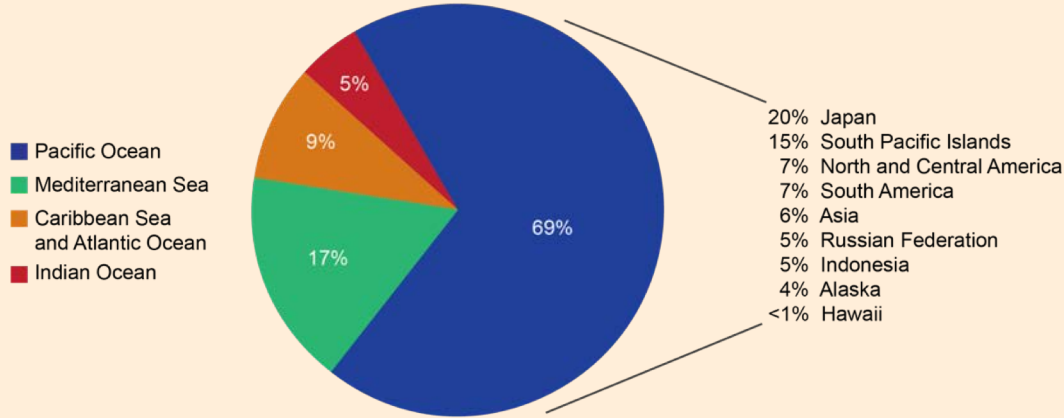
Anytime and anywhere, and if local, can attack in minutes. You cannot outrun a tsunami.

## WHAT IS ITS IMPACT?



Floods coastal areas devastating homes, contaminating soil, killing coral, and flattening landscapes.

# Tsunamis – where, how



- 69% in Pacific
- 87% from earthquakes. Earthquake-generated landslides
- 90% deaths from local or regional tsunamis

# The Issues - Tonga

➤ Not an earthquake! Warning for 'unfamiliar' event: ==> 'Detect', then Warn  
➤ What to do the next time

➤ Next Science? *New, faster, better Detection and Forecast*

➤ Next Community?

➤ Are you ready? *Plan ahead. Be Prepared.*

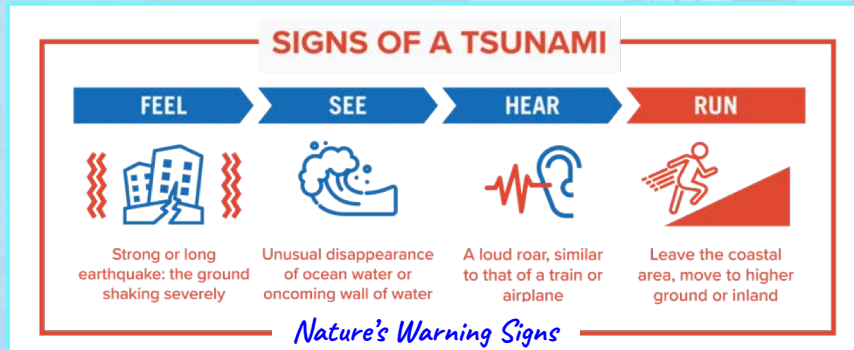
➤ How to Detect? *Nature's Warning Signs*

➤ How to be Safe? *Get Tsunami Ready now!*



Tanaki'anga o'e nau nau 'a e kolo ki  
he Tokelau Pihake 'o Ano Ieka

Ha'apai, Tonga (TGS)



# What happened - See, Hear, Feel, Act

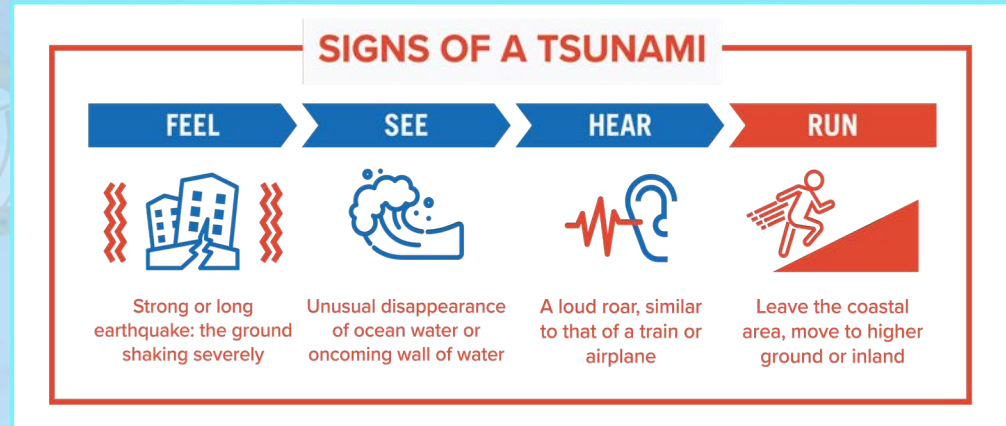
➤ Remember Past - Day before, small eruption, small waves, sulfur smell, next day

## AS IT HAPPENS

➤ SEE the steam/ash cloud. HEAR the loud Explosion. FEEL ground shaking.  
“everyone knew something going to happen since never happened before”

## AS IT ARRIVES, SEE

- See unusual ocean -  
Witness fast draining  
Swirling water eddies
- Animals disturbed  
Birds flying, Ash falling



# Lessons Learnt

- Noting historically, earthquake generate 90% of tsunami (volcano 6%), Prepare for earthquakes, but be aware of the 10%
- For local (close by) and distant, **NEED TO BE TSUNAMI READY!**
- Science (priority): Simply ETA (time to reach) fr ALL sources
- Communities: Must Plan Ahead, get Tsunami Ready  
What to do? Where to go? Practice beforehand  
YOU must act yourself – personal action / responsibility
- Communications: Must be Reliable, Robust, Redundant, Realistic  
Must broadcast. Must be simple. Must reach (low and high-tech)



‘Ōlelo No‘eau, Hawaiian proverb or wise saying

**“ ‘Iliki ke kai i ka ‘ope‘ope lā, lilo!  
I lilo nō he hāwāwā.”**

**A person who fails to watch out often loses!  
Never turn your back on the sea.**

Mary Kawena Pukui

