

Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System



TSUNAMI NEWSLETTER



International Tsunami Information Center

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Twenty-fifth Session of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS-XXV)



Sixty-five participants from 16 Member States gathered for the Twenty-Fifth Session of the ICG/PTWS. Photo courtesy of Russian Federation.

SUMMARY OF EARTHQUAKES

1 JULY - 31 DECEMBER 2013

Reported by: International Tsunami Warning Centres

Compiled by: International Tsunami Information Center, ITIC

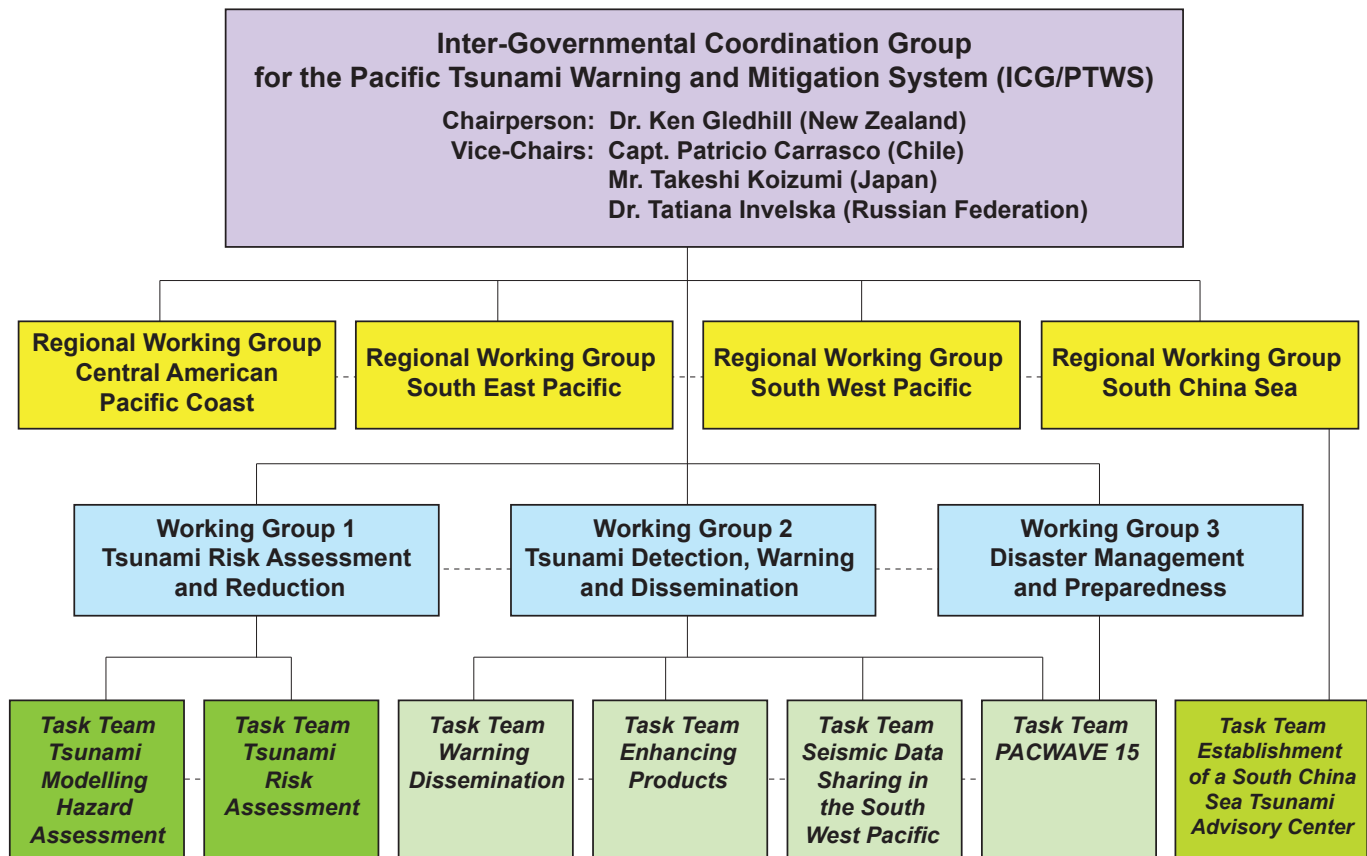
Advisories issued by international tsunami warning centers. The Pacific Tsunami Warning Center (P) issues: Tsunami Information Bulletins (TIB), Fixed and Expanding Regional Warnings (FRW, ERW), and Ocean-wide or Widespread Watch/Warnings (TWW) for the Pacific; Tsunami Information Bulletins (TIB), Local, 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 National Tsunami Warning Center (N - formerly A, renamed on 1 October 2013, formerly know as West Coast/Alaska Tsunami Warning Center), 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 M_w from the USGS (G), and M_w from PTWC, NTWC, and JMA at action time. Other earthquakes with M_w 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_w	PTWC (P), JMA (J) or WC/ATWC (A) ACTION	ACTION TIME (UTC)	TSUNAMI? DAMAGING?	MAXIMUM MEASUREMENT and LOCATION
7-Jul	18:36	North of the Solomon Islands	3.923° S 153.920° E	382	7.3 (A, G, J, P)	(P) 01 TIB (A) 01 TIS (J) 01 NWPTA	18:42 18:43 18:58	NO NO	14 cm (amp) (g), Port Alexander, Alaska
15-Jul	14:04	South Sandwich Islands	60.868° S 25.144° W	22	7.2 (A, P) 7.3 (G)	(P) 01 TIS (A) 01 TIS	14:18 14:20	NO NO	
21-Jul	05:10	Off East Coast of the South Island, N.Z.	41.713° S 174.443° E	12	6.9 (A, P) 6.5 (G)	(P) 01 TIB (A) 01 TIS	05:17 05:18	YES NO	7 cm (amp) (g), Kaikoura, North Wharf, New Zealand
13-Aug	15:43	South of Panama	5.757° N 78.200° W	20	6.7 (A, P) 6.6 (G)	(P) 01 TIB (A) 01 TIS	15:47 15:49	NO	
16-Aug	02:31	Cook Strait, New Zealand	41.767° S 174.061° E	12	6.8 (A, P) 6.5 (G)	(P) 01 TIB (A) 01 TIS	02:35 02:38	YES NO	8 cm (amp) (g), Kaikoura, North Wharf, New Zealand
30-Aug	16:25	Andreanof Islands, Aleutian Is., Alaska	51.610° N 175.361° W	26	7.0 (A, G, P)	(A) 01 TIS (P) 01 TIB (P) 02 TIB	16:31 16:34 16:43	NO NO	
4-Sep	02:32	Andreanof Islands, Aleutian Is., Alaska	51.592° N 174.760° W	20	6.5 (A, G, P)	(A) 01 TIS (P) 01 TIB	02:35 02:43	NO NO	
25-Sep	16:43	Near the coast of central Peru	15.851° S 74.562° W	48	7.2 (A, P) 7.0 (G)	(P) 01 TIB (A) 01 TIS (P) 02 TIB (A) 01 TIS	16:48 16:49 17:11 17:14	NO NO	
30-Sep	05:56	Kermadec Islands, New Zealand	30.880° S 178.378° W	53	6.7 (A, P)	(P) 01 TIB (A) 01 TIS	06:06 06:06	NO NO	
12-Oct	02:10	Near the Coast of Venezuela	10.877° N 62.278° W	78	6.0 (N - formerly A, P) 6.1 (G)	(P) 01 TIS (N - formerly A) 01 TIS	02:19 02:21	NO NO	

Earthquakes, *continued*

DATE	TIME (UTC)	LOCATION	EPICENTER	DEPTH (km)	M _w	PTWC (P), JMA (J) or WC/ATWC (A) ACTION	ACTION TIME (UTC)	TSUNAMI? DAMAGING?	MAXIMUM MEASUREMENT and LOCATION
15-Oct	00:13	Mindanao, Philippines	9.866° N 124.011 °E	12	7.2 (J, N - formerly A, P) 7.1 (G)	(P) 01 TIB (N - formerly A) 01 TIS (J) 01 NWPTA	00:22 00:23 00:34	NO NO	
16-Oct	10:31	Solomon Islands	6.487° S 154.928° E	46	7.1 (J, N - formerly A, P) 6.8 (G)	(P) 01 TIB (N - formerly A) 01 TIS (J) 01 NWPTA	10:37 10:40 10:54	NO NO	
19-Oct	17:55	Gulf of California	26.268° N 110.178° W	15	6.8 (N - formerly A, P) 6.5 (G)	(P) 01 TIB (N - formerly A) 01 TIS	18:00 18:01	NO NO	
24-Oct	19:25	East of the South Sandwich Islands	58.208° S 12.950° W	22	6.5 (N - formerly A, P) 6.7 (G)	(P) 01 TIS (N - formerly A) 01 TIS	19:38 19:39	NO NO	
25-Oct	17:10	Off the East Coast of Honshu, Japan	37.170° N 144.665° E	21	7.5 (N - formerly A, P) 7.1 (G, J)	(P) 01 TIB (N - formerly A) 01 TIS (J) 01 NWPTA (J) 02 NWPTA (J) 03 NWPTA	17:20 17:22 17:22 17:54 19:26	YES NO	30 cm amp (g), Ayukawa, Japan
31-Oct	12:02	Taiwan	23.591° N 121.443° E	20	6.7 (N - formerly A, P) 6.5 (J) 6.3 (G)	(P) 01 TIB (N - formerly A) 01 TIS (J) 01 NWPTA	12:10 12:12 12:16	NO NO	
31-Oct	23:04	Near the coast of central Chile	30.298° S 71.557° W	35	6.6 (N - formerly A, G, P)	(P) 01 TIB (N - formerly A) 01 TIS	23:08 23:10	NO NO	
2-Nov	18:54	Tonga Region	19.128° S 172.634° W	12	6.5 (N - formerly A, P) 6.2 (G)	(P) 01 TIB (N - formerly A) 01 TIS	19:00 19:02	NO NO	
12-Nov	07:04	Near the east coast of Kamchatka Russia	54.681° N 162.286° E	29	6.6 (N - formerly A, G, J, P)	(P) 01 TIB (N - formerly A) 01 TIS (J) 01 NWPTA	07:12 07:14 07:23	NO NO	
16-Nov	03:35	Scotia Sea	60.213° S 47.108° W	13	7.4 (N - formerly A, P) 6.9 (P revised) 6.8 (G)	(P) 01 TIS (N - formerly A) 01 TIS (P) 02 TIS	03:43 03:44 03:53	NO NO	
17-Nov	09:05	Scotia Sea	60.296° S 46.362° W	22	7.8 (N - formerly A, P) 7.3 (G)	(P) 01 TIB (P) 01 TIS (N - formerly A) 01 TIS	09:17 09:18 09:20	YES NO	13 cm amp (g), King Edward Point, UK
23-Nov	07:49	Fiji Region	17.097° S 176.562° W	388	6.3 (P) 6.5 (G)	(P) 01 TIB	07:55	NO NO	
25-Nov	06:27	South Atlantic Ocean	53.962° S 54.894° W	12	6.6 (N - formerly A, P) 5.6 (G)	(P) 01 TIS (N - formerly A) 01 TIS	06:41 06:47	NO NO	

IOC ICG/PTWS STRUCTURE - WORKING GROUPS AND TASK TEAMS



Approved ICG/PTWS-XXV, Sept 2013

Courtesy of ITIC.

ICG/PTWS-XXV Summary

http://ioc-unesco.org/index.php?option=com_oe&task=viewEventRecord&eventID=1264

The Twenty-fifth Session of the Intergovernmental Coordination Group for the Pacific Ocean Tsunami Warning and Mitigation System (ICG/PTWS-XXV) was held from 9 to 11 September 2013, hosted by the Federal Service for Hydrometeorology and Environmental Monitoring (ROSHYDROMET), in Vladivostok, Russian Federation. The ICG/PTWS, which convenes every two years, provides a critical forum for Member States to coordinate activities that will improve Pacific Ocean tsunami warnings. One of the most important activities of the PTWS is to ensure the timely issuance of tsunami alerts to save lives and reduce property damage to 46 countries throughout the Pacific Basin, including the protection of U.S. Pacific States, Territories and Commonwealths, and

maritime assets. The continued strengthening of the PTWS, through its policy of free exchange of global observational data and hazard information (seismic, sea level, tsunami threat, etc.) and international collaboration yields increased capacity to protect all Pacific Member States. The UNESCO Intergovernmental Oceanographic Commission (IOC) leads the coordination of the Global Tsunami Warning and Mitigation System.

The ICG/PTWS-XXV Session was chaired by the PTWS Chair, Dr. Ken Gledhill (New Zealand). The session was attended by 65 participants from 16 Member States. The main outcomes of the session were 1) for PTWC to replace current products with endorsed Enhanced Tsunami Products, starting from 1 October 2014, for use by PTWS National Tsunami Warning Centres (NTWC), 2) acceptance of China's offer to establish a South China Sea Tsunami Advisory

ICG/PTWS-XXV Summary, *continued*

Center (SCSTAC), 3) agreement to continue most PTWS Working Groups and Task Teams, 4) agreement to conduct Exercise Pacific Wave 2015 (PacWave 15) preferably during the first quarter of 2015, and 5) agreement to hold the next ICG/PTWS-XXVI session, which will commemorate the 50th anniversary of the International Tsunami Warning System in the Pacific, in Honolulu, Hawaii USA in April 2015.

The following are major activities of the Pacific Tsunami Warning Center (PTWC) and the International Tsunami Information Center (ITIC) during the inter-sessional period from May 1, 2011 through July 31, 2013.

In addition to the development of new enhanced products based on forecasting methodologies, PTWC responded to more than 2000 global earthquakes in support of the ICG/PTWS and its Member States. PTWC issued 771 Observatory Messages for earthquakes with magnitudes in the mid-5s and above. These messages are disseminated primarily to other earthquake observatories and are also used as input to the U.S. Geological Survey – California Integrated Seismic Network (CISN) earthquake display that is installed in many of the PTWS NTWCs. Of these, 108 earthquakes prompted the issuance of a PTWS tsunami product. There were 5 Tsunami Warnings issued, and 103 Tsunami Information Bulletins, advising that the earthquake presented very little if any tsunami threat. Initial earthquake observatory message Issuance time averaged 6.5 minutes for the

1069 events (2011-2013) that PTWC responded to.

During the inter-sessional period, the ITIC dedicated a significant amount of its time to Tsunami Standard Operating Procedures training. Over the past five years, ITIC conducted 40 international training courses (ITP-International; 28 for Pacific countries, 10 for Indian Ocean, 2 for Caribbean), and four Hawaii-based (ITP-Hawaii) trainings, reaching ~1400 country warning and emergency officials. In post-training evaluations, more than 90% rated ITIC's courses as extremely valuable and useful for developing their tsunami early warning and mitigation systems, and extremely important and relevant for their job execution, with excellent reference materials.

ITIC led efforts to support the implementation of the PTWC Enhanced Products, conducting regional and national feedback sessions on the Enhanced Products, co-authoring of the PTWS Users Guide to the PTWC Enhanced Products, and co-leading Exercise Pacific Wave 2011 and 2013. ITIC continued its sustained efforts to keep IOC-ITIC Awareness materials updated, included the updated, newly-formatted Tsunami Glossary 2013. Altogether, ~212,000 copies of awareness and decision support tools were distributed globally, with ~185,000 to the PTWS (~37,000 in 2011, 66,000 in 2012, 81,000 in 2013). ITIC worked with the IOC to coordinate an International Tsunami Survey Team to El Salvador after a small tsunami in September 2012.



Dr. Ken Gledhill, Chairman of the ICG/PTWS, opens the Twenty-fifth Session. Photo courtesy of C. McCreery.

In ITIC's PTWS Customer Satisfaction Survey (Aug, 2013, from 30 countries), ITIC international services and web site information were unanimously highly rated. ITIC is in regular communication with Member States (90% report direct communication in the last six months). To improve information sharing, an email List Service / Message Board was requested. Valuable services included up-to-date tsunami event information, awareness and education materials and decision support tools, training, exercise coordination, and post-tsunami survey coordination. For training, there was significant interest in developing distance-learning platforms to enable wider participation. Requests were also made for tsunami modeling and inundation training topics, and expanded foreign language translations.

ICG/PTWS-XXV Summary, *continued*

The following are the **Executive Summary & Recommendations** adopted by the **ICG/PTWS-XXV Session**.

The **ICG requested** the Pacific Tsunami Warning Center (PTWC) to replace the current PTWC tsunami products for PTWS from 1 October 2014 with the endorsed Enhanced Tsunami Products. The PTWC Enhanced Tsunami Products for the PTWS will no longer advise levels of alert to Member States, but instead provide more detailed forecast levels of tsunami threat for use by the National Tsunami Warning Centres (NTWCs).

The **ICG accepted** China's proposal to build a South China Sea Tsunami Advisory Centre (SCSTAC) to service the approved sub-regional South China Sea Tsunami Warning and Mitigation System within the framework of the ICG/PTWS. China's National Marine Environmental Forecasting Centre (NMFEC) will be responsible for building the centre.

The **ICG decided** to continue Working Group 1 on Tsunami Risk Assessment and Reduction with Dr Vasily Titov (USA) as Chair.

The **ICG agreed** to continue Working Group 2 on Tsunami Detection, Warning and Dissemination with Mr Rick Bailey (Australia) as Chair.

The **ICG decided** to rename and redefine the Terms of Reference of the Working Group 3 to Disaster Management and Preparedness and elected Mr David Coetzee (New Zealand) as Chair.

The **ICG decided** to continue the Regional Working Group on Tsunami Warning and Mitigation on the Central American Pacific Coast with Ms Angelica Muñoz (Nicaragua) as Chair.

The **ICG decided** to continue the Regional Working Group on Tsunami Warning and Mitigation in the Southeast Pacific Region with Lt. Carlos Zuñiga (Chile) as Chair.

The **ICG decided** to continue Regional Working Group on Tsunami Warning and Mitigation in the South China Sea Region with Mr Hing-Yim Mok (China) as Chair.

The **ICG decided** to continue the Working Group on Tsunami Warning and Mitigation in the Southwest Pacific Region and elected Ms Filomena Nelson (Samoa) as Chair.

The **ICG agreed** that a PacWave 15 exercise be conducted in 2015, and established a Task Team to coordinate the exercise chaired by Dr Laura Kong, ITIC Director.

The **ICG thanked** USA and agreed to hold the ICG/PTWS-XXVI session in Honolulu, USA, in April 2015.

The **ICG elected** Dr Ken Gledhill (New Zealand) as Chair and Captain Patricio Carrasco (Chile), Dr Tatiana Ivelskaya (Russian Federation) and Mr Takeshi Koizumi (Japan) as Vice-Chairs for the ICG/PTWS for the period September 2013–April 2015.



Left to right: Outgoing ICG/PTWS Vice-Chairs Capt. Patricio Carrasco (Chile), Dr. Fujiang Yu (China), and Takeshi Koizumi (Japan), Chair Dr. Ken Gledhill (New Zealand), and Boris Kubay (Director, Primorsky State Department of Hydrometeorology and Monitoring of Environment) at the Opening Ceremony to the ICG/PTWS-XXV. Photo courtesy of ITIC.

Recommendation ICG/PTWS-XXV.1 ICG/PTWS Governance

The Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS),

Having met for its 25th Session from 9 to 11 September, 2013 in Vladivostok, the Russian Federation,

Expresses its deep condolences to the people of Solomon Islands for the loss of life caused by the earthquakes and tsunamis in February 2013,

Recalling IOC Resolution IV–6 that established the International Coordination Group for the Tsunami Warning System in the Pacific (ICG/ITSU) and IOC Resolution XXXIX-8 that renamed ITSU to be the Pacific Tsunami Warning and Mitigation System (PTWS) and to provide continuity through the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS),

Reaffirming that the Pacific Tsunami Warning and Mitigation System (PTWS) will be a coordinated network of national systems and capacities, and will be part of a global network of early-warning systems for all ocean-related hazards,

Reaffirming further that each Member State has the sovereign responsibility to issue warnings within its respective territories,

Noting with appreciation the tsunami forecasting products provided for the Member States of the PTWS by the PTWC, hosted by the USA, and the NWPTAC hosted by Japan, and guidance materials by the ITIC,

Recalling the Mauritius Declaration adopted at the Intergovernmental Coordination Meeting held at Grand Baie, 14–16 April 2005, to openly share and exchange tsunami-relevant real-time observational data in accordance with the UNESCO/IOC Oceanographic Data Exchange Policy,

Having noted IOC Resolution Decision IOC-XXVII/Dec.5.2.2. which decided to continue the TOWS-WG and the Inter-ICG Task Teams on Disaster Management and Preparedness, Hazard Assessment Related to Highest Potential Tsunami Source Areas, and Tsunami Watch Operations for the next intersessional period, with the same membership and Terms of Reference,

Having reviewed the progress made in the implementation of the PTWS since the 24th Session of the ICG/PTWS,

Having considered the reports of:

- Working Group 1 on Tsunami Risk Assessment and Reduction,
- Working Group 2 on Tsunami Detection, Warning and Dissemination and its Task Teams,
- Working Group 3 on Tsunami Awareness and Response,
- WG2 Task Team on Warning Dissemination,
- WG2 Task Team on PACWAVE 11,
- WG2 Task Team on Enhancing Products,
- WG2 Task Team on Seismic Data Sharing in the South West Pacific,
- Regional Working Group on Tsunami Warning and Mitigation System on the Central American Pacific Coast,
- Regional Working Group on Tsunami Warning and Mitigation System in the South East Pacific Region,
- Regional Working Group on Tsunami Warning and Mitigation System in the South West Pacific Region,
- Regional Working Group on Tsunami Warning and Mitigation System in the South China Sea,

ICG/PTWS-XXV Recommendations, *continued*

- The intra-sessional Working Groups' reports for PTWS Implementation Plan, WG-SCS, WG3,
- Third Meeting of the PTWS Steering Committee held in Hawaii, USA, May 2012,
- Sixth Meeting of the TOWS-WG and Task Team on Tsunami Watch Operations (Paris, February 2013),
- North West Pacific Tsunami Advisory Center (NWPTAC),
- Pacific Tsunami Warning Center (PTWC),
- International Tsunami Information Center (ITIC),

Recognizing the difficulty in providing effective near-field tsunami warning,

Acknowledging that the PTWS is effective in saving lives and reducing the impacts to communities in both near-field and distant-tsunami events through the three pillars of risk assessment and reduction, detection, warning and dissemination, and awareness and response,

Encourages voluntary contributions to support Budget and Programme activities recommended by the ICG/PTWS either directly or through the IOC Special Account set up for the PTWS as well as in-kind and extrabudgetary contributions, in particular for training with regards to the new enhanced products;

Encourages Member States to nominate members for the WG1 Risk Assessment and Reduction, and WG3 on Awareness and Response;

Recognizing the limited capacity of many Member States of the PTWS in hazard assessment and risk reduction;

Requests Member States to regularly review the list of Tsunami National Contacts (TNCs) and Tsunami Warning Focal Points (TWFPs) on the IOC website and inform the Secretariat of all changes;

Requests Member States to share any new forms of sea level data for tsunami warning purposes in accordance with the IOC Oceanographic Data Sharing Policy;

Decides to:

1. Continue existing Working Groups (WG) and associated Task Teams with same Terms of Reference as attached in Appendix to Recommendation ICG/PTWS-XXV.1:

WG1. Tsunami Risk Assessment and Reduction; Chair Dr Vasily Titov (USA) and Vice-Chair Dr Francois Schindele (France);

- WG1 Task Team on Tsunami Modelling Hazard Assessment; Chair Dr Vasily Titov (USA);
- WG1 Task Team on Tsunami Risk Assessment; Chair Dr Nguyen Hong Phuong (Vietnam);

WG2. Tsunami Detection, Warning and Dissemination; Chair Mr Rick Bailey (Australia) and Vice-Chair Mr Carlos Zuniga (Chile);

- WG2 Task Team on Warning Dissemination (Filomena Nelson (Samoa)
- WG2 Task Team on Enhancing Products (Chair Chip McCreery (USA)
- WG2 Task Team on Seismic Data Sharing in the South West Pacific (Co-Chair Eslina Garaebiti Bule (Vanuatu)and Siosina Lui (Samoa)

Sub-Regional Working Groups:

- Regional Working Group on Tsunami Warning and Mitigation System on the Central American Pacific Coast, Chair Angelica Munoz (Nicaragua) and vice-chair Francisco Gavidia (El Salvador).
- Regional Working Group on Tsunami Warning and Mitigation System in the South East Pacific Region; Chair Carlos Zuniga (Chile).

ICG/PTWS-XXV Recommendations, *continued*

- Regional Working Group on Tsunami Warning and Mitigation System in the South West Pacific Region; Chair Ms Filomena Nelson (Samoa).
 - Regional Working Group on Tsunami Warning and Mitigation System in the South China Sea; Chair Mr Mok Hing-yim (China) and Vice-Chair Dr Nguyen Hong Phuong (Vietnam)
2. Continue the Steering Committee with same Terms-of-Reference as attached in Appendix to Recommendation ICG/PTWS-XXV.1
 3. To reconstitute WG3 under the name of Disaster Management and Preparedness with new Terms-of-Reference as attached in the Appendix, Chair Mr David Coetzee (New Zealand), Vice-chair to be appointed by the Working Group.
 4. To establish WG2 Task Team on PACWAVE 15 (Co-Chair Jo Guard (New Zealand) and Laura Kong (ITIC)) with Terms of Reference as attached in Appendix to Recommendation ICG/PTWS-XXV.1.
 5. To establish a Task Team on Establishment of a South China Sea Tsunami Advisory Center of the Regional Working Group on Tsunami Warning and Mitigation in the South China Sea, with Terms-of-Reference as attached in Appendix to Recommendation ICG/PTWS-XXV.1.
 6. Continue to disseminate a communication test message from the PTWC once a month on the same day and at the same time every month and two random unannounced tests annually to the PTWS Member State TWFPs;
 7. Conduct training workshops on hazard and risk assessment organised by WG1 in coordination with IUGG to enhance collaboration between the operational and research communities as recommended by the TOWS-WG, subject to extra-budgetary funding support being identified;

Decides to implement the enhanced PTWC products for the PTWS in accordance with the timetable and conditions contained in Recommendation ICG/PTWS-XXV.2

Endorses the proposal of the South China Sea Sub-Regional Working Group to the Establishment of a South China Sea Tsunami Advisory Centre in accordance with the timetable and conditions contained in Recommendation ICG/PTWS-XXV.3

Endorses the PTWS Medium Term Strategy 2014-21 presented by the Steering Committee noting the change of the third pillar to Disaster Management and Preparedness,

Requests the Executive Secretary to:

1. Publish the PTWS Medium Term Strategy 2014-21.
2. Publish the PTWS Implementation Plan when finalised by the Steering Committee.



Left to Right: Incoming PTWS Officers Vice-Chairs Capt. Patricio Carrasco (Chile) and Takeshi Koizumi (Japan), Chair Dr. Ken Gledhill (New Zealand), Vice-Chair Dr. Tanya Ivelskaya (Russian Federation), and Rapporteur Daniel Jaksa (Australia) at the Closing Ceremony of the ICG/PTWS-XXV. Photo courtesy of ITIC.

ICG/PTWS-XXV Recommendations, *continued*

3. Inform the Member States about the website for TNC and TWFP contact details, provide them with passwords and advise them of the procedures for updating contact details.
4. Organize documentation on the IOC Tsunami website by discipline/topic to facilitate access and utility of reference material across Working Groups and ICGs.
5. In conjunction with PTWC:
 - Ascertain whether each Member State needs every text product issued by PTWC for a single event, or they only need the initial text product after which any additional PTWC products will be obtained via other methods such as GTS, AFTN, email, or EMWIN (for example);
 - Ascertain whether each Member State TWFP needs every fax number currently assigned to them on the PTWC distribution list and if there are more than two could they limit each TWFP to two fax numbers; and
 - Notify Member States at least 90 days in advance that PTWC will begin faxing only the first text product of a single event to Member States unless they specifically request to receive all text products for each event.

Encourages Member States to include representation of Disaster Management Organizations (DMOs) in their delegations to the ICG and intersessional Working Groups;

Instructs the PTWS Steering Committee to prepare a priority list of activities and resource requirements to be reported at ICG/PTWS-XXVI;

Instructs the PTWS Steering Committee to complete and have published the Implementation Plan, taking into consideration the outcomes from the IntraSessional Working Group for the Implementation Plan;

Expresses its gratitude to the Government of the Russian Federation for kindly hosting the 25th Session of the ICG/PTWS in Vladivostok;

Accepts with appreciation the kind offer of the USA to host the 26th Session of the ICG/PTWS in Hawaii in April 2015 subject to the approval of the Government

Financial Implications: None

Recommendation ICG/PTWS-XXV.2 PTWC Enhanced Products for PTWS

The Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS),



Left to Right: Dr. Phuong Nguyen (Vietnam), Dr. Alexei Gorbatov, Daniel Jaksa, and Rick Bailey (Australia), Suhardjono and Dr. Karyono (Indonesia), Cdr. Miguel Angel Reyes Martinez (Mexico) review ICG/PTWS reports. Photo courtesy of ITIC.



The US Consul General, US ICG/PTWC Delegation, PTWC, ITIC, and SAIC visited the Primorye Tsunami Warning Center to learn about their tsunami operations. Photo courtesy of ITIC.

ICG/PTWS-XXV Recommendations, *continued*

Recalling the following Recommendations adopted by the ICG/PTWS:

1. Recommendation ICG/PTWS-XXIII.1 on Enhancing Tsunami Warning Products;
2. Recommendation ICG/PTWS-XXIV.1, Annex on Working Groups and Task Teams which established a Task Team on Enhancing Products and PacWave 11;
3. Recommendation ICG/PTWS-XXIV.3 on PTWS Exercises which endorsed the objective of using the exercise programme to test Enhanced Products.

Having considered:

1. The report of the Task Team on Enhanced Tsunami Products;
2. The Statement from Pacific Island Countries to Member States at the 25th Session of the UNESCO/IOC Intergovernmental Coordination Group of the Pacific Tsunami Warning and Mitigation System (ICG/PTWS-XXV);
3. The report on the Exercise Pacific Wave 11 by the PacWave11 Task Team;
4. The report on the Exercise Pacific Wave 13 by the PacWave13 Task Team;
5. The report of the Task Team on Tsunami Watch Operations of the IOC Working Group on Tsunami and Other Hazards Related to Sea-Level Warning and Mitigation System (TOWS-WG)

Acknowledging it is the sovereign right of Member States to issue tsunami warnings for their communities;

Acknowledging with appreciation the efforts of the US/NOAA Pacific Tsunami Warning Centre (PTWC) Director and staff in developing and testing the Enhanced Tsunami Products;

Noting that the issuance of the PTWC Enhanced Tsunami Products for the PTWS on an experimental basis began on 15 April 2013;

Noting that the PTWC Enhanced Tsunami Products for the PTWS will no longer advise levels of alert to Member States, but instead provide more detailed forecast levels of tsunami threat;

Noting with appreciation the large number of training and consultation workshops undertaken under the leadership of the US/NOAA International Tsunami Information Centre (ITIC) Director;

Noting the importance of training for both implementation and ongoing operations for the PTWC Enhanced Products for the PTWS.

Endorses the PTWC Enhanced Tsunami Products as presented in the updated Report of the Task Team on Enhanced Products attached in Annex XX of the Summary Report for ICG/PTWS-XXV;

Agrees that the text bulletins of the endorsed PTWC Enhanced Tsunami Products be made available to the public;

Agrees that the scientifically more complex graphical products only be disseminated via secure channels to Tsunami Warning Focal Points (TWFPs) for use by National Tsunami Warning Centres (NTWCs) in order to avoid potential misinterpretation by the public;

Requests the PTWC to replace the current products from 1 October 2014 with the endorsed Enhanced Tsunami Products for use by NTWCs of the PTWS subject to:

1. The satisfactory completion by the US National Weather Service of the operational baseline process for the PTWC tsunami forecasting models;
2. The satisfactory completion of US National Weather Service arrangements for US national alerting products;

ICG/PTWS-XXV Recommendations, *continued*

Agrees that the transition to PTWC Enhanced Tsunami Products for the PTWS may be delayed beyond 1 October 2014 through consultation with the Steering Committee, if internal US issues arise that require extra time to rectify.

Requests the PTWC to advise the ICG/PTWS Working Group 2 on Tsunami Detection, Dissemination and Warning of changes to the agreed PTWC Enhanced Tsunami Products for the PTWS, which WG2 may refer major changes to the Steering Committee for consideration and approval and referral to the ICG/PTWS for decision if required;

Requests the PTWC to work with the IOC Secretariat to advise Tsunami National Contacts (TNCs) and TWFPs of any changes to the Enhanced Tsunami Products with at least 3 months formal notification.

Financial implications: None

Recommendation ICG/PTWS-XXV.3**Sub-Regional Tsunami Warning and Mitigation System for the South China Sea Region (WG-SCS)**

The Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS),

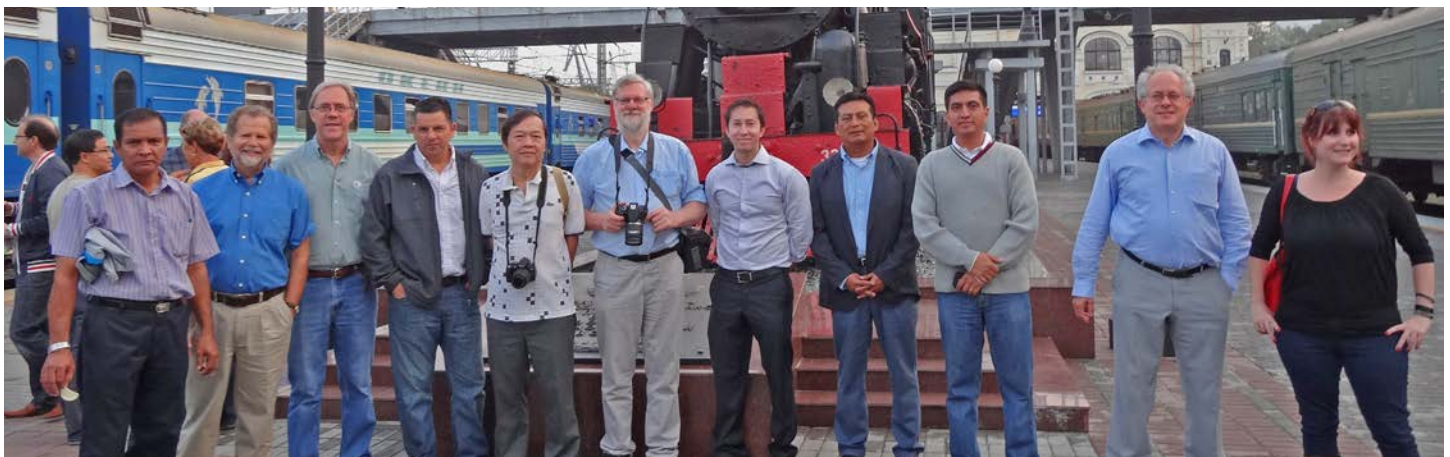
Recalling that the Intergovernmental Oceanographic Commission (IOC) adopted Resolution EC-XLI.6, which the Member States around the South China Sea and other regional seas, as appropriate, actively promote the development, establishment and sustained operation of national and sub-regional Tsunami Warning and Mitigation Systems within the framework of the ICG/PTWS,

Recalling further that the ICG/PTWS adopted Recommendation ICG/PTWS-XXIII.5, which established the Working Group for the South China Sea; and Recommendation ICG/PTWS-XXIV.4 to establish a sub-regional Tsunami Warning and Mitigation System for the South China Sea region within the framework of the ICG/PTWS.

Having considered the reports of:

- The First meeting of the ICG/PTWS-WG-SCS, held in SanYa, China, 12–14 December 2011.
- The Second meeting of the ICG/PTWS-WG-SCS, held in Petaling Jaya, Malaysia, 16–18 October 2012.

Having considered the Proposal for a South China Sea Tsunami Warning and Mitigation System submitted to the WG-SCS by China;



PTWS delegates visiting Trans-Siberian Railway Station, Vladivostok. Left to Right: Rajendra Prasad (IOC, ICG/PTWS Secretariat), Dr. Garry Rogers (Canada), Tony Elliott (IOC, ICG/IOTWS Secretariat), CPFG Juan Proano (Ecuador), Dr. Phuong Nguyen (Vietnam), Dr. Ken Gledhill (New Zealand), Cdr. Miguel Ángel Reyes Martinez (Mexico), Ivan Saltos and Lt. Cdr. Luis Morales (Ecuador), Dr. Francois Schindelè (France), Lara Bland (New Zealand). Photo courtesy of L. Kong.

ICG/PTWS-XXV Recommendations, *continued*

Noting with appreciation that PTWC and NWPTAC are providing tsunami advisory services on an interim basis to the South China Sea region,

Reaffirms its commitment to establish a sub-regional Tsunami Warning and Mitigation System for the South China Sea region within the framework of the ICG/PTWS;

Decides to approve the Proposal for a South China Sea Tsunami Warning and Mitigation System as the basis for the establishment of the sub-regional Tsunami Warning and Mitigation System within the framework of the ICG/PTWS,

Decides further to establish a WG-SCS Task Team on the Establishment of a South China Sea Tsunami Advisory Centre (SCSTAC), with Terms of Reference attached as Appendix I.

Noting the offer of China to host the SCSTAC at the National Marine Environmental Forecasting Centre in Beijing, China,

Decides to accept China's offer to host the SCSTAC and **recommends** the establishment of the SCSTAC under the guidance of the WG-SCS.

Encourages members of the Working Group of the South China Sea, as well as all coastal countries of this region to actively participate in and contribute to the establishment of the sub-regional Tsunami Warning and Mitigation System within the framework of the ICG/PTWS,

Invites countries outside the South China Sea region to provide appropriate support to establish the sub-regional Tsunami Warning and Mitigation System within the framework of ICG/PTWS,

Decides to organize an inter-sessional meeting of the WG-SCS in either late 2013 or in early 2014.

Expresses gratitude to the Government of China for hosting the First meeting of the WG-SCS in San Ya, China, from 12 to 14 December 2011 and the WESTPAC-ICG/PTWS Training Workshop on Tsunami Modelling and Risk Assessment, held in Beijing, China, from 24 to 27 September 2012,

Expresses gratitude to the Government of Malaysia for hosting the Second meeting of the WG-SCS in Petaling Jaya, Malaysia, from 16 to 18 October 2012.

Financial implications: None

IOC News**Summary of Major IOC Regional Tsunami Trainings, August – December 2013**

The following is a summary of major IOC Regional Tsunami Trainings conducted in the Pacific and Indian Oceans, and Caribbean to build national country capacities in tsunami warning and response from August - December of 2013. The ITIC International Trainings (ITP) were conducted in collaboration with the IOC, along with New Zealand, Indonesia, Dominican Republic, Barbados, and China as the host countries. Topics covered tsunami warning and emergency response standard operating procedures,

and included a 'real-time' tabletop exercise and consultations on implementation of the new PTWS PTWC enhanced products in the Pacific and the Caribbean. On October 1, 2014 for the PTWS, PTWC will officially changeover to the new enhanced products, which will be based on numerical forecasts of expected tsunami wave height. Important feedback on the use of the new products by country stakeholders was received. Evaluations by the participants rated the trainings overwhelmingly excellent to good with course topics useful, comprehensive, essential, and practical for training their staff, and for strengthening their tsunami warning and mitigation system.

Regional Tsunami Trainings, *continued*

David Coetzee (NZ MCDEM), lectured on tsunami emergency response at the ITP-PIC. Photo courtesy of ITIC.



Pacific Island Countries Regional Tsunami Training

http://www.ioc-tsunami.org/index.php?option=com_oetask&task=viewEventRecord&eventID=1336

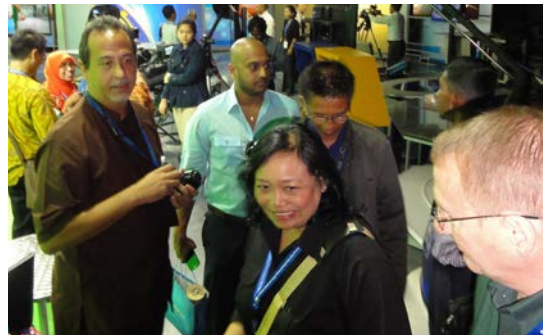
The IOC Pacific Island Countries (ITP-PIC) Regional Tsunami Training and Consultation Workshop was held 12-16 August, 2013, in Wellington, New Zealand, hosted by New Zealand Ministry of Civil Defence and Emergency Management. Trainers were David Coetzee (New Zealand Ministry of Civil Defence & Emergency Management (MCDEM)), Dr. Ken Gledhill (New Zealand GNS), Dr. Laura Kong, (ITIC), Dr. Charles McCreery (PTWC), and Rajendra Prasad (IOC). Altogether, there were 25 Directors and/or Senior Staff from National Tsunami Warning Centers and Disaster Management Offices from 14 Pacific Island Countries (Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu). A PIC Consultation was also conducted to solicit feedback on the new PTWC international products. The Consultation produced a PIC Statement

for Member State decision-making at the ICG/PTWS-XXV (September 2013), and specifically requested further training and a changeover date of 1 October 2014 or later to provide countries enough time to prepare. For more information on the changeover, see previous cover story, Recommendation ICG/PTWS-XXV.2 PTWC Enhanced Products for PTWS.

Dr. Fauzi (UNESCO Oman, formerly Indonesia BMKG) provided IOTWS guidance on local tsunami warning watchstander SOPs. Photo courtesy of Indonesia BMKG.



Left to right front: Ardito Kodijat (Jakarta Tsunami Information Center), Sumonpan Kosonsiriset (Thailand Television), and Walter Welz (Asia Broadcasting Union) inside the broadcast studio of Indonesia's MetroTV visited by IOTWS Disaster Management Workshop participants. Photo courtesy of L. Kong



Participants of the ITP-PIC Regional Training, Wellington, New Zealand. Photo Courtesy of New Zealand.

Regional Tsunami Trainings, *continued*

Participants of the IOTWS Regional SOP Workshop, Jakarta, Indonesia. Photo Courtesy of Indonesia BMKG.

Indian Ocean Countries Regional Tsunami Training

http://www.ioc-tsunami.org/index.php?option=com_oe&task=viewEventRecord&eventID=1372

The IOC Regional Workshop on Standard Operating Procedures (SOP) for Tsunami Warning and Emergency Response for Northern and Eastern Indian Ocean Countries of the ICG/IOTWS was held in Jakarta, Indonesia from 23-27 September 2013. The training was organized by the ICG/IOTWS Secretariat (Tony Elliott) and IOTWS Working Groups 1 and 3, with the ITIC Director (Dr. Laura Kong) attending as an invited expert resource person. Other trainers included the IOTWS Regional Tsunami Service Providers (Peter Coburn, Australia Bureau of Meteorology; Patanjali Kumar, Indian National Centre for Ocean Information Services; Suhardjono and Karyono, Indonesia Meteorological, Climatological and Geophysical Agency (BMKG)), IOTWS Working Group 3 on Tsunami Awareness (Dr. Harkunti Rahayu,

Indonesia Bandung Institute of Technology; Irina Rafliana; Indonesia LIPI; and Ardito Kodijat (JTIC)).

Nine countries and 28 participants from their national tsunami warning centers, disaster management offices and/or the media attended. On the last day of the training, a live tsunami exercise designed by Dr. Kong and Mr. Elliott was conducted using IOTWS tsunami products with participants testing their SOPs they had created earlier in the week.

Indian Ocean Regional Tsunami Service Provider (RTSP) operations commenced in 12 October 2011. RTSP services are being provided by Australia, India, and Indonesia. RTSPs provided further training on their products and their impacts on national tsunami warning center and national disaster management SOPs. This was the second in the series of regular SOP trainings for IOTWS countries; the first SOP training was conducted in September 2011.



Participants of the ITP-CAR1 Regional Training, La Romana, Dominican Republic. Photo courtesy of ITIC.

Regional Tsunami Trainings, *continued*

*Exercise
Controllers
Julie
Leonard
(USAID/
OFDA/
LAC)
and Judy
Thomas
(Barbados
DEM)*



reviewed injects during the ITP-CAR2 Day 5 live local tsunami exercise simulation. Photo courtesy of L. Kong.



Shown are participants role-playing as the Grenada (front table), Barbados, and Martinique (back table) disaster management agencies during the ITP-CAR2 tsunami exercise. Photo courtesy of L. Kong.



Masahiro Yamamoto, Senior IOC Tsunami Advisor (retired) discusses the 11 March 2011 Tohoku tsunami impacts at the ITP-CAR2 training. Photo courtesy of ITIC.

Two Caribbean Regional Tsunami Trainings

ITP-CAR1: http://www.ioc-tsunami.org/index.php?option=com_oie&task=viewEventParticipants&eventID=1394

ITP-CAR2: http://www.ioc-tsunami.org/index.php?option=com_oie&task=viewEventRecord&eventID=1397

Member States at the Eighth Session of the ICG/ CARIBE-EWS (April, 2013) requested the IOC and its Caribbean Tsunami Information Center (CTIC) to organize three sub-regional trainings on tsunami standard operating procedures. To ensure global and inter-ICG consistency in training, the IOC requested the ITIC to lead in the organization and conduct of the Caribbean trainings. Two Caribbean Regional Training Workshops (ITP-CAR1 and ITP-CAR2) were held in the Dominican Republic and Barbados in early and



Participants of the ITP-CAR2 Regional Training, Bridgetown, Barbados. Photo courtesy of L. Kong.

Regional Tsunami Trainings, *continued*

The ITP-SCS class visited the Tsunami Warning Center located within the China SOA NMEFC. The Center receives real-time seismic data from the China Earthquake Administration (CEA) and from abroad, and monitors sea levels in China and around the world. Photo courtesy of L. Kong.

mid November 2013, respectively. These were the 1st tsunami trainings conducted on tsunami warning and emergency response standard operating procedures for Caribbean countries since the coordinated regional system started in 2006.

ITP-CAR1: 4-8 November 2013, La Romana, Dominican Republic, hosted by the Caribbean Tsunami Information Center (CTIC). Trainers were Bernardo Aliaga (IOC), Tammy Fukuji and Dr. Laura Kong (ITIC), Dr. Charles McCreery (PTWC), and Christa Von Hillebrandt-Andrade, (Caribbean Tsunami Warning Program). There were 28 participants from 13 countries (Anguilla, Antigua, Bahamas, Barbados, British Virgin Islands, Dominican Republic, Haiti,



The ITP-SCS class also visited the CEA Earthquake Networks Center, where staff monitor China and global seismicity. Photo courtesy of L. Kong.

Mexico, Nevis, St. Kitts, Turks & Caicos Islands, US Puerto Rico, Virgin Islands), and the Caribbean Disaster Emergency Management Agency (CDEMA) Regional Organization.

ITP-CAR2: 18-22 November 2013, Bridgetown, Barbados, hosted by CTIC. Trainers were Nicolas Arcos and Dr. Laura Kong (ITIC), Tony Elliott (IOTWS), Kerry Hinds (Barbados Dept. of Emergency Management), and Masahiro Yamamoto (IOC retired). There were 37 participants from 10 countries (Aruba, Barbados, Curacao, Dominican Republic, Grenada, Martinique, Saint Lucia, Saint Vincent, Trinidad & Tobago, Venezuela), and CDEMA and the Caribbean Institute for Meteorology and Hydrology Regional Organizations. The USAID Office of Foreign Disaster



Participants of the ITP-SCS Regional Tsunami Training, Beijing, China. Photo courtesy of China NMEFC.

Regional Tsunami Trainings, *continued*

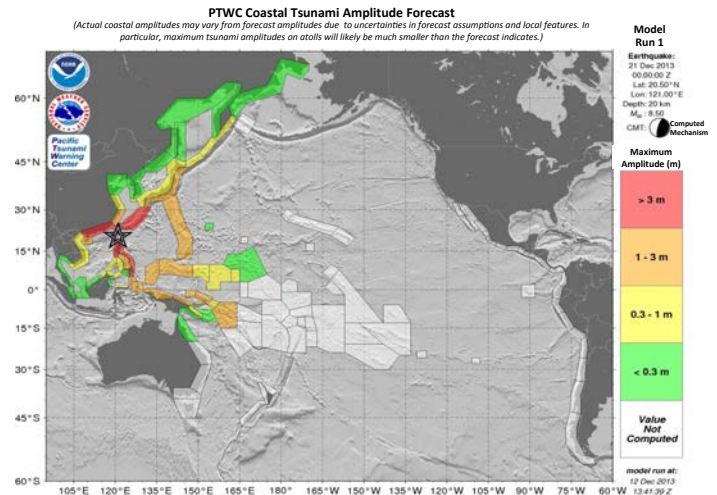
Assistance – Latin America Senior Disaster Reduction Advisor also attended and led the Next Steps discussion on the last day.

South China Sea Regional Tsunami Training

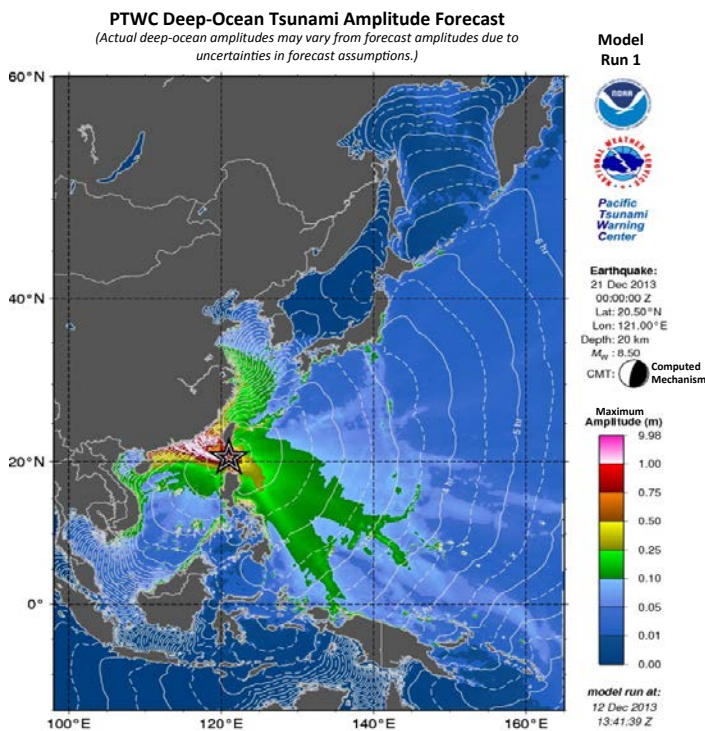
http://www.ioc-tsunami.org/index.php?option=com_oe&task=viewEventRecord&eventID=1368

The IOC South China Sea (ITP-SCS) Regional Tsunami Training on Strengthening Tsunami Warning and the use of new PTWC Enhanced Products was conducted in Beijing, China from 16-20 December 2013. Trainers were Bernardo Aliaga (IOC), Tony Elliott (IOTWS), Yohko Igarashi (Japan Meteorological Agency), Dr. Laura Kong (ITIC), and Dr. Dailin Wang (PTWC). The training included 28 operational staff from National Tsunami Warning Centers and National Disaster Management Offices of South China Sea countries (Brunei, China, Indonesia, Malaysia, Thailand, Vietnam) and Mexico. The training was hosted by the National Marine Environmental Forecasting Center

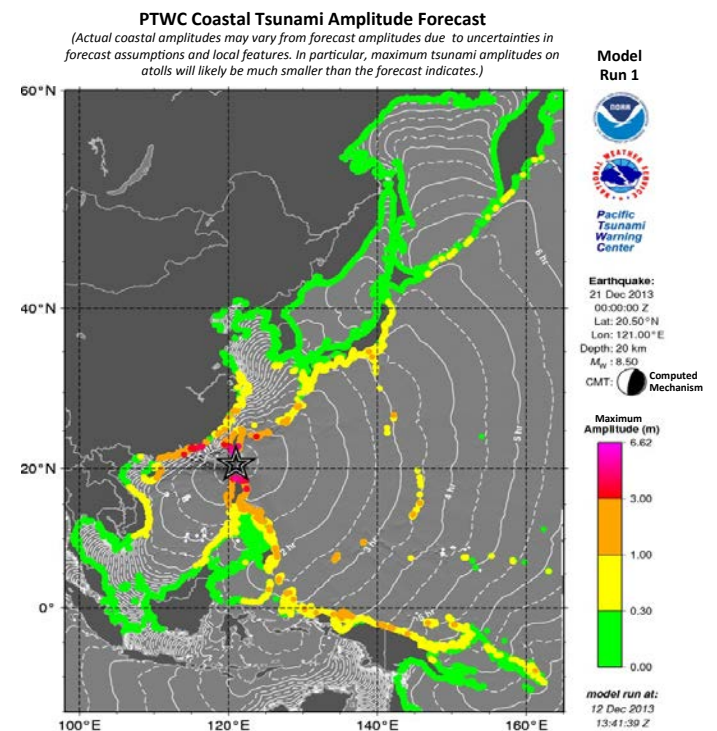
(NMEFC) of State Oceanic Administration (SOA), China and especially focused on the training on the PTWC New Enhanced Products.



PTWC RIFT model run of coastal tsunami amplitude forecast using polygon regions for Exercise South China Sea 2013. Courtesy of PTWC.



PTWC Enhanced Tsunami Forecast Model Product: Realtime Forecast of Tsunamis (RIFT) model run of deep ocean energy and tsunami amplitude forecast. An exercise magnitude 8.5 earthquake north of the Philippines was used to generate the tsunami model during a tabletop Exercise South China Sea 2013, conducted at the IOC regional training in Beijing. Courtesy of PTWC.



PTWC RIFT model run of coastal tsunami amplitude forecast points for Exercise South China Sea 2013. Courtesy of PTWC.

Regional Tsunami Trainings, *continued*

Weniza (Indonesia BMKG) receives her Course Certificate from the trainers (left to right: Kong, Elliott, Weniza, Wang, Igarashi, Aliaga). Photo courtesy of ITIC.

Samoa – American Samoa Tsunami Early Warning Coordination Meeting, 8-9 August 2013, Apia, Samoa

As Pacific Countries face the dangers of tsunami from distant, regional and local sources, Tsunami Warning Centers and Disaster Management Offices must be prepared and work closely to ensure an effective tsunami warning and evacuation. To enable this, two Samoa Tsunami Coordination meetings were held in 2008 (prior to the Sept 2009 South Pacific Tsunami), 2009, 2010, 2012 and 2013. The 2013 Meeting was attended by ITIC, NWS WSO Pago Pago, Samoa Meteorology Division (SMD), Samoa Disaster Management Office (DMO), American Samoa Department of Homeland Security (ASDHS) and the South Pacific Regional Environmental Programme (SPREP). The PTWC Director, Dr. Charles McCreery, joined by phone for sessions on the new international and US domestic products.

The goals of the 2013 meeting included coordination of tsunami warnings as received and acted upon by American Samoa and Samoa. Because of the close proximity of the two countries, citizens in both countries hear alerts issued by both Weather Offices and this can cause confusion and panic that compromises public safety.

Internationally, under the framework and at the high-priority request of the ICG/PTWS, the PTWC will implement new international tsunami alert products

for Pacific countries scheduled for 1 October 2014. Samoa subscribes to these international alerts. The content and format of the improved products will differ significantly from the existing products in their interpretation and use by country National Tsunami Warning Centers and National Disaster Management Offices. At the same time, in order to provide customized threat assessments to American Samoa, the PTWC will implement new US domestic products for American Samoa in March 2014. During tsunami events, NWS Weather Service Office Pago Pago works with the PTWC to issue warnings for American Samoa. The Samoa Meteorological Division issues warnings for Samoa. Both offices share information through telephone communication.

As the US domestic and international products use different criteria and lexicon, there is now an even higher priority to coordinate effectively during a tsunami emergency. It is important that tsunami alert information and public safety instructions issued by both Samoa and American Samoa be as consistent as possible.

American Samoa and Samoa briefed on their tsunami warning and response standard operating procedures, and preparedness activities, including Exercise Pacific Wave 2013, and system improvements since the last Coordination Meeting. PTWC briefed on proposed American Samoa domestic product and the PTWS International Enhanced Products. The Samoa – American Samoa Agreement for Weather Services on earthquake and tsunami early warning



Siosina Lui of Samoa SMD analyzing earthquakes in the Samoa National Tsunami Warning Center. Photo courtesy of L. Kong.

Samoa - American Samoa, *continued*

provisions was further discussed. Moreover, progress on Recommendations and Actions were reviewed.

Afterward, the Group visited the Afiamalu Seismic Station, which provides data as part of the Global Seismographic Network (GSN), and the Samoa Meteorological Division National Tsunami Warning

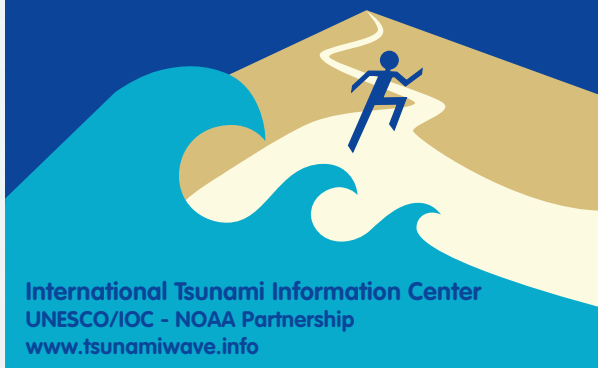
Center (NTWC). The NTWC operates on a 24x7 schedule with 1 person on-site on-duty. Shift times are 0100-0900, 0900-1700, and 1700-0100. The Center has many PCs and 4 large-screen, wall-mounted monitors that display real-time waveform data from their local seismic network and the current global seismicity (CISN software tool).



Participants of the 2013 Two Samoa Tsunami Early Warning Coordination Meeting in Apia, Samoa. Front L to R. Filomena Nelson, Asst CEO Samoa NDMO; Laura Kong, Director ITIC, Mase Akapo, MIC NWS Pago Pago, Mulipola Titimaea, Asst CEO Samoa Meteorology Division (SMD), Iuniasolua Savusa, Director ASDHS. Back L to R: Malaefatu Leavasa, SMD, Maccarios Auvae, SMD, Lomi Akapo, ASDHS, Molly Nielsen, Samoa NDMO, Siosina Lui, SMD, Tagaloasa Paratiso, SMD, Salesa Nihmei, SPREP, Fata Seuseu, SMD. Photo courtesy of L. Kong.

Located in Honolulu, Hawaii, USA, the International Tsunami Information Center (ITIC) was established on 12 November 1965 by the Intergovernmental Oceanographic Commission (IOC) of the United Nations Educational, Scientific, and Cultural Organization (UNESCO) and is hosted by the US National Oceanic & Atmospheric Administration (NOAA). 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 ICG/PTWS encompasses 46 countries within the Pacific Ocean and its marginal seas and basins.

**After an earthquake,
a tsunami may follow.**
Move quickly to higher ground.



International Tsunami Information Center
UNESCO/IOC - NOAA Partnership
www.tsunamiwave.info