

## Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System



# TSUNAMI NEWSLETTER



## International Tsunami Information Center

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### Santa Cruz Islands, Solomon Islands, 6 February 2013, UTC 01:12, $M_w = 8.0$

On 6 February 2013, a powerful M8.0 earthquake occurred at 01:12 UTC off the Santa Cruz Islands, Solomon Islands due to shallow thrust faulting at a depth of 28 km on or near the plate boundary interface between the Australia and Pacific plates. The M8.0 earthquake generated a tsunami that was recorded on sea level gauges around the Pacific. The largest wave of 1 m amplitude was recorded at Lata Wharf located about 50 km from the epicenter. Over the month leading up to the event, there had been dozens of earthquakes in the epicentral region, 7 of which were greater than M6. There were also two aftershocks greater than M6.

The PTWC issued a regional tsunami warning for countries in the Southwest Pacific 6 minutes after the earthquake and continued to monitor the tsunami. PTWC cancelled the regional warning after 2.5 hours. Reports from the Solomon

Islands National Disaster Center indicate at least 9 casualties with damage to at least four villages and about 700 homes in Temoto Province.



*Tsunami damage to homes at Venga village in Santa Cruz Islands, Solomon Islands. Photo courtesy of Solomon Islands National Disaster Management Office.*

*Continued p. 4*

## SUMMARY OF EARTHQUAKES

1 JANUARY - 30 JUNE 2013

Reported by: International Tsunami Warning Centres

Compiled by: International Tsunami Information Center, ITIC

Advisories issued by international tsunami warning centers. The Pacific Tsunami Warning Center (P) issues: Tsunami Information Bulletins (TIB), Fixed and Expanding Regional Warnings (FRW, ERW), and Ocean-wide or Widespread Watch/Warnings (TWW) for the Pacific; Tsunami Information Bulletins (TIB), Local, Regional, and Ocean-wide Tsunami Watches (LTW, RTW, TW) for the Indian Ocean (IO) until 31 March 2013; Tsunami Information Statements (TIS), Local, Regional, and Ocean-wide Watches (LTW, RTW, TW) for the wider Caribbean (C). The Japan Meteorological Agency (J), issues: Tsunami Advisories (NWPTA) for the Northwestern Pacific; Tsunami Watch Information (TWI) for the Indian Ocean until 31 March 2013. The West Coast/Alaska Tsunami Warning Center (A) issues: Tsunami Information Statements (TIS), Tsunami Advisories (TA), Tsunami Watch/Warnings (TWW) for Canada, the US (including Puerto Rico, excluding Hawaii and US-affiliated Pacific Island countries), and the US/British Virgin Islands. Depth (from GCMT solution), epicenter and Mw from the USGS (G), and Mw from PTWC, WC/ATWC, and JMA at action time. Other earthquakes with Mw greater than or equal to 6.5 and a depth no greater than 100 km, as recorded by USGS, have also been included. Wave height and period measurements from sea level gauges (g) reported as amplitude (amp), peak to trough, or greatest value for either flow depth (fd) or runup (r) as indicated. Event location (e.g. name) is derived from PTWC message(s).

DATE	TIME (UTC)	LOCATION	EPICENTER	DEPTH (km)	M <sub>w</sub>	PTWC (P), JMA (J) or WC/ATWC (A) ACTION	ACTION TIME (UTC)	TSUNAMI? DAMAGING?	MAXIMUM MEASUREMENT and LOCATION
5-Jan	08:58	Southeastern Alaska	55.368° N 134.621° W	14	7.6 (P) 7.5 (A, G)	(A) 01 TWW (P) 01 TIB (A) 02 TWW (P) 02 TIB (A) 03 TWW (A) 04 TWW	09:01 09:06 09:30 09:43 10:17 10:58	YES NO	14 cm (amp) (g), Port Alexander, Alaska
30-Jan	20:16	Central Chile	28.181° S 70.800° W	47	6.6 (A) 6.7 (P) 6.8 (G)	(A) 01 TIS (P) 01 TIB	20:19 20:22	NO NO	
1-Feb	22:17	Santa Cruz Islands	10.926° S 165.450° E	12	6.7 (A, P) 6.3 (G)	(P) 01 TIB (A) 01 TIS (J) 01 NWPTA	22:24 22:26 22:41	NO NO	
2-Feb	14:18	Hokkaido Japan Region	42.812° N 143.078° E	99	6.8 (P) 6.9 (A, G)	(P) 01 TIB (A) 01 TIS	14:27 14:27	NO NO	
6-Feb	01:12	Santa Cruz Islands	10.738° S 165.138° E	28	8.0 (A, G, J, P)	(P) 01 ERW (A) 01 TIS (J) 01 NWPTA (P) 02 ERW (P) 03 ERW (A) 02 TIS (P) 04 ERW (P) 05 ERW (P) 06 ERW (A) 03 TIS (J) 02 NWPTA (P) 08 FRW	01:18 01:22 01:25 01:49 02:12 02:25 02:52 03:07 03:16 03:21 03:31 03:47	YES YES	101 cm (amp) (g) Lata Wharf, Solomon Islands
7-Feb	18:59	Santa Cruz Islands	11.001° S 165.658° E	13	6.7 (A, J, P) 6.6 (G)	(P) 01 TIB (A) 01 TIS (J) 01 NWPTA	19:05 19:07 19:19	NO NO	
8-Feb	11:12	Santa Cruz Islands	10.904° S 165.895° E	12	7.1 (A, J, P) 6.8 (G)	(P) 01 TIB (A) 01 TIS (J) 01 NWPTA	11:18 11:20 11:33	NO NO	

Earthquakes, *continued*

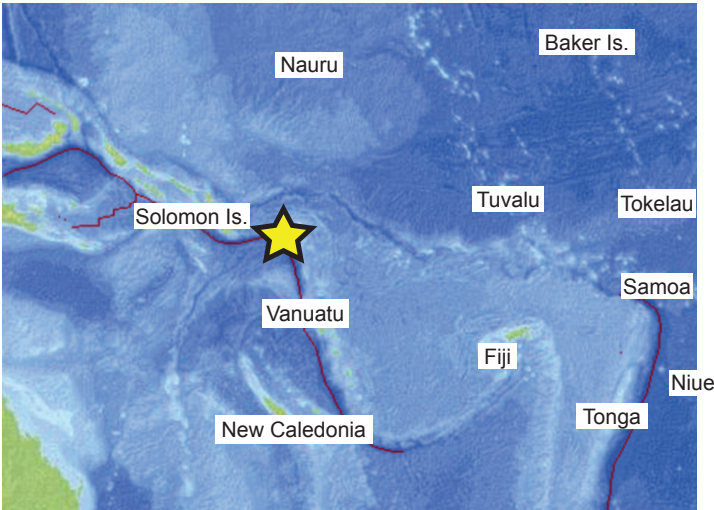
DATE	TIME (UTC)	LOCATION	EPICENTER	DEPTH (km)	M <sub>w</sub>	PTWC (P), JMA (J) or WC/ATWC (A) ACTION	ACTION TIME (UTC)	TSUNAMI? DAMAGING?	MAXIMUM MEASUREMENT and LOCATION
8-Feb	15:27	Santa Cruz Islands	10.910° S 165.964° E	24	7.0 (A, G, J, P)	(P) 01 TIB (A) 01 TIS (J) 01 NWPTA	15:32 15:34 15:46	YES NO	11 cm (amp) (g) Lata Wharf, Solomon Islands
9-Feb	14:16	Colombia	1.167° N 77.384° W	155	6.9 (A, G, P)	(P) 01 TIB (A) 01 TIS	14:24 14:27	YES NO	1.1 m (amp) (g) Meulaboh, Indonesia (A, P)
9-Feb	21:02	Santa Cruz Islands	10.964° S 165.792° E	17	6.9 (A, J, P) 6.6 (G)	(P) 01 TIB (A) 01 TIS (J) 01 NWPTA	21:09 21:12 21:24	NO NO	
14-Feb	13:14	Eastern Siberia Russia	67.580° N 142.593° E	12	6.9 (A, P) 6.6 (G)	(P) 01 TIB (A) 01 TIS	13:23 13:25	NO NO	
28-Feb	14:06	Kuril Islands	50.934° N 157.339° E	48	6.9 (A, G, J, P)	(P) 01 TIB (A) 01 TIS (J) 01 NWPTA	14:13 14:14 14:25	NO NO	
1-Mar	12:54	Kuril Islands	50.938° N 157.511° E	48	6.7 (A) 6.4 (G)	(A) 01 TIS	13:30	NO NO	
1-Mar	13:21	Kuril Islands	50.945° N 157.476° E	43	6.7 (J, P) 6.5 (G)	(P) 01 TIB (J) 01 NWPTA	13:29 13:41	NO NO	
10-Mar	22:52	New Britain Region Papua New Guinea	6.653° S 148.155° E	12	6.7 (A, J, P) 6.5 (G)	(P) 01 TIB (A) 01 TIS (J) 01 NWPTA	23:02 23:04 23:18	NO NO	
6-Apr	04:43	Papua, Indonesia	3.526° S 138.466° E	75	7.2 (A, J, P) 7.0 (G)	(P) 01 TIB (A) 01 TIS (J) 01 NWPTA	04:49 04:51 05:05	NO NO	
14-Apr	01:32	Solomon Islands	6.479° S 154.584° E	28	6.7 (A, J, P) 6.6 (G)	(P) 01 TIB (A) 01 TIS (J) 01 NWPTA	01:38 01:40 01:51	NO NO	
16-Apr	22:55	Near North Coast of New Guinea P.N.G.	3.218° S 142.543° E	18	6.8 (A, J, P) 6.6 (G)	(P) 01 TIB (A) 01 TIS (J) 01 NWPTA	23:01 23:02 23:13	NO NO	
19-Apr	03:05	Kuril Islands	46.182° N 150.796° E	107	7.0 (A, J, P) 7.2 (G)	(J) 01 NWPTA (P) 01 TIB (A) 01 TIS	03:16 03:17 03:18	YES NO	20 cm (amp) (visual observation) Shikotan Island
23-Apr	23:15	New Ireland Region Papua New Guinea	3.911° S 152.127° E	12	6.6 (A, J, P) 6.5 (G)	(P) 01 TIB (A) 01 TIS (J) 01 NWPTA	23:21 23:22 23:39	NO NO	
11-May	20:47	Tonga	17.944° S 175.075° W	242	6.5 (A, G, P)	(P) 01 TIB (A) 01 TIS	20:54 20:55	NO NO	
14-May	00:32	Mariana Islands	18.748° N 145.294° E	608	7.0 (A, P) 6.8 (G, J)	(P) 01 TIB (A) 01 TIS (J) 01 NWPTA	00:39 00:40 00:48	NO	
20-May	09:49	West Chile Rise	44.944° S 80.541° W	18	6.8 (A, P) 6.5 (G)	(P) 01 TIB (A) 01 TIS	09:57 09:58	NO	



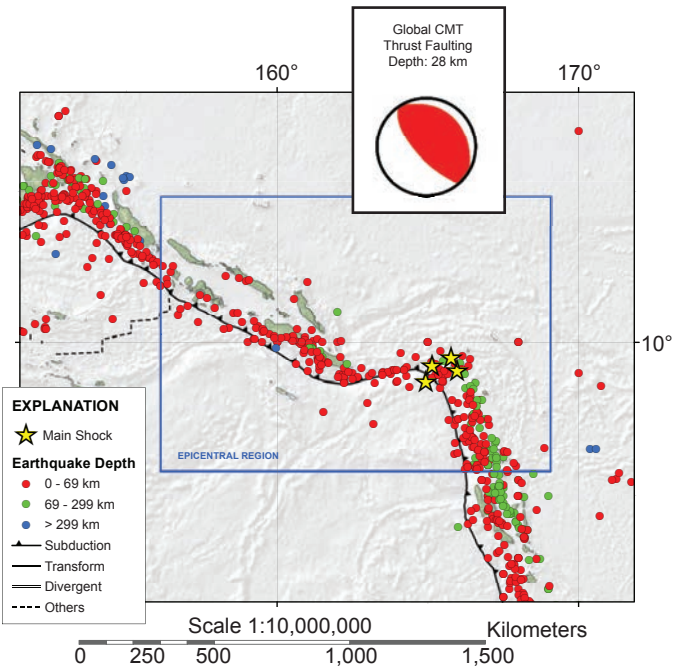
Earthquakes, *continued*

23-May	17:19	South of Fiji Islands	23.025° S 177.109° W	189	7.4 (A, G, P)	(P) 01 TIB (A) 01 TIS	17:26 17:27	NO NO
23-May	21:08	Tonga	20.561° S 175.730° W	161	6.5 (A, P) 6.6 (G)	(P) 01 TIB (A) 01 TIS	21:15 21:16	NO NO
24-May	05:45	Sea of Okhotsk	54.874° N 153.280° E	607	8.2 (A, P) 8.3 (G)	(P) 01 TIB (A) 01 TIS	05:52 05:52	NO NO
24-May	14:57	Sea of Okhotsk	52.222° N 151.515° E	644	6.5 (A, P) 6.8 (G)	(P) 01 TIB (A) 01 TIS	15:10 15:11	NO NO
2-Jun	05:43	Taiwan	23.794° N 121.082° E	18	6.5 (A, P) 6.2 (G)	(P) 01 TIB (A) 01 TIS	05:52 05:53	NO NO
15-Jun	17:34	Near the Coast of Nicaragua	11.771° N 86.936° W	41	6.6 (A, P) 6.5 (G)	(P) 01 TIB (A) 01 TIS	17:39 17:40	NO NO
24-Jun	22:04	Northern Mid- Atlantic Ridge	10.726° N 42.616° W	19	6.6 (A, P) 6.4 (G)	(P) 01 TIS (A) 01 TIS	22:12 22:14	NO NO

Santa Cruz Islands, *continued*

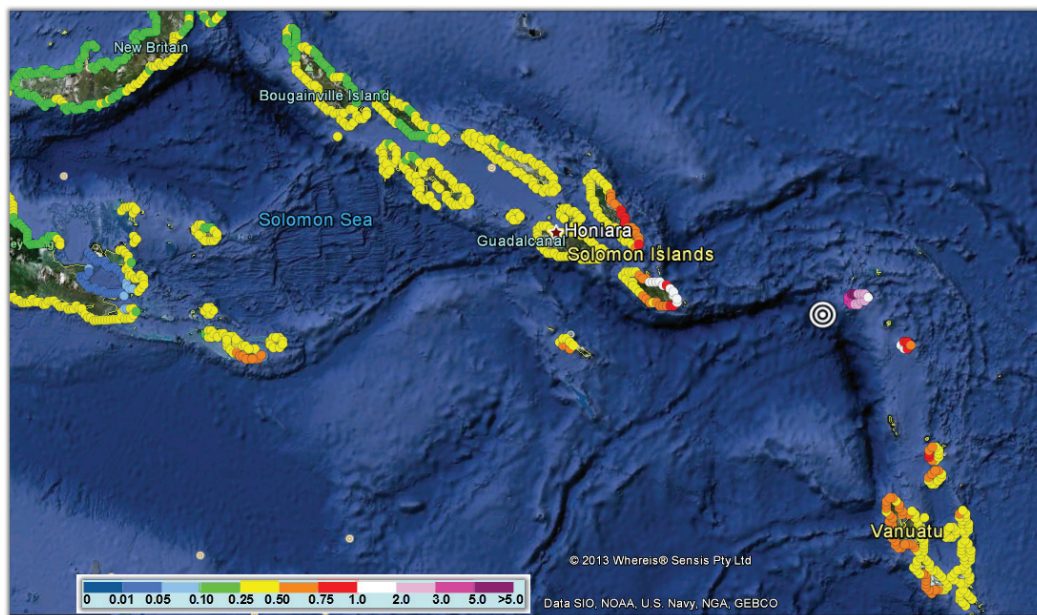


Magnitude 8.0 Santa Cruz Islands, 6 February 12, depth 28 km. Map courtesy of USGS National Earthquake Information Center (NEIC).

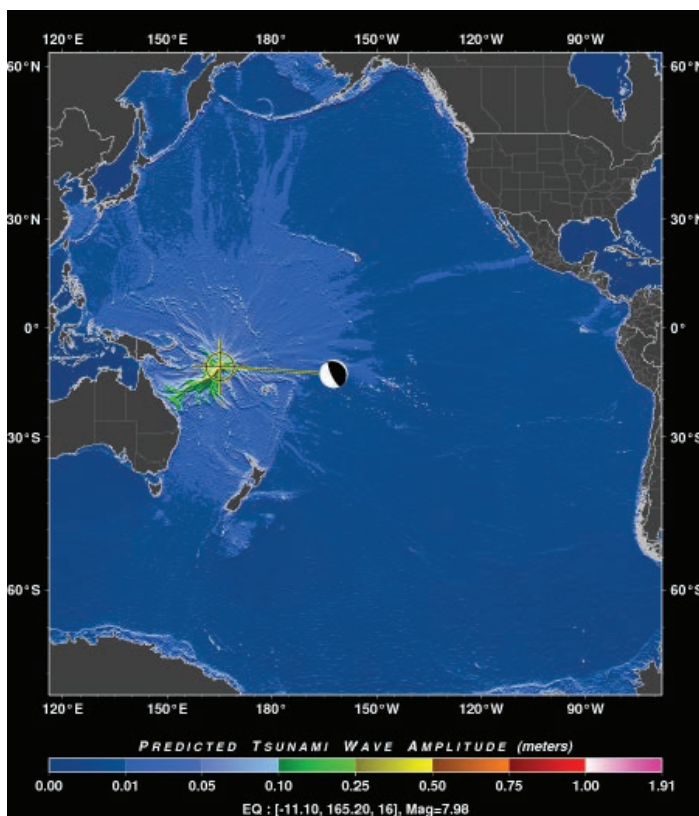


Historic seismicity with recent earthquake locations marked by star. Map courtesy of USGS National Earthquake Information Center (NEIC).

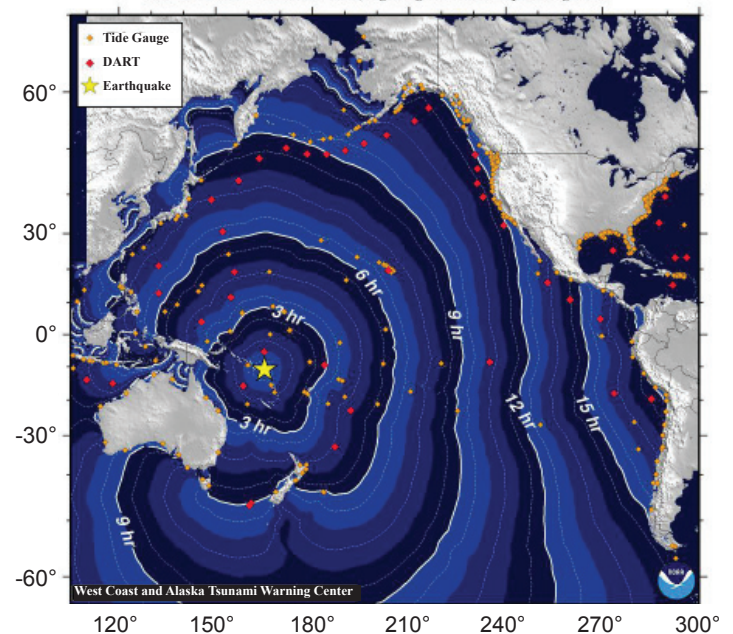
Left: Aerial photo of tsunami coastal inundation of Western Santa Cruz, 8 February 2013. Courtesy of Solomon Islands National Disaster Management Office and Royal Australian Air Force.

Santa Cruz Islands, *continued*

*PTWC Enhanced Product: Detailed model of coastal tsunami forecast amplitudes of the Santa Cruz Islands, Solomon Islands magnitude 8.0 earthquake. (epicenter circle) Courtesy of PTWC Realtime Forecast of Tsunamis (RIFT) Model.*

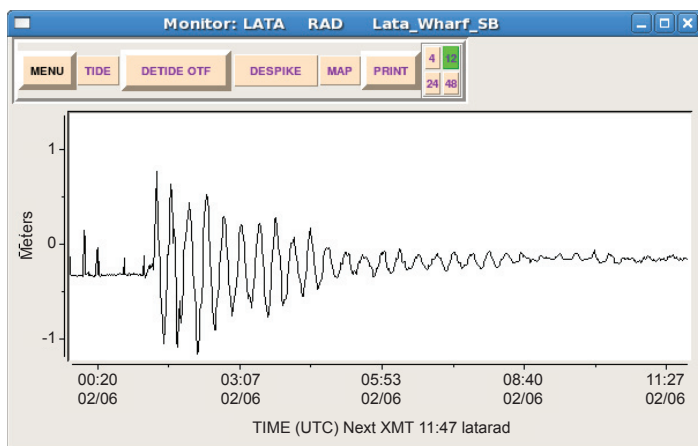


*PTWC RIFT model simulation showing the predicted maximum off-shore tsunami wave amplitudes from the 1112 UTC 6 February 2013 shallow thrust earthquake. Courtesy of PTWC.*

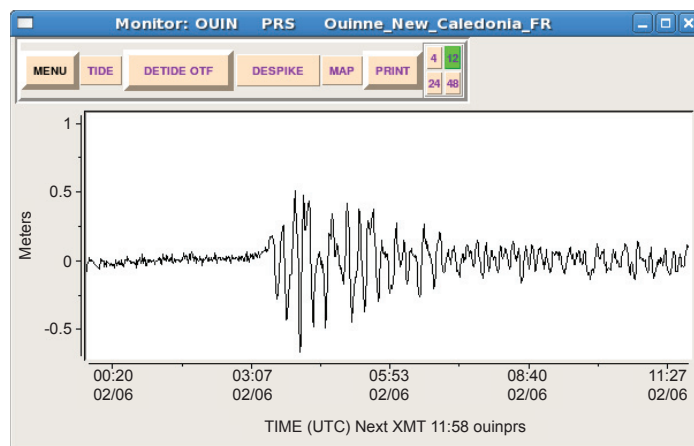


*Solomon Islands tsunami travel times. Map courtesy of WC/ATWC.*

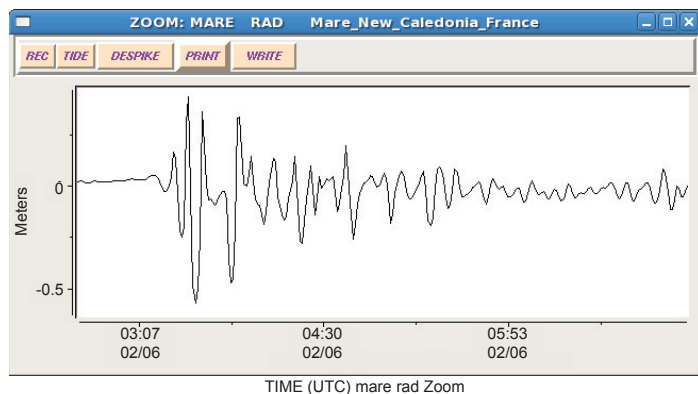


Santa Cruz Islands, *continued*

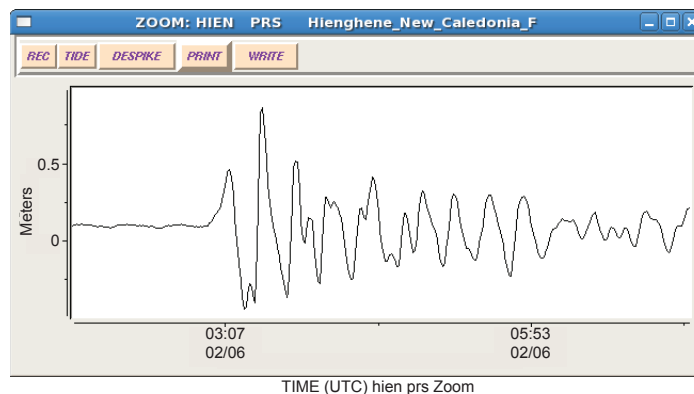
A 1 m amplitude tsunami was recorded at Lata Wharf about 50 km from the epicenter. Courtesy of PTWC.



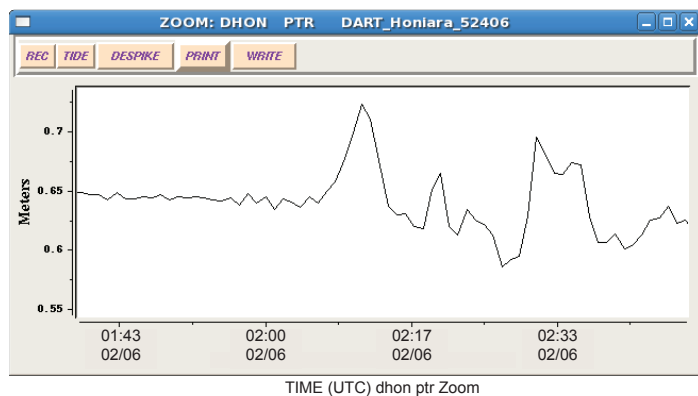
A 44 cm amplitude tsunami was recorded at Mare, New Caledonia. Courtesy of PTWC.



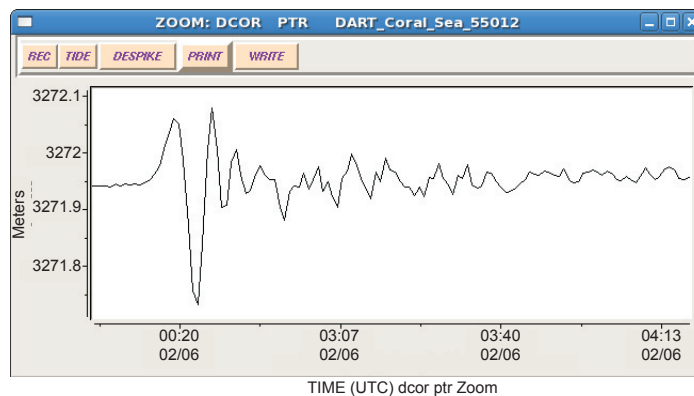
A 49 cm amplitude tsunami was recorded at Ouinne, New Caledonia. Courtesy of PTWC.



A 77 cm amplitude tsunami was recorded at Hienghene, New Caledonia. Courtesy of PTWC.



DART 52406 deep-ocean instrument near Honiara, Solomons recorded an 81 cm amplitude tsunami. Courtesy of PTWC.



DART 55012 deep-ocean instrument in the Coral Sea recorded a 13 cm amplitude tsunami (PTWC). Courtesy of PTWC.

Tide gage/ Measurement Location	Observed Arrival time (UTC)	Peak amplitude (above sea level in cm)	Time of Peak Amplitude Measurement (UTC)	Initial motion	Sample Interval (min)
Lata Wharf, Solomon Islands	116	101	130	up	1
Luganville, Vanuatu	201	29	452	up	1
Apia, West Samoa	501	7	531	up	1
Burnie, Tasmania	?	5	1453	?	1
Cape Ferguson, Australia	631	5	643	up	1
Honiara, Solomon Islands	229	10	431	up	1
Manus, Papua New Guinea	547	5	712	?	1
Port Kembla, Australia	?	7	1532	?	1
Port Vila, Vanuatu	230	33	439	up	1
Rossllyn Bay, Australia	700	19	810	up	1
Spring Bay, Tasmania	755	8	1635	?	1
Betio, Tarawa, Kiribati	345	14	414	up	1
Thevenard, Australia	?	4	1409	?	1
Nukualofa, Tonga	600	5	740	up	1
Suva Viti Levu, Fiji	404	6	443	up	1
Korotiti Bay, New Zealand	703	18	920	?	1
Kwajalein, Marshall Islands	433	12	812	?	1
Legaspi, Philippines	1015	4	1108	?	1
Lifou, New Caledonia	256	40	309	?	1
Lottin Point, N.Z.	657	10	823	up	1
Mare, New Caledonia	311	44	329	up	1
Sand Island, Midway	742	9	1147	?	1
Ouinne, New Caledonia	313	49	359	up	1
Pago Pago, American Samoa	519	10	1010	up	1
Papeete, Fr. Polynesia	818	6	851	up	1
Raoul Is. Boat Cove, N.Z.	613	9	748	?	1
Raoul Is. Fishing Rock, N.Z.	609	16	927	?	1
Saipan, USA	700	3	813	?	3
Wake Island, USA	559	5	709	?	1
Christmas Is., Kiribati	656	4	906	up	1
Yap, Micronesia	738	4	1227	up	1
Chichijima, Japan	832	19	914	up	1
Hanasaki, Japan	947	13	1123	up?	1
Ishigakijima, Japan	?	6	1116	?	1

Santa Cruz Islands, *continued*

Tide gage/ Measurement Location	Observed Arrival time (UTC)	Peak amplitude (above sea level in cm)	Time of Peak Amplitude Measurement (UTC)	Initial motion	Sample Interval (min)
Kushimoto, Japan	939	19	1047	?	1
Mera, Japan	1022	14	1252	?	1
Ofunato, Japan	1012 ?	11	1211	?	1
Omaezaki, Japan	1048	13	1556	?	1
Severo Kurilsk, Russia	1115	10	1623	down	1
Barbers Point, HI	819	5	1114	up	1
Haleiwa, HI	839	19	1120	down	10 sec
Honokahau, HI	814	7	1039	up	10 sec
Honolulu, HI	823	10	1038	up	1
Kahului, Maui, HI	857	18	1038	up	1
Kaunapali, HI	816	6	1035	up	1
Kawaihae, HI	820	10	1118	up	1
Lahaina, HI	838	12	1029	up	10 sec
Makapuu, HI	850	8	913	down	10 sec
Mokuloe, Oahu, HI	?	2	1013	?	1
Nawiliwili, HI	829	~1	825	?	10 sec
Waianae, HI	816	14	1035	up	10 sec
Adak, AK	1134	9	1732	?	1
Atka, AK	?	11	1243	?	1
Chignik, AK	?	14	1504	?	15 sec
Nikolski, AK	1219	11	1309	up	1
Port Alexander, AK	1349	5	2018	?	1
Sand Point, AK	1242	11	1543	up	1
Sitka, AK	1422	3	1540	?	15 sec
Yakutat, AK	1433	7	1451	up	1
Langara, BC**	~1245	5	~1405	up	1
Winter Harbor, BC**	~1250	6	~1308	up	1
Neah Bay, WA	?	7	1747	?	1
Port Angeles, WA	1516	5	2018	?	1
Crescent City, CA	?	20	310	?	1
La Jolla, CA	1428	6	1755	?	1
Monterey Harbor, CA	?	4	1431	?	1
Port San Luis, CA	1358	15	1500	?	1
Santa Monica, CA	1434	8	1857	down	1



**Santa Cruz Islands, *continued***

Tide gage/ Measurement Location	Observed Arrival time (UTC)	Peak amplitude (above sea level in cm)	Time of Peak Amplitude Measurement (UTC)	Initial motion	Sample Interval (min)
Cabo San Lucus, Mexico	?	6	1607	?	1
Quepos, Costa Rica	1900	4	2339	?	1
Arica, Chile	2017	15	2325	?	1
Caldera, Chile	?	16	33	?	1
Callao La Punta, Chile	?	12	2340	?	1
Chanaral, Chile	?	13	2138	?	1
Coquimbo, Chile	?	17	140	?	1
Iquique, Chile	?	4	2140	?	1
LaLibertad, Ecuador	?	14	2214	?	1
San Antonio, Chile	?	10	345	?	1
Santa Cruz, Galapagos, Ecuador	1853	19	2353	down	1
Talcahuano, Chile	?	11	538	?	1
Valparaiso, Chile	1956	7	2128	down	1

*Sea Level Measurements of the Solomon Islands Tsunami. Courtesy of WC/ATWC. \*\* Courtesy Canadian Hydrographic Survey.*

**IOC News****IOC Regional Tsunami Training for Central America and Mexico, San Salvador, El Salvador, 9-16 February 2013**

The ITIC Director, Dr. Laura Kong, ITIC Technical (Tsunamis) Information Specialist, Mr. Nicolas Arcos, PTWC Director, Dr. Charles McCreery, along with trainers from the US Geological Survey, Dr. Walter Mooney, and the ICG/PTWS Secretariat, Mr. Bernardo Aliaga, conducted IOC Regional Training on Strengthening Tsunami Warning and Emergency Response Standard Operating Procedures (SOPs) and the PTWC New International Tsunami Products, from 11-15 February 2013, in San Salvador, El Salvador. The training was hosted by the El Salvador Ministerio de Medio Ambiente y Recursos Naturales (MARN, Ministry of the Environment and Natural Resources). This was the first time tsunami training has been conducted in this region by ITIC and PTWC. The training invited participants from the National Tsunami Warning Centers and National Disaster Management Offices of Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua and Panama, every country in Central America with a Pacific coast as well as Mexico. The ITIC, a partnership of NOAA and the IOC and operated by the NOAA NWS Pacific

Region since 1965, has served as a primary resource assisting countries to build and strengthen their tsunami warning systems. This training supported ITIC's mission and commitment to strengthen the Pacific Tsunami Warning and Mitigation System.



*Jeniffer Alejandra Larreynaga Murcia (MARN/El Salvador), Angelica Munoz (INETER/Nicaragua), Emilio Adán Talavera (INETER/Nicaragua), Bernardo Aliaga (IOC), Luis Ignacio Islas Martínez de Pinillos (CAT/Mexico) discuss Central America Regional Tsunami Activities. Photo courtesy of Ministerio de Medio Ambiente y Recursos Naturales (MARN), El Salvador.*

**El Salvador, *continued***

Immediately following the 27 August 2012 earthquake and tsunami off of the coast of El Salvador, the Government of El Salvador requested the IOC and ITIC to coordinate an International Tsunami Survey Team (ITST) post-tsunami survey. ITIC deployed Nicolas Arcos from 3-12 September 2012 to El Salvador to support the survey. NOAA's Pacific Marine Environmental Laboratory and USAID-LAC also participated. The ITST report documenting the tsunami impact, and providing broad general recommendations to improve El Salvador's national system was coordinated by ITIC. It was provided to the government of El Salvador in November 2012. As a result of the Post-Tsunami Survey and experiences during the tsunami, the Government of El Salvador formally requested the IOC and ITIC to conduct a regional training to strengthen the existing tsunami warning and response systems and associated procedures. Financial support for the training came from USAID Latin America Countries Office and IOC. Support was also received from the US Contribution to the WMO Voluntary Contribution Program (WMO-VCP), the NOAA Tsunami Program, the USGS, and El Salvador.

**Summary of Activities and Discussions:**

- Trainers conducted regional training on Tsunami

Warning Center and Emergency Response Standard Operating Procedures, and PTWC New Products. Training included real-time tabletop exercise.

- Trainers and trainees visited to the MARN Tsunami Warning Operations Center.
- ITIC Director discussed ITST-El Salvador Summary Report contents, and status within the El Salvador government, with MARN Director of Environmental Observations
- ITIC and PTWC Directors, along with IOC PTWS Technical Secretary Met with MARN Minister and Director of Environmental Observations to learn about El Salvador's improvement activities after the tsunami, and to discuss further possible technical assistance to El Salvador.
- Multiple Press Events were associated with this mission.

**Outcomes:**

- Trained twenty-five (25) participants from seven (7) countries in tsunami SOPs. Participants rated the course as overwhelmingly excellent with all topics covered critical to their jobs.
- Briefed Region on PTWC's new international products, including conduct of table top exercise



*IOC Regional Tsunami Training for Central America and Mexico in San Salvador, El Salvador. Participants were from National Tsunami Warning Centres and National Disaster Management Offices in Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua and Panama. Photo courtesy of Ministerio de Medio Ambiente y Recursos Naturales (MARN), El Salvador.*



**El Salvador, *continued***

*Minister Herman Rosa Chávez speaking at the opening ceremony. Photo courtesy of Ministerio de Medio Ambiente y Recursos Naturales (MARN), El Salvador.*

using the new products.

- Confirmed the release of the ITST- El Salvador Report as a public document. MARN to officially communicate its release to IOC and ITIC.
- Identified possible types of technical assistance and capacity building that could be provided by the US and IOC to El Salvador. MARN will share its Millenium Proposal on Disaster Risk Reduction that was previously submitted for funding (by US) and requested feedback on the tsunami component of that proposal. A possible next step is a MARN-invited scoping mission to elaborate on a more detailed work plan and

budget that will measurably improve its warning and mitigation system.

- During the training, the Mexico Navy inquired to IOC on possible PTWS training for its country. IOC and ITIC are following up on the request for invitational training.
- Soon after the training, Honduras COPECO informed all on its receipt of funds to improve its tsunami warning system. IOC and ITIC will inquire on details and whether any support is requested.

**Follow-Up Actions to be done based on the trip include the following:**

- Continue to provide assistance to El Salvador and MARN, on their request.
- Continue to provide assistance to Mexico, Guatemala, Honduras, Nicaragua, Costa Rica and Panama, on their request.

**IOC Tsunami Meetings, Paris, France, 18-21 February 2013**

Following the Central America Regional Training in early February 2013, Drs. McCreery and Kong participated in the IOC Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems Working Group (TOWS-WG) and Tsunami Watch Operations Task Team meetings in Paris, France from 18-21 February 2013. The IOC established the TOWS-WG to advise the IOC Governing Bodies on coordinated development and implementation activities on warning and mitigation systems for tsunamis and other hazards related to sea level as a common priority to all Global Intergovernmental Coordination Groups for Tsunami Warning and Mitigation Systems. For Warning Operations, key issues that required discussion and coordination included areas of responsibility services, common terminology for alert levels, seismic magnitude, sea-level parameters, format and content of warning products, public bulletins, and dissemination methods. At the TOWS WG meeting, Dr. Kong represented the Task Team on Disaster Management and Preparedness.

Drs. McCreery and Kong also participated to the informal PTWS Steering Committee meeting held on the afternoon of 19 February 2013.



*Ana Deisy Lopez (MARN/El Salvador) explains the operations of the El Salvador Tsunami Warning Center. Photo courtesy of Ministerio de Medio Ambiente y Recursos Naturales (MARN), El Salvador.*

**Paris, continued**

Drs. McCreery and Kong also met with Dr. Iouri Oliounine, former Technical Secretary for the IOC Tsunami Programme (1981-2001) to seek his historical suggestions on activities and key persons that were instrumental in establishing and building the PTWS System.

Dr. McCreery visited the France National Tsunami Warning Center on 22 February 2013. France is serving as a Tsunami Watch Provider to the NEAMTWS within the framework and facilities of the Center of Atomic (Alternative) Energy and its Laboratory of Geophysical Detection, of the Analysis, Monitoring and Environment Dept. of the Direction of Military Applications. The CENALT was developed taking into consideration the existing tsunami expertise that has evolved at the CEA since the 1960's with its experience in the Pacific. NEAMTWS CENALT became operational in 2012.

**Summary of NOAA Activities and Discussions:**

- Participated to the TOWS WG Task Team 3 on Watch operations, 18-19 Feb 2013
- Participated to the informal PTWS Steering Committee Meeting, 19 Feb 2013
- Participated to the TOWS WG, 20-21 Feb 2013
- Met with Dr. Iouri Oliounine, former ITSU Technical Secretary and IOC Deputy Director



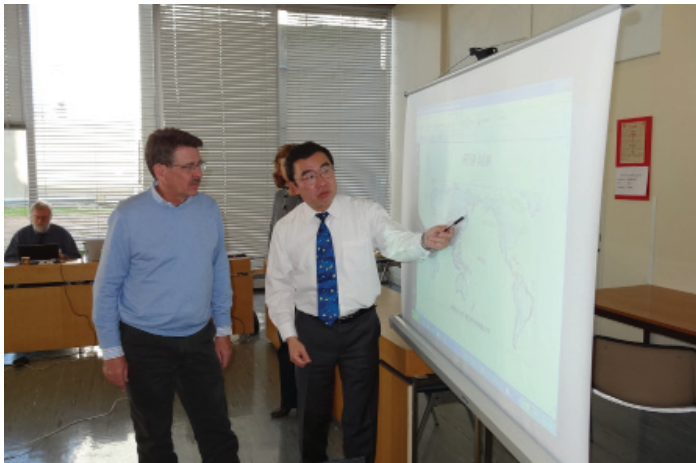
*Participants of the IOC Working Group on Tsunamis and Other Hazards related to Sea Level Waning and Mitigation Systems Working Group (TOWS-WG). Ms. Christa Von Hillebrandt-Andrade (Chair ICG/CARIBE-EWS), Mr. Tony Elliott (Head IOTWS Secretariat), Mr. Gerassimos Papadopoulos (NEAMTWS representative), Mr. Takeshi Koizumi (ICG/PTWS representative), Mr. Ken Gledhill (Chair ICG/PTWS), Mr. Rick Bailey (Chair ICG/IOTWS), Dr. François Schindelé (Chair ICG/NEAMTWS), Dr. Chip McCreery (Director PTWC), Dr. T. Srinivasa Kumar (Chair TOWS-WG TT3), Dr. Thorkild Aarup (Head IOC Tsunami Unit) and Dr. Laura Kong (Director ITIC). Photo courtesy of ITIC.*

- Met with Ingrid Pastor to finalize IOC-ITIC Tsunami Glossary 2013 (English and Arabic), as well as to confirm updates for Tsunami Great Waves 2012 (finished in 2012 in English and French) and Surviving Tsunami 2013 (to be finalized in English)
- Met with NEAMTIC to share information and resources
- Met with IOC IOTWS Head of Office to finalize IOC-ITIC SOP Publication (finalizing in 2013) and discuss planned IOTWS SOP Training (June 2013)
- Visited the France NEAMTWS CENALT

**Outcomes:**

- TOWS WG Task Team 3: PTWC provided status on its AOR and briefed on PTWS PTWC New Enhanced Products; ITIC led discussion on post-tsunami surveys. Both PTWC and ITIC provided input on agenda items based on their long experiences in the Pacific.
- PTWS Steering Committee Meeting: Discussed and agreed on update plan for the PTWS Medium Term Strategy and Implementation Plan, Issuance of PTWS PTWC New Enhanced Products (start 15 April 2013), Exercise Pacific Wave 2013 (1-14 May 1-14 2013), and training requirements in support of the new products.
- TOWS WG: Reported on TOWS TT 2 and TT 3 (including lessons learned from recent events, and proposed new TT 2 Terms of Reference). ITIC finalized TT 2 Report and provided TT 2 presentation to TOWS WG.
- Met with IOC Dr. Iouri Oliounine, former IOC Tsunami Programme Technical Secretary and IOC Deputy Director.
- Met with IOC Ingrid Pastor to finalize IOC-ITIC Tsunami Glossary 2013 (English and Arabic), as well as to confirm updates for Tsunami Great Waves 2012 (finished in 2012 in English and French) and Surviving Tsunami 2013 (to be finalized in English)
- Finalized and published IOC Manual and Guide 58, How to Plan, Conduct, and Evaluate IOC Tsunami Wave Exercises (2013), available at [www.pacwave.info](http://www.pacwave.info) (along with other PacWave13 info)
- Met with IOC NEAMTIC to share information



Paris, *continued*

*Dr. Charles McCreery, PTWC Director and Mr. Takeshi Koizumi, JMA Senior International Tsunami Advisor discuss issues for Global Intergovernmental Coordination Groups for Tsunami Warning and Mitigation Groups. Photo courtesy of ITIC.*

and resources

- Met with IOC IOTWS Head of Office to finalize IOC-ITIC SOP Publication (finalizing in 2013) and discuss planned IOTWS SOP Training (June, 2013)

#### **Follow-Up Actions to be done based on the trip include the following:**

##### **TOWS WG**

- ITIC to continue to support other regional TICs, and share best practices amongst TOWS WG TT 2 (Disaster Management and Preparedness) and TICs
- ITIC to work with TT 3 Chair to standardize post-event evaluation survey for use across all ICGs after significant tsunami
- PTWC to continue taking into account recommendations of the TOWS Task Team for Watch Operations in the development of new products and procedures for the Pacific and Caribbean

##### **PTWS**

- ITIC and PTWC to work together with PTWS Task Teams to finish the PTWC New Enhanced Products User's Guide (March 15th), PacWave13 Exercise Manual (April 15th), and prepare for start of new products issuance (April 15th)
- ITIC to work with PTWS Secretariat to identify

training needs of regions / countries and work together to meet them in 2013 and/or 2014. Goal is 1 Training / PTWS Regional Working Group

- ITIC to continue to work with IOC to update existing and develop new global awareness materials
- Continue to discuss PTWS 50th Anniversary possible activities with IOC

#### **IOC Regional Tsunami Training for South America, 4-8 March 2013, Valparaíso, Chile**

ITIC Director, Dr. Laura Kong, Technical Information Specialist, Mr. Nicolas Arcos and PTWC Deputy Director, Dr. Stuart Weinstein conducted South America Regional Tsunami Training in Valparaíso, Chile from 4-8 March. The Chilean Navy SHOA hosted the training. The NWS Pacific Region, in the U.S. Agency for International Development, and the UNESCO Intergovernmental Oceanographic Commission (IOC), coordinated the regional tsunami training involving the four South American countries that border the Pacific Ocean (Chile, Colombia, Ecuador, Peru). There were a total of 26 participants. The training covered tsunami warning and emergency response standard operating procedures, and the new PTWC PTWS international products. Important feedback on the use of the new products by country stakeholders was received. Evaluations by the participants rated the training overwhelmingly excellent with all topics considered critically important.



*Lieutenant Commander Miguel E. Vasquez, Chile SHOA (center), took participants on a tour of SHOA's tsunami warning center. Photo courtesy of ITIC.*

Chile, *continued*

IOC Reginal Tsunami Training for South America in Valparaiso, Chile. Participants were from National Tsunami Warning Centres and National Disaster Management Offices in Chile, Colombia, Ecuador and Peru. Photo courtesy of Servicio Hidrográfico Oceanográfico de la Armada de Chile (SHOA).



Participants worked together in a table-top exercise involving South America tsunami warning and response Standard Operating Procedures. Photo courtesy of ITIC.

### Oman Public Awareness and Outreach on Tsunami Hazard, Muscat, Oman, 11-12 March 2013

Dr. Laura Kong, ITIC Director, participated as an invited expert to the IOC and Oman Tsunami Public Awareness workshop in Muscat, Oman from 11-12 March. The workshop focused on public awareness for Tsunami Early Warning Systems. Participants included national officers and key stakeholders of the Oman National Multi-Hazard Early Warning System. The event was hosted by IOC and the Directorate General of Meteorology and Air Navigation of Oman. The Oman National Tsunami Warning Center discussed with ITIC possible tsunami training opportunities for its staff in 2014.



Public Awareness and Outreach on Tsunami Hazard workshop in Muscat, Sultanate of Oman. Participants included international experts from Indonesia, Japan, and USA, along with IOC Project Specialists, and Oman scientists from DGMAN and Sultan Qaboos University. Photo courtesy of A. Kodijat, JTIC.

### Excercise Pacific Wave 13 - Report on Pacific-wide Tsunami Warning and Enhanced Products Exercise, 1-14 May 2013

The occurrences of three destructive tsunamis in three years (29 September 2009 South Pacific tsunami – 192 deaths, 27 February 2010 Chile tsunami – 124 deaths, 11 March 2011 Japan tsunami – more than 18,000 deaths) were sober reminders to all of the need for every country to be prepared. This is especially true in the Pacific where tsunamis occur most often. Local and regional tsunamis occur most frequently, and in the Pacific over history, have been the cause of 99% of tsunami casualties, as they will impact shorelines in minutes. Exercise Pacific Wave (PacWave) 2006 and 2008 provided the opportunity for participating

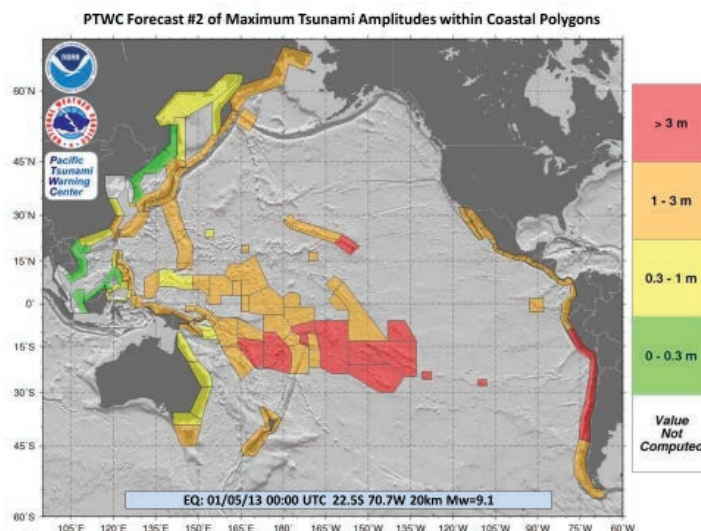


**PacWave 13**, *continued*

countries to exercise general procedures and communications arrangements.

PacWave11 included the introduction of new international tsunami products proposed by PTWC and approved by the Twenty-fourth session of the ICG/PTWS (May 2011) for implementation in 2014. The PTWC Enhanced Products are threat-based on tsunami wave forecasts, rather than based upon earthquake magnitude thresholds and time or distance to impact. Several levels of tsunami threat have been established, and forecast threat levels are assigned to polygons representing segments of extended coastlines or to island groups. The improvements should greatly reduce the number of areas warned unnecessarily and also provide some advance notice of potential local tsunamis. Details on the PTWC New Enhanced Products for the PTWS are provided in IOC document User's Guide for the Pacific Tsunami Warning Center Enhanced Products for the Pacific Warning System (IOC/2013/TS/105). It can be downloaded from the PacWave13 website (<http://www.pacwave.info>)

In May 2012, the Task Team (TT) on Pacwave11 and Enhancing PTWS Tsunami Warning Products established under Working Group on Detection, Warning and Dissemination (WG2) convened to evaluate the PacWave11 findings and to compile a list of feedback improvements that would allow PTWC to further refine its draft new products. Subsequently, the PTWS Steering Committee (PTWS-SC) convened on 24–25 May 2012 to review progress on the PTWS's inter-sessional activities. It approved the PacWave11 and Enhancing Tsunami Warning Products TT recommendations, the PTWC new products implementation time line, and the conduct of Exercise Pacific Wave 2013 (PacWave13) to continue the enhanced products development process noting that PacWave13 would be important to enable informed decision-making at the next Intergovernmental Coordination Group (ICG). It was intended that the PTWS Steering Committee would review the results of PacWave13 before the ICG/PTWS-XXV. The planned changeover date from the PTWC current products to its new products will be determined upon the formal approval of Member States at the next ICG/PTWS-XXV Session that will be held in Vladivostok, Russian Federation, from 9 to 11 September 2013. The goal continues to be for an official changeover in 2014. Accordingly, PacWave13 was conducted between 1-14 May 2013.



*PTWC Enhanced Product - Forecast polygon wave amplitude map for exercise scenario earthquake source off the coast of northern Chile. Yellow colors indicate strong currents dangerous to mariners and orange and red colors indicate dangerous land flooding hazard. Map courtesy of PTWC.*

**Purpose**

The purpose (aim) of Exercise Pacific Wave 2013 was to validate the understanding and use of the Pacific Tsunami Warning Center (PTWC) enhanced products. The exercise provided an opportunity for Pacific countries to review enhancements of the new products, and review their tsunami response procedures. Regular exercises are important for maintaining staff readiness in case of a real event. This is especially true for tsunamis, which are infrequent, but when they occur, require a rapid response. Every Pacific country was encouraged to participate.

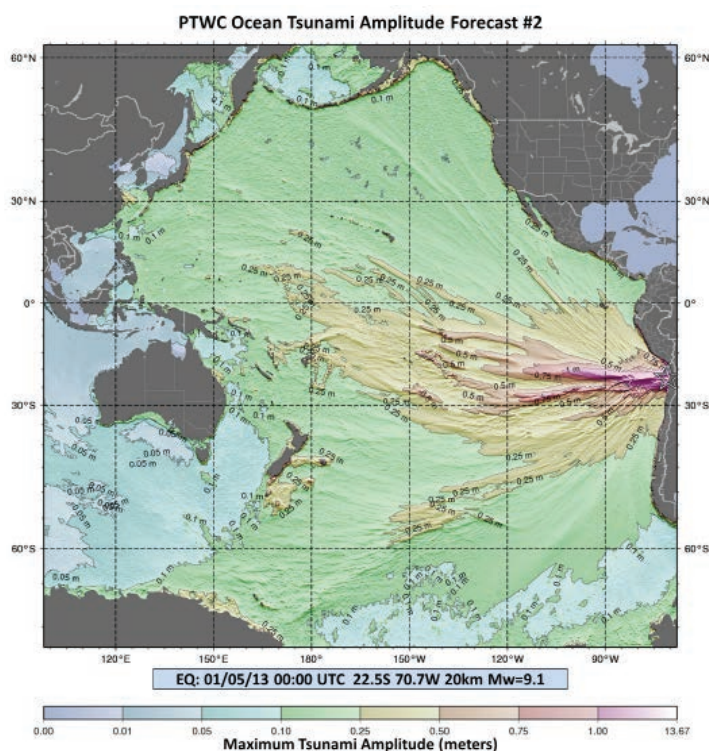
**Objectives**

The overall objectives for Exercise Pacific Wave 13 were to evaluate and provide feedback on PTWC new enhanced products.

Objective 1. Evaluate the format and content of PTWC Enhanced Products.

Objective 2. Provide feedback that a country is prepared to officially receive and utilize the PTWC Enhanced Product.

Objective 3. Provide feedback that a country's stakeholders will be informed of the PTWC Enhanced Products to enable appropriate changes to their Tsunami Emergency Response Plans. Stakeholders

PacWave 13, *continued*

*PTWC Enhanced Product - Wave energy amplitude distribution forecast map for exercise scenario earthquake source off the coast of northern Chile. Map courtesy of PTWC.*

include national/provincial/local government agencies, media, and the public.

It was recommended by the PacWave 13 Task Team that the exercise be carried out in a tabletop format that would promote communication and decision making at government levels, without disrupting or alarming the general public. Unlike previous exercises, PacWave 13 was not intended to be played in real time, and thus no “dummy” kickoff exercise messages were required. Participating countries were able to select a relevant scenario and the most convenient date and time to conduct the Tabletop Exercise within the 1-14 May 2013 time period.

### Scenarios

Exercise Pacific Wave 2013 involved multiple scenarios (three in total), to allow all Pacific countries to select and exercise a regional/local source tsunami event. Countries were recommended to choose only one scenario to exercise.

The exercise scenarios include major tsunamis generated by great earthquakes in the following areas:

- Off Northern Japan (Japan Trench)
- Philippines–South China Sea (Manila Trench)
- Off Northern Chile (Peru–Chile Trench)

### Country Participation

A total of 34 countries (38 including subnational entities) independently participated in PacWave13. Pacific countries and sub- national jurisdictions that participated, or planned to participate, were:

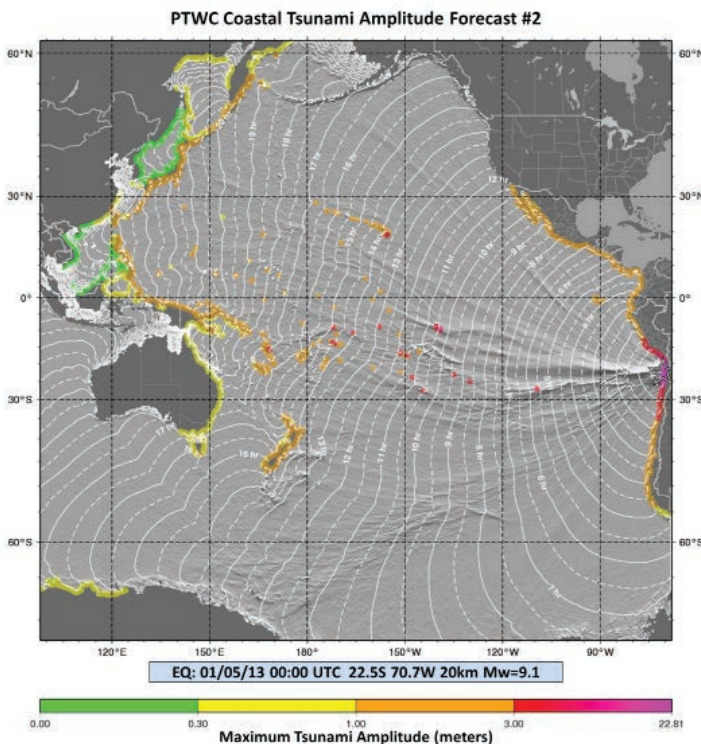
Australia, Brunei Darussalam, Canada, China - SOA, China - Hong Kong Colombia, Chile, Cook Islands, Ecuador, El Salvador, Federated States of Micronesia - Chuuk, Pohnpei, Fiji ,France - French Polynesia, Guatemala, Indonesia, Japan - JMANWPTAC, Kiribati, Malaysia, Mexico, Nauru, New Zealand, Nicaragua, Niue, Palau, Peru, Philippines, Russian Federation, Samoa, Solomon Islands, Thailand, Tonga, Tuvalu, USA - American Samoa, USA - Guam, USA - Northern Mariana Islands, USA - PTWC, Vanuatu and Vietnam

The overwhelming majority of responding countries expressed a positive view of PacWave13 planning and conduct. PacWave13 objectives were exercised, evaluated and reported, thus enabling PTWS recommendations and lessons learned to be formulated that were consistent with the PTWS Medium Term Strategy. PacWave13 contributed to the improvement of PTWC enhanced products for implementation in 2014. Countries generally understood the PTWC enhanced products and viewed them as adding important advice to guide them in providing more accurate national warnings. PacWave13 provided valuable feedback from countries on the proposed PTWC enhanced products, and this feedback has been provided to PTWC and PTWS Task Team on Enhanced Products. PacWave13 reinforced the integration of PTWC enhanced products in their country decision-making processes, and in their standard operating procedures (SOPs). Although most countries are currently not ready in 2013 to implement the enhanced products, they do plan to become ready upon 2014 official implementation. Thus, there is a need for continued training and harmonization of the PTWC enhanced products among stakeholder agencies and the media.

### Findings

The following are highlights of the findings of the Post



PacWave 13, *continued*

*PTWC Enhanced Product - Coastal wave amplitude forecast map for exercise scenario earthquake source off the coast of northern Chile. Map courtesy of PTWC.*

## Exercise Evaluation Forms.

- An overwhelming majority of respondents ranked the Text Message as the most useful product, followed by the Forecast Polygon Map. Moderately useful products were the Coastal Forecast Map, Energy Forecast Map, and Forecast Polygon Table. The Coastal KMZ file was ranked the least useful product.
- The majority of respondents agreed that the format and content of PTWC Enhanced Products were satisfactory. Edits and additional information were suggested for the products.
- The majority of respondents recommended the text product at a minimum be made available to the public.
- The majority of respondents would like to see a forecast included in the initial product, knowing that earthquake magnitudes and tsunami forecasts are likely to change over the first hour.
- The majority of respondents indicated the National Tsunami Warning Centres understand the contents of the enhanced products, how

to use the products, and the limitations of the products.

- Half of respondents indicated the National Disaster Management Office also understand the content of the products.
- The majority of respondents are currently NOT ready to implement and/or utilize the products in 2013. However, a strong majority of respondents anticipate being ready in 2014 through further training and harmonization with key stakeholder agencies.
- The majority of respondents indicated their stakeholders understand that current PTWC international Watch/Warning products will be discontinued.
- The majority of respondents understand that the National Tsunami Warning Centre, not PTWC, will be responsible for issuing future national alerts (e.g. Watches/Warnings/Cancellations).
- Efforts will be undertaken by almost all respondents to prepare their stakeholder agencies and media for the enhanced products official implementation in 2014.

## Recommendations

1. **On Implementaion of PTWC Enhanced Products.** To effect a smooth transition from the current PTWC tsunami Watch/Warning bulletins to its new Enhanced Products in 2014, conduct PacWave13 to further measure its understanding and interpretation in national tsunami warning threat assessment.

**Recommendation:** ICG/PTWS move forward with the selection of an official date to implement PTWC Enhanced Products in 2014 based on positive findings of PacWave 13.

2. **On Feedback on PTWC Enhanced Products.** PacWave 13 Member State participants provided a number of product improvement comments.

**Recommendation:** PTWS Task Team on Enhanced Products further improve product content based on PacWave13 results and comments before 2014 implementation date. Discern if country requested improvements are warranted and feasible to include in an international product.

PacWave 13, *continued*

3. **On Information Released to the Media/Public on PTWC Enhanced Products.** Determine what portion of PTWC Enhanced Products would be useful and understandable for media / public consumption.

**Recommendation:** Use text message product as a minimum for release to media/public. ICG/PTWS to determine if other enhanced products should also be released.

4. **Regional Trainings.** A number of PTWS Member States request training on the PTWC Enhanced Products.

**Recommendation:** IOC sponsor follow up regional trainings on PTWC Enhanced Product harmonization and build "Training of Trainer" (ToT) capacity within PTWS Regional Working Groups for sustainability of operational readiness.

5. **Follow up In-Country Trainings.** A number of PTWS Member States indicated further training is

needed in country with their stakeholder agencies to harmonize PTWC Enhanced Products.

**Recommendation:** IOC encourages Member States that have already received PTWC Enhanced Product training or are already familiar with the product content to further conduct in-country trainings with their major stakeholders at various levels of government, prior to 2014 official implementation.

Countries should also take note that the PTWC began the issuance of its new enhanced products in live trial phase to Member States of the ICG/PTWS on 15 April 2013. The PTWC issued the new enhanced products in parallel with their existing products, and only by email to IOC officially designated Tsunami Warning Focal Points (TWFP). This introduction and familiarization period is intended to also provide lead time for training on the new products and for countries to incorporate necessary changes to their National Tsunami Warning and Emergency Response Standard Operating Procedures.

## ITIC News

## Tsunami Awareness Materials Updated

## Tsunami the Great Waves

Tsunami the Great Waves is a 12-page glossy brochure which provides information on what a tsunami is, how fast and how big they can be, what causes them, and describes programs undertaken to mitigate this hazard, including the development of tsunami warning centers, research programmes, and safety rules describing what to do when a tsunami

attack your coastline. Tsunami the Great Waves is available in English, French, Spanish, and Chinese. The 2012 version is available in English, French and Spanish. It was designed and published by the International Tsunami Information Centre, with support from the UNESCO/IOC Tsunami Programme, the USA (National Ocean and Atmospheric Administration), and France (Laboratoire de Geophysique) and can be downloaded from the ITIC web site at [http://itic.ioc-unesco.org/index.php?option=com\\_content&view=article&id=1169&Itemid=2017](http://itic.ioc-unesco.org/index.php?option=com_content&view=article&id=1169&Itemid=2017)



Cover of English Great Waves, completed in December 2012.



Cover of French Great Waves, 2012 version completed in 2013.

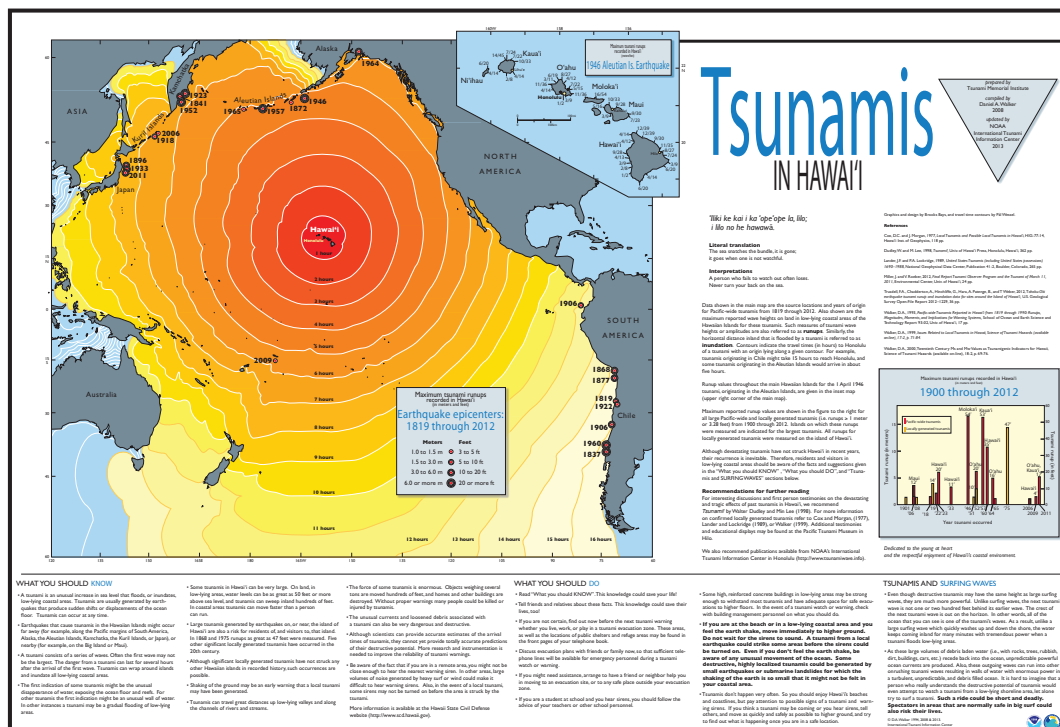


Cover of Spanish Great Waves, 2012 version completed in 2013.



Awareness Materials, *continued*Tsunamis in Hawaii  
Poster

The Tsunamis in Hawaii poster was updated in March 2013 by ITIC along with Dr. Daniel Walker, retired University of Hawaii Seismologist, to include data through 2012. Data shown in the main map are the source locations and years of origin for Pacific-wide tsunamis from 1819 through 2012. Poster can be downloaded from the ITIC website at [http://itic.ioc-unesco.org/index.php?option=com\\_content&view=article&id=1626&Itemid=1434](http://itic.ioc-unesco.org/index.php?option=com_content&view=article&id=1626&Itemid=1434).



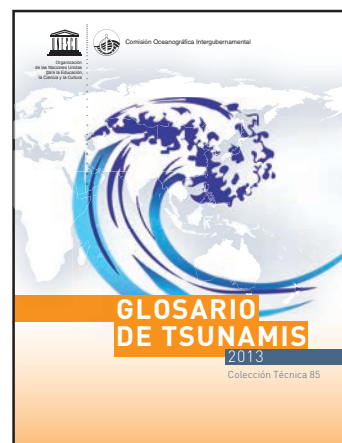
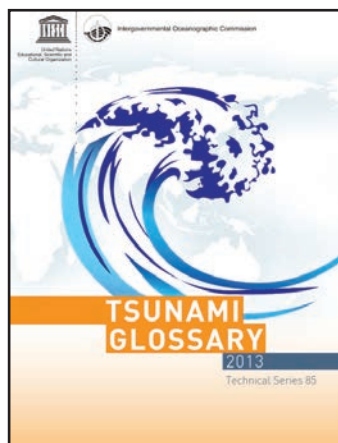
*Tsunami in Hawaii poster, updated March 2013. Courtesy of Tsunami Memorial Institute.*

## Tsunami Glossary 2013

Tsunami Glossary 2013. The Tsunami Glossary was revised in English in 2013. The 2013 version was translated into Arabic, French, Spanish by the Intergovernmental Oceanographic Commission. The 2013 Tsunami Glossary includes the definition of technical terms, and information on the global intergovernmental coordination groups for tsunami warning and mitigation and can be downloaded from the ITIC web site at [http://itic.ioc-unesco.org/index.php?option=com\\_content&view=article&id=1328&Itemid=1142](http://itic.ioc-unesco.org/index.php?option=com_content&view=article&id=1328&Itemid=1142).

## Hawaii Historical Tsunami Runup Maps

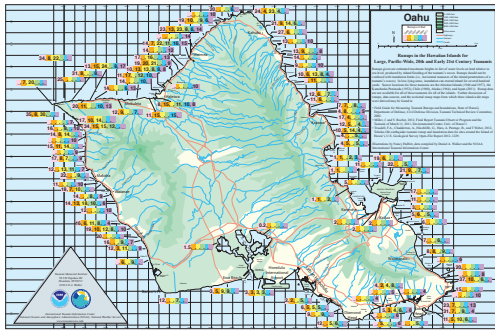
In March 2013, ITIC in collaboration with Dr. Daniel Walker updated the historical tsunami runup maps for Hawaii island, Oahu, Maui and Kauai to include data from the 2011 Japan tsunami. Data on the maps are runups in the Hawaiian Islands for large, Pacific-wide, 20th and early 21st century tsunamis. Maps can be download from the ITIC website at [http://itic.ioc-unesco.org/index.php?option=com\\_content&view=article&id=1647&Itemid=1434](http://itic.ioc-unesco.org/index.php?option=com_content&view=article&id=1647&Itemid=1434).



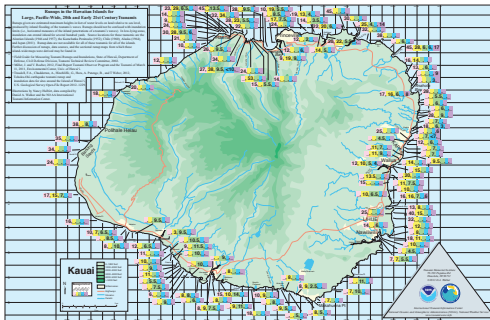
*Covers of the new Tsunami Glossary 2013. English, Arabic, Spanish and French.*

Awareness Materials, *continued*

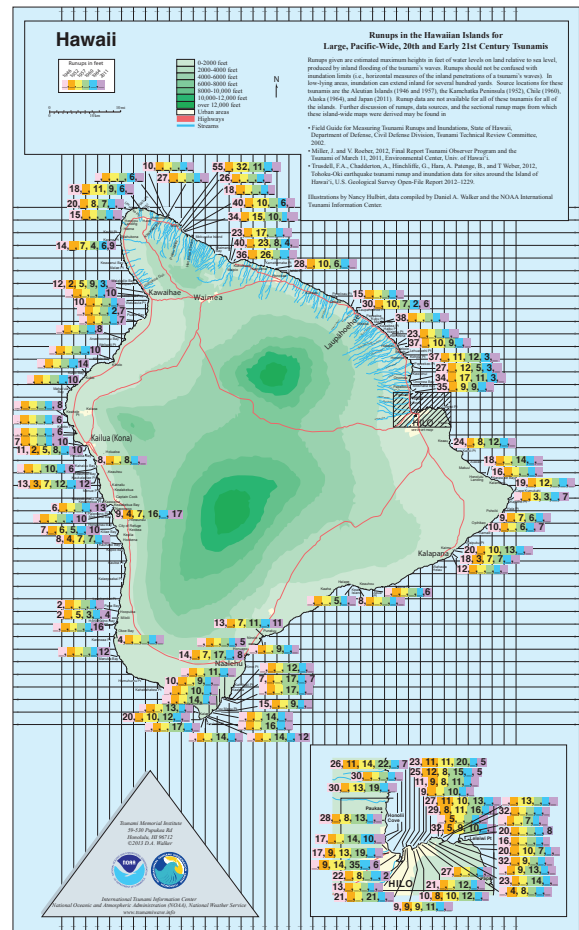
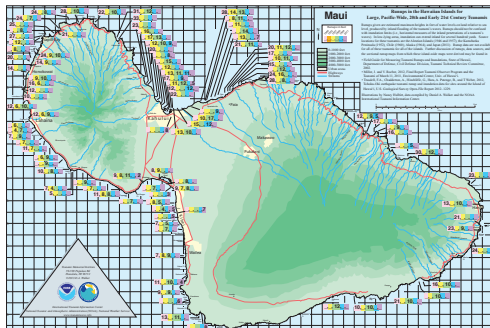
*Oahu runup map, updated March 2013.  
Courtesy of Tsunami Memorial Institute.*



*Kauai runup map, updated March 2013.  
Courtesy of Tsunami Memorial Institute.*



*Maui runup map, updated March 2013.  
Courtesy of Tsunami Memorial Institute.*



*Hawaii island runup map, updated March 2013. Courtesy of Tsunami Memorial Institute.*

Located in Honolulu, the International Tsunami Information Centre (ITIC) was established on 12 November 1965 by the Intergovernmental Oceanographic Commission (IOC) of the United Nations Educational, Scientific, and Cultural Organization (UNESCO). In 1968, the IOC first convened the International Coordination Group for the Tsunami Warning System in the Pacific (ITSU). In 2005, ITSU became the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS) so as to better convey the comprehensive approach required to reduce tsunami risks.

The 35 Member States with Tsunami National Contacts and Tsunami Warning Focal Points are: Australia, Canada, Chile, China, Colombia, Cook Islands, Costa Rica, Democratic People's Republic of Korea, Ecuador, El Salvador, Fiji, France, Guatemala, Indonesia, Japan, Malaysia, Mexico, New Zealand, Nicaragua, Niue, Panama, Papua New Guinea, Peru, Republic of the Philippines, Republic of Korea, Russian Federation, Samoa, Singapore, Solomons, Thailand, Tonga, Tuvalu, U.S.A., Vanuatu and Vietnam.

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