



**unesco**

**Intergovernmental  
Oceanographic  
Commission**

## **Tsunamis Generated by Non-seismic and Complex Sources**

**Rick Bailey  
Head of Secretariat ICG/IOTWMS**

**ICG Indian Ocean Tsunami Warning & Mitigation System SOP Workshops July 2023:  
*Standard Operating Procedures (SOPs) for  
National Tsunami Warning Centres (NTWCs) and  
Disaster Management Organisations (DMOs)***

# Tsunamis Generated by Non-seismic and Complex Sources



unesco

Intergovernmental  
Oceanographic  
Commission

- Palu (2018), Anak Krakatoa (2018) and Hunga Tonga-Hunga Ha'apa (2022) tsunami events demonstrated hazard and risk associated with tsunamis generated by non-seismic and complex sources.
- Non-seismic and complex sources include landslides, volcanoes, splay-faulting, atmosphere (meteotsunamis), and meteorites
- Up until recently most tsunami warning systems based on tsunamis generated by subduction earthquakes.
- TOWS Working Group (Global ICG Coordination) established *Ad Hoc* Teams on Tsunamis Generated by Volcanoes and Meteotsunamis)... reports being finalised
- TSP Australia has developed capability for providing far-field threat information for tsunamis generated by non-seismic sources
- Other countries (eg Indonesia) developing capabilities for monitoring and warning for tsunamis generated by non-seismic sources
- Western Indian Ocean Workshop planned for November 2023 in Seychelles discuss regional implications further



# Tsunamis Generated by Volcanoes Recommendations

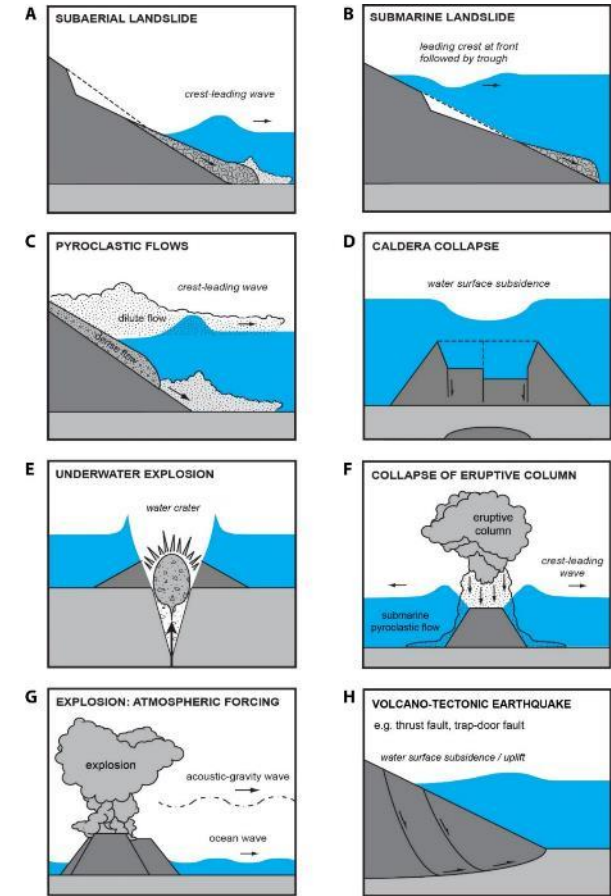


unesco

Intergovernmental  
Oceanographic  
Commission

## *Risk Assessment and Preparedness:*

1. A TGV hazard and risk assessment should be undertaken to determine vulnerable areas.
2. For TGV, multi-stakeholder meetings should be convened that included science agencies, volcano and tsunami warning operations centres, and disaster management agencies. For each identified potential source, worst-case and credible scenario planning discussions should start as soon as possible.
3. During a period of heightened TGV hazard, consider closing access to vulnerable areas. When eruption is imminent and then tsunami hazard is high, consider evacuating populations from vulnerable locations.
4. Specific TGV signage and evacuation routes should be implemented in all areas that may be impacted by tsunamis generated by volcanoes.
5. TGV public awareness campaigns should be conducted regularly – the type and frequency of awareness activities may be different for the local population compared to transient populations such as tourists.



# Tsunamis Generated by Volcanoes Recommendations

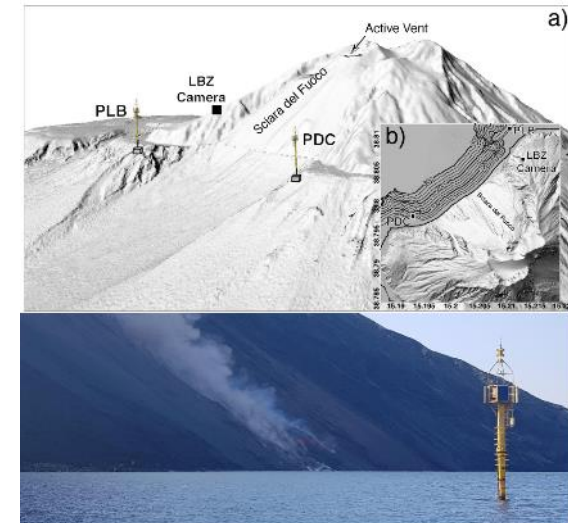
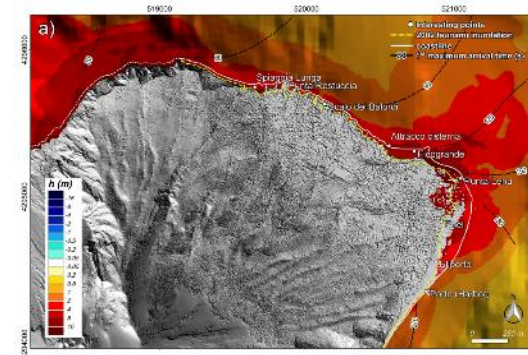


unesco

Intergovernmental  
Oceanographic  
Commission

## Monitoring and Warning:

1. As a first step, organisation(s) should be designated for monitoring and warning of Tsunamis Generated by Volcanoes (TGV). The second and third steps are to install monitoring instrumentation and develop Standard Operating Procedures (SOPs) to handle volcanic tsunamis.
2. TGV monitoring and warning system should be implemented by, or in cooperation with the National Tsunami Warning Centre (NTWC) and regional Tsunami Service Provider and national and regional Volcano Service Providers, where such exist.
3. All volcanoes mentioned in the TGV report should be monitored and have processes in place to warn for tsunamis. Should other, potentially tsunamigenic volcanoes begin erupting, these should also be monitored and included within the tsunami warning process.
4. Detect/warn geophysical (seismology, GNSS, tiltmeter, barometric and sea level data streams need to be available to the designated tsunami monitoring/warning agency (and possibly also to the volcano monitoring agency)
5. As well as monitoring systems for volcano activity and potential far-field propagation of sea level signal, a sea level gauges network with real-time continuous data transmission should be deployed close to each identified volcano to verify risk and then ongoing monitoring and warning.
6. Methods to also specifically alert persons in remote areas (such as scientific teams in the field, or recreational hikers) should be considered.
7. TGV SOPs for tsunami warning should be linked with existing Volcano Alert Activity scales





**unesco**

Intergovernmental  
Oceanographic  
Commission

**THANK YOU**