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Safe Ocean Laboratory Satellite Activity:

Further Challenges for Warnings of Tsunamis - Concept Note

UN Decade of Ocean Science for Sustainable Development 2021-2030

Background

Tsunamis are one of the most deadly and difficult natural hazards to warn for and to respond to. In recent times as examples, more than 230,000 people lost their lives due to the Indian Ocean Tsunami of 2004 and more than 20,000 lost their lives due to the Tohoku earthquake and tsunami of 2011. Tsunamis may impact at-risk coastal communities within as little as 5-15 minutes. Tsunamis may even travel across entire ocean basins in 10-12 hours, still not leaving much time for entire coastal communities to be evacuated. Furthermore, our current knowledge and ability to warn is based on tsunamis generated by undersea earthquakes along subduction zones. These compromise around 80-85% of recorded tsunamis. Even then there are large uncertainties in our forecasts, especially shortly after the earthquake when warnings are required to be as accurate as possible.

In addition to the most typical types of tsunamis generated by undersea earthquakes along subduction zones, there are what we term “non-seismic tsunamis” and “complex tsunamis”. These may be generated by landslides and submarine landslides generated by volcanic eruptions or earthquakes not necessarily associated with subduction zones. They may also be caused by atmospheric disturbances, either due to certain resonating meteorological conditions or infrasound sonic waves created by volcanic eruptions. We are currently very limited in our knowledge of such tsunamis and in our ability to monitor their generation and warn for their likely impacts to save lives.

The massive eruption of the Krakatoa volcano off the coast of Indonesia in 1883 created a tsunami that devastated communities along local coastlines and further impacted coastal communities across the Indian Ocean. In 2018 a devastating tsunami was created when the flank collapsed of Anak Krakatoa (volcanic island that has grown in the place of the former Krakatoa Island), taking the lives of more than 400 people across the other side of Sunda Strait on the island of Java. On 15th January 2022 the eruption of the Hunga Tonga – Hunga Ha’apai volcano saw tsunami waves devastate many coastal communities of Tonga, with tsunami waves also spreading across the Pacific Ocean. Tsunami advisories were issued by the Pacific Tsunami Warning Centre (PTWC) to Member States of the IOC-UNESCO Pacific Tsunami Warning & Mitigation System (PTWS). Warnings were then issued by serval countries under threat to their coastal communities. Amazingly the sonic waves in the atmosphere generated by the explosion

traversed the globe three times, even generating small tsunami waves in other ocean basins such as the NE Atlantic. In Tonga, many lives were saved by the community recognizing the natural warning signs and self-evacuating for the short-fuse event close to their shores. The advisories and warnings issued for the rest of the Pacific Ocean were based on limited information and a lack of forecasting skill for such atypical events

Opportunity

The year of 2021 was the start of the United Nations Decade of Ocean Science for Sustainable Development (2021 - 2030), also known as the Ocean Decade. The Ocean Decade provides a 'once in a lifetime' opportunity to create a new foundation across the science-policy interface to strengthen the management of our oceans and coasts for the benefit of humanity. One of the seven outcomes of the Decade is a Safe Ocean where life and livelihoods are protected from Ocean Hazards, such as tsunamis. One of the 10 challenges is to increase community resilience to ocean hazards as a contribution to the Safe Ocean societal benefit.

In 2021, the IOC Assembly approved the establishment of the IOC Ocean Decade Tsunami Programme (ODTP). The main objectives are:

a) Explore technological and observational advances to lower uncertainties and improve timeliness of tsunami detection and warnings.
b) Match these capability advancements with improved community preparedness efforts, including striving for 100% Tsunami Ready or comparable recognition of all at-risk coastlines.

Objectives of the "Further Challenges for Warnings of Tsunamis" Satellite Activity of the Safe Ocean Laboratory

Increase community resilience to ocean hazards by:

1) Gaining an understanding of the current knowledge of tsunamis generated by non-seismic and complex sources;
2) From recent and past events, learning what is required to better warn and respond to tsunamis generated by non-seismic and complex sources.

Justification

The proposed satellite activity will:

a) Help save lives, infrastructure, and socio-economic well-being of coastal communities at-risk of tsunami impacts;
b) Coordinate and focus the outcomes from a number of recent national and international efforts to enhance tsunami warnings and community responses to tsunamis generated by non-seismic and complex sources (presently not catered for by most tsunami warning systems);
c) Address the United Nations Decade of Ocean Science for Sustainable Development (2021 - 2030) challenges to increase community resilience to ocean hazards, expand the Global Ocean Observing System, and skills, knowledge and technology for all;
d) Harness, stimulate and coordinate interdisciplinary research efforts at all levels, in order to support delivery of the information, action and solutions needed to achieve the UN's 2030 Agenda for Sustainable Development;

e) Address Sendai Framework for Disaster Risk Reduction (SFDRR) targets with substantial reductions in: 1) Global disaster mortality; 2) Numbers of affected peoples; 3) Disaster economic losses in relation to global gross domestic product (GDP); 4) Disaster damage to critical infrastructure and disruption of basic services, among them health and educational facilities;
f) Take urgent and concrete action to address the vulnerability of Small Island States (SIDs);
g) Identify new challenges and opportunities for Least Developed Countries (LDCs) and the actions required at national and international levels to respond to them effectively.

Technical Implementation:

Two separate online sessions have been organized (see below), which will be gender inclusive (presenters and panel members from both genders and increased female participation through online participation), geographically diverse (spanning a range of time zones across the globe, facilitated by the two sessions in different time slots), generationally inclusive (by including youth representatives from U-INSPIRE and ECOPS), multi-actor and multi-disciplinary (warning and disaster management stakeholders).

This satellite activity will be coordinated with, and will help inform the work of the ODTP Science Committee, the IOC-UNESCO Working Group on Tsunami and Other hazards related to sea level Warning and mitigation Systems (TOWS-WG) and its Task Team on Disaster Management and Planning (TT DMP) and Task Team on Tsunami Watch Operations (TT TWO), plus the Intergovernmental Coordination Groups of the Pacific Tsunami Warning & mitigation System (PTWS), Indian Ocean Tsunami Warning & Mitigation System (IOTWMS), Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (CARIBE-EWS), Tsunami Early Warning and Mitigation System in the North-Eastern Atlantic, Mediterranean and connected seas (NEAMTWS)

The format will be presentations followed by panel discussions (geographically and theme split), with questions also taken from online participants:

For more information, including the agenda, please visit the event website at:
https://oceanexpert.org/event/3422

To register and get the zoom links for the two sessions, please use the registration links below.

SESSION A: Learnings from recent tsunamis generated by non-seismic and complex sources.

Day/Date: Wednesday, 6 April 2022

Time: 00:00-02:30 UTC (02:00 – 04:30 CEST)

Zoom Link Registration: https://bit.ly/Further_Challanges_A

SESSION B: What do we know and need to know to warn for.

Day/Date: Thursday, 7 April 2022

Time: 07:00-09:30 UTC (09:00 – 11:30 CEST)

Zoom Link Registration: https://bit.ly/Further_Challanges_B