

## Session Summary -History of the PTWS

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Following the devastating tsunamis of 1960 and 1964 an international tsunami warning system was established, building on the foundation of existing local systems in Hawaii, Japan and Kamchatka. Fortunately, the USA took a leadership role and offered to host this new TWS in Hawaii, and to provide the services of ITIC, with the general mandate of mitigating the effects of tsunamis throughout the Pacific.

Initially the Group had only 6 members and the first decades were challenging. Even with the best available seismographs, tide gauges and communication systems the Pacific's area was hard to overcome. There were too few instruments and the times needed to collect seismic and water level information and to disseminate warnings and watches were too great for most events. In The Pacific Basin the Ring of Fire is a very large ring.

Slowly the number of Member States grew, and with it the number of seismic and water level stations. By the mid-80s new digital instruments, computers, satellite communication, numerical models and the internet reduced the time needed to collect data and disseminate warnings and watches. The western and southern Pacific regions still presented challenges to the PTWS.

The ITIC developed training programs and educational material, produced a Newsletter and established a visiting scientists program. "A Guide for a Post-tsunami Survey" was produced and the Group developed for the first time a Master Plan to ensure that resources for the improvement of the international TWS were most effectively utilized.

During the first 25 years of the PTWS there weren't a large number of destructive tsunamis, most being only locally destructive and all of these tsunamis were 'normal' in their behavior. By 1990 the PTWS was finally starting to get a handle on things. New tools, like the TREMORS system and the MOST model were helping in this regard.

After 1990 the frequency of destructive earthquakes increased and there were more "abnormal" tsunamis; slow earthquakes in Nicaragua (1992) and Peru (1996), and earthquakes with tsunami wave heights much larger than expected in Indonesia (1992) and Japan (2011). These events are challenging for the Tsunami Warning Systems and for emergency response planners. Fortunately, these are the events that most interest the tsunami research community. Their investigations result in findings which feed back to the operational warning and mitigation communities and contribute to improved understandings and procedures.

On December 26, 2004 when the Sumatra earthquake occurred the PTWS was able to calculate the earthquakes magnitude and destructive potential. Unfortunately, they had no contact information for many countries in the Indian Ocean. With that information warnings could have been issued which would have saved lives in Sri Lanka, India and other countries in the western Indian Ocean. In the aftermath of the tsunami the PTWC provided tsunami warnings for the Indian Ocean region until their own TWS was operational.



The IOC took the lead in establishing other warning systems in the Indian Ocean, the Caribbean Sea, and the North Atlantic and Mediterranean Sea. The ICG/PTWS community provided much support in the creation of these new TWSs (e.g. Masahiro Yamamoto, IOC Tsunami Unit, Senior Science Advisor). Staff of the PTWC, ITIC and the NOAA NWS all provided their expertise and support, as did the officers of the ICG/PTWS.

Fifty years after the PTWS's humble beginnings the PTWC has real-time access to 500 seismic stations, 600 tide stations and 60 DART buoys. There are automated systems to determine an earthquake's epicenter, magnitude and depth, and numerical models to simulate the tsunami's propagation and to estimate coastal impacts. Warnings and Watches are routinely sent within 10 minutes of an earthquake event. The ICG/PTWS now has 46 Member States!

The ICG/PTWS and ITIC continue to work to develop better tools for tsunami detection, to support capacity building and training, to develop new education material, and to interact with the other TWSs and emergency management organizations. There is no standing still.

If that small group of people who attending the first Working Group meeting in Honolulu in April 1965 could have been with us this week their impressions would have been very un Spock-like. They would likely stand up, exchange 'high-fives' and say "well done". I hope the ICG/PTWS will have a very productive meeting this week.

With regard to recommendations for the next 5-10 years, the Historical Session group of speakers has one recommendation. They encourage the active participation of ALL members of the Group. Don't leave it to the Group Chair to do most of the work. The Vice-Chairs, Task Teams and other members all have contributions to make. Every member can contribute by being a champion of the PTWS program in their country.