

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



# TSUNAMI NEWSLETTER



## International Tsunami Information Center

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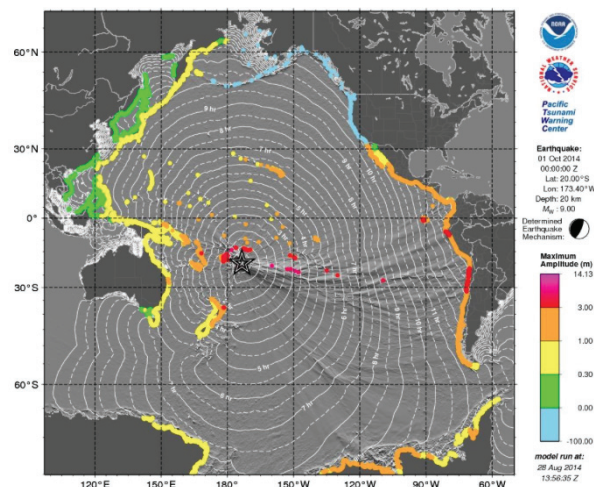
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### PTWC New Enhanced Products to Start 1 October 2014

<http://PTWS-PTWCnewproducts.info>

Starting 1 October 2014, the Pacific Tsunami Warning Center (PTWC) will commence issuance of its new Enhanced Tsunami Products for Pacific Countries. The start culminates a 7-year intergovernmental process coordinated by the UNESCO IOC and International Tsunami Information Center (ITIC) through its Intergovernmental Coordination Group for the Pacific Ocean Tsunami Warning and Mitigation System (ICG/PTWS).

In July 2014, the Steering Committee (SC) of the ICG/PTWS met in Honolulu, Hawaii. Per ICG/PTWS XXV.3 Recommendation, the SC reviewed the progress and meeting requirements for implementation and confirmed that the PTWC Enhanced Products will begin 1 October 2014 UTC. The U.S. National Weather Service (NWS) advised the ICG/PTWS that their internal processes for the satisfactory completion



*PTWC's Coastal Tsunami Amplitude Forecast Map displays individual coastal forecast points colored according to the forecast tsunami amplitude at each point for the Pacific region from a Tonga earthquake scenario. Courtesy of PTWC.*

*Continued p. 4*

## SUMMARY OF EARTHQUAKES

1 MAY - 30 SEPTEMBER 2014

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 Statements (TIS), Local, Regional, and Ocean-wide Watches (LTW, RTW, TW) for the wider Caribbean (C). The Japan Meteorological Agency Northwest Pacific Tsunami Advisory Center (J), issues: Tsunami Advisories (NWPTA) for the Northwestern Pacific; The US National Tsunami Warning Center (USNTWC), 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, NTWC, 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	EPICENTRE	DEPTH (km)	M <sub>w</sub>	PTWC (P), JMA (J) or NTWC (N) ACTION	ACTION TIME (UTC)	TSUNAMI? DAMAGING?	MAXIMUM MEASUREMENT & LOCATION
1-May	06:37	Southeast of Loyalty Islands	21.502° S	120	6.7 (N, P)	(P) 01 TIB	06:44	NO	
			170.352° E		6.6 (G)	(N) 01 TIS	06:45	NO	
4-May	09:16	South of the Fiji Islands	24.642° S	533	6.8 (N, P)	(P) 01 TIB	09:21	NO	
			179.084° E		6.6 (G)	(N) 01 TIS	09:22	NO	
8-May	17:00	Guerrero, Mexico	17.385° N	23	6.8 (N, P)	(P) 01 TIB	17:04	NO	
			100.656° W		6.4 (G)	(N) 01 TIS	17:06	NO	
13-May	06:35	South of Panama	7.249° N	15	6.8 (G, N, P)	(P) 01 TIB	06:40	NO	
			82.330° W			(N) 01 TIS	06:43	NO	
14-May	20:56	Federated States of Micronesia Region	6.458° N	18	6.5 (J, N, P)	(P) 01 TIB	21:03	NO	
			144.877° E		6.1 (G)	(N) 01 TIS	21:04	NO	
						(J) 01 NWPTA	21:22		
15-May	08:17	Federated States of Micronesia Region	6.509° N	19	6.6 (G, J, N, P)	(P) 01 TIB	08:23	NO	
			144.899° E			(N) 01 TIS	08:24	NO	
						(J) 01 NWPTA	08:45		
16-May	11:02	Leeward Islands	17.087° N	12	6.0 (G, N, P)	(P) 01 TIS	11:05	NO	
			60.390° W			(N) 01 TIS	11:07	NO	
31-May	11:54	Off the coast of Jalisco, Mexico	18.852° N	17	6.6 (N, P)	(P) 01 TIB	12:07	NO	
			107.445° W		6.2 (G)	(N) 01 TIS	12:11	NO	
23-Jun	19:19	Kermadec Islands Region	29.977° S	26	7.2 (N, P)	(P) 01 TIB	19:27	NO	
			177.725° W		6.9 (G)	(N) 01 TIS	19:29	NO	

Summary of Earthquakes, *continued*

DATE	TIME (UTC)	LOCATION	EPICENTRE	DEPTH (km)	M <sub>w</sub>	PTWC (P), JMA (J) or NTWC (N) ACTION	ACTION TIME (UTC)	TSUNAMI? DAMAGING?	MAXIMUM MEASUREMENT & LOCATION
23-Jun	20:53	Rat Island, Aleutian Islands, Alaska	51.830° N	104	8.0 (N, P)	(N) 01 TWW	20:57	YES	17 cm (g), Amchitka, AK
			178.750° E		7.9 (G)	(P) 01 TIB	21:01	NO	
						(N) 02 TWW	21:13		
						(P) 02 TIB	21:21		
						(N) 03 TWW	21:43		
						(N) 04 TWW	22:44		
						(N) 05 TWW	23:45		
						(N) 05 TWW	00:35		
24-Jun	03:16	Rat Island, Aleutian Islands, Alaska	52.205° N	12	6.6 (N, P)	(N) 01 TIS	03:20	NO	
			176.698° E		6.3 (G)	(P) 01 TIB	03:23	NO	
29-Jun	07:53	South Sandwich Islands Region	55.470° S	21	7.2 (N, P)	(P) 01 TIS	08:01	NO	
			28.367° W		6.9 (G)	(N) 01 TIS	08:05	NO	
29-Jun	15:52	Samoa Islands Region	14.780° S	12	6.8 (N, P)	(P) 01 TIB	16:00	NO	
			175.259° W		6.4 (G)	(N) 01 TIS	16:02	NO	
29-Jun	17:15	Samoa Islands Region	14.983° S	15	6.8 (N, P)	(P) 01 TIB	17:25	NO	
			175.510° W		6.7 (G)	(N) 01 TIS	17:26	NO	
3-Jul	19:50	Kermadec Islands Region	30.449° S	49	6.6 (N, P)	(P) 01 TIB	19:57	NO	
			176.454° W		6.3 (G)	(N) 01 TIS	20:00	NO	
4-Jul	15:00	New Britain Region Papua New Guinea	6.230° S	12	6.7 (N, P)	(P) 01 TIB	15:07	NO	
			152.808° E		6.5 (G)	(N) 01 TIS	15:11	NO	
7-Jul	11:24	Near the Coast of Chiapas, Mexico	14.758° N	64	7.1 (N, P)	(P) 01 TIB	11:27	NO	
			92.430° W		6.9 (G)	(N) 01 TIS	11:29	NO	
11-Jul	19:21	Off the East Coast of Honshu Japan	37.005° N	12	6.8 (J, N, P)	(P) 01 TIB	19:30	YES	20 cm (g), Ofunato, Japan
			142.452° E			(N) 01 TIS	19:31	NO	
						(J) 01 NWPTA	19:33		
						(J) 02 NWPTA	20:51		
21-Jul	14:55	Fiji Region	19.802° S	630	6.8 (P)	(P) 01 TIB	15:00	NO	
			178.400° W		6.9 (G)			NO	
27-Jul	01:29	Northern Mid-Atlantic Ridge	23.800° N	15	6.6 (G, P)	(P) 01 TIB	01:40	NO	
			46.600° W					NO	

Summary of Earthquakes, *continued*

DATE	TIME (UTC)	LOCATION	EPICENTRE	DEPTH (km)	M <sub>w</sub>	PTWC (P), JMA (J) or NTWC (N) ACTION	ACTION TIME (UTC)	TSUNAMI? DAMAGING?	MAXIMUM MEASUREMENT & LOCATION
3-Aug	00:22	Federated States of Micronesia Region	0.830°N	17	7.2 (P, N, J)	(P) 01 TIB	00:30	NO	
			146.169°E		6.9 (G)	(N) 01 TIS	00:32	NO	
						(J) 01 NWPTA	01:11		
24-Aug	23:22	Near the Coast of Central Peru	14.598°S	89	6.8 (P, N, G)	(P) 01 TIB	23:26	NO	
			73.571°W			(N) 01 TIS	23:30	NO	
10-Sep	02:46	Kepulauan Sula Indonesia	0.242°S	32	6.5 (P, N)	(P) 01 TIB	03:03	NO	
			125.104°E		6.2 (G)	(N) 01 TIS	04:05	NO	
17-Sep	06:15	Mariana Islands	13.764°N	140	7.1 (P, N, J)	(P) 01 TIB	06:23	NO	
			144.429°E		6.7 (G)	(N) 01 TIS	06:25	NO	
						(J) 01 NWPTA	06:32		

PTWC New Enhanced Products, *continued*

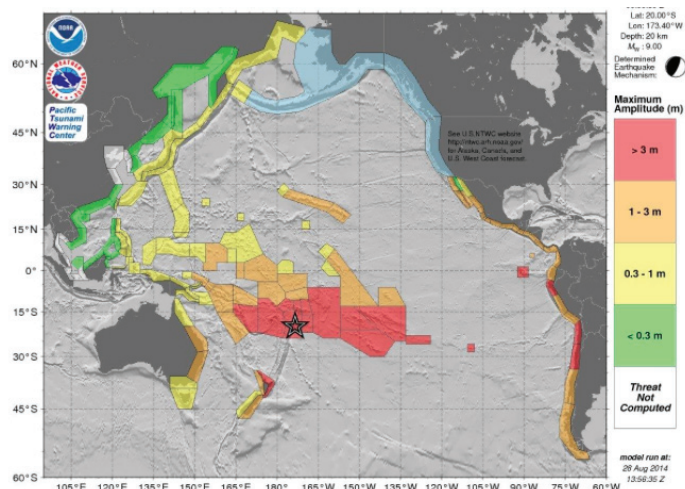
of operational baselines for PTWC tsunami forecasting models and NWS arrangements for U.S. National alerting products were on track for the 1 October transition.

The PTWC will use the Real-time Inundation Forecast of Tsunamis (RIFT) model as the basis for its international forecast products for the PTWS. Developed by PTWC, RIFT is currently a tsunami forecast model of NOAA based on the linear shallow water equations.

The PTWC Enhanced Products will feature threat assessments based on maximum wave amplitude forecasts, measured from sea level to peak or sea level to trough, not on predetermined earthquake magnitude threshold. PTWC will provide the following four categories of forecast maximum coastal tsunami wave amplitudes:

- < 0.3m (No threat)
- 0.3 to ≤ 1m
- 1 to ≤ 3m
- > 3m
- Other: Forecast not yet computed

Forecasts will be constrained by the earthquake fault calculated from the W phase centroid moment tensor and tsunami sea level readings. In addition to the



PTWC's Coastal Tsunami Amplitude Forecast Polygons Map was generated using a Tonga earthquake scenario. Courtesy of

public text message, graphical forecasts and statistical tables will be sent to Country 24 x 7 Tsunami Warning Focal Points (TWFP) to further assist their national decision-making. The PTWC products include:

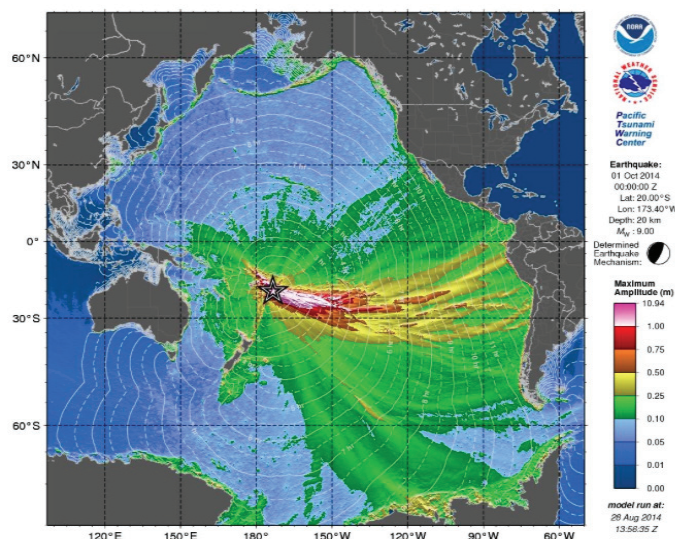
- Text Products
- Coastal Tsunami Amplitude Forecast Polygons Map
- Table of Forecast Statistics for Regional Polygons
- Deep-Ocean Tsunami Amplitude Forecast Map
- Coastal Tsunami Amplitude Forecast Map
- Coastal Tsunami Amplitude Forecast KMZ file



## PTWC New Enhanced Products, *continued*

PTWC will no longer issue Tsunami Warnings and Watches for the Pacific Basin. Instead, Country National Tsunami Warning Centers (NTWC) will become responsible for issuing warnings to their sovereign nation. It is expected that this will eliminate the conflict between the PTWC and NTWC alert levels. The Enhanced Products will still be conservative, but should greatly reduce over-warning. The products will:

- Provide estimated level of impact
- Include graphical as well as text products
- Include a “kmz” file of forecast points to facilitate drilling-down to finer spatial resolution
- Use a real-time model that handles earthquake hypocenters and fault mechanisms anywhere, rather than the shallow-thrust earthquakes in subduction zones
- Use the Real Time Inundation Forecast for Tsunamis (RIFT) model and Green’s Law to estimate coastal forecasts for all Pacific coasts.



*PTWC's Deep-Ocean Tsunami Amplitude Forecast map is useful for understanding why some areas may be more threatened because they are in a “beam” of directed tsunami energy. Above example is from a Tonga earthquake scenario. Courtesy of PTWC.*

## IOC NEWS

### PTWS Steering Committee and Task Team Meetings, 8-11 July 2014

[http://www.ioc-tsunami.org/index.php?option=com\\_oe&task=viewEventRecord&eventID=1538](http://www.ioc-tsunami.org/index.php?option=com_oe&task=viewEventRecord&eventID=1538)

ITIC and NWS Pacific Region hosted the ICG/PTWS Steering Committee & Task Team meetings at the new NOAA Inouye Regional Center (IRC) from 8-11 July 2014. Task Teams worked on the PTWC New Products and Exercise Pacific Wave 2015. Reports were received from PTWS Regional and Technical Working Groups. Also, 50th PTWS Anniversary Plans were developed for April 2015.

The PTWS SC was chaired by Dr. Ken Gledhill (New Zealand). The main outcomes of the SC meeting were 1) the decision to go-live with the PTWC Enhanced Tsunami Products for the PTWS on 1 October 2014, 2) progress reviews of approved recommendations from the September 2013 ICG/PTWS-XXV session in Vladivostok, Russian Federation, and, 3) reports from the Technical and Regional Working Groups (WG) on their main achievements and planned activities in the inter-sessional period from September 2013-April 2015.

The SC approved the conduct of Exercise Pacific Wave

2015 from 2-6 Feb 2015. The 50th Anniversary of the PTWS will include the 26th session of the ICG/PTWS on 22-24 April 2015 at the Royal Hawaiian Hotel in Waikiki, and be preceded by an International Tsunami Workshop 20-21 April at the IRC. The meetings will be hosted by the USA.

### Major Actions:

- The SC set a goal for the PTWS Implementation Plan to be finalized by September 2014. The SC agreed that the Implementation Plan and its priorities should be tied to fundraising. Funding from several sources has enabled Standard Operating Procedures (SOP) and Enhanced Product training on a case-by-case basis. Also, PTWS will look for ways to improve LDC funding.
- Once the first version of the PTWC Enhanced Products for the PTWS is operational, then preparedness should become a main theme for the PTWS. Emphasis should be on developing maps and evacuation procedures.

### Major Recommendations:

**Tsunami Risk Assessment and Reduction (WG1) - Chair, Dr. Vasily Titov**

**PTWS Meetings, *continued***

- Working Group on Tsunami Modeling Hazard Assessment: The SC noted the report of WG1 and agreed to forward the recommendations for tsunami hazard models, assessments, and evaluations, to the next session of the ICG/PTWS. Recommendations included compiling a list of models that have been evaluated and tested with standards, using deterministic approaches for hazard assessment, and integrating tsunami data where available to constrain tsunami hazard assessment products.

**Tsunami Detection, Warning and Dissemination (WG2) – Filomena Nelson**

- Task Team on Seismic Data Sharing in the South West Pacific: The Task Team noted the Oceania Regional Seismic Network (ORSNET) Data Sharing Strategy with South West Pacific members including New Caledonia, Solomon Islands, Fiji, Vanuatu, Papua New Guinea, Samoa, Tonga and the PTWC. Sea level data will also receive improvements including the release of China station data in the South China Sea, through GTS

and the IOC Sea Level Monitoring Facility.

- Task Team on Enhanced New Products: The Task Team reported extensive training conducted on the Enhanced Products by ITIC, IOC, PTWC and New Zealand. Takeshi Koizumi highlighted the changes proposed by NWPTAC to its services and provided a timeline of the introduction of the enhanced products targeting 2018 after following a similar process to the one initiated by PTWC. The SC agreed with the proposed course of action and recommended JMA to continue their progress. Also, the Task Team recommended final changes for the PTWC public and private products. The SC, as instructed by ICG/PTWS XXV.3, confirmed the change over to the PTWC Enhanced Tsunami Products for the PTWS will commence on 1 October 2014 UTC with the agreed revisions.
- Task Team on PACWAVE reported feedback from PACWAVE 13 and from regional trainings indicate that the majority of Member States will be ready for the implementation of the new enhanced products on 1 October 2014. The Task Team recommended the aim of PACWAVE 15 is to test the new products.



*The PTWS Steering Committee met at the new NOAA Inouye Regional Center at Pearl Harbor, Hawaii in July 2014. Back row (left to right): Carlos Zuñiga (Chile SHOA), Jennifer Lewis (NOAA), Bernardo Aliaga - PTWS Technical Secretary (IOC), Michael Angove (NOAA, US Tsunami National Contact), Vasily Titov (NOAA, WG 1 Chair), Daniel Jaksa (Geoscience Australia), Rajendra Prasad (IOC), Laura Kong (ITIC, PacWave Co-Chair), Charles McCreery (PTWC), Jo Guard (New Zealand Ministry of Civil Defence & Emergency Management, PacWave Co-Chair). Front row (left to right): Hing-Yim Mok (China Hong Kong Observatory, SCS WG Chair), David Coetzee (New Zealand Ministry of Civil Defence & Emergency Management), Patricio Carrasco - Vice Chair (Chile SHOA), Ken Gledhill - Chair (GeoNet Project Director, NZ), Takeshi Koizumi - Vice Chair (Japan Meteorological Agency), Filomena Nelson (Samoa Ministry of Natural Resources & Environment, SWP WG Chair).*



**PTWS Meetings, *continued*****Disaster Management and Preparedness (WG3) – Chair, David Coetzee**

The SC requested WG3, in close coordination with ITIC and the Secretariat, to continue to work alongside of the WGs of other ICGs on TOWS planned activities with specific new focus on Evacuation Plans, Maps, and procedures, and to work with the Task Team on Tsunami Modeling Hazard Assessment (WG1).

The SC further requested ITIC to prepare a capacity building proposal and then accepted ITIC's recommendation to develop a new course. ITIC will develop a standardized training course and process

enabling the production of reliable and practical community-level tsunami evacuation maps. Applying globally standardized tools and methodologies, the course and process will link a series of tsunami training workshops on

- Evacuation Planning
- Evacuation Map Development (inundation modeling and map creation)
- Tsunami Warning & Emergency Response Standard Operating Procedures (SOPs)
- Conducting Tsunami Exercises (including evacuation)

**ITIC NEWS****ITIC Training Programme - International (ITP-Intl) Trainings Summary, April - June 2014**

The following is a summary of the ITIC Training Programme - International Trainings conducted in the Pacific and Indian Oceans, Latin America and Caribbean to build national country capacities in tsunami warning and response from April - June 2014. The ITP-International trainings were hosted by Ecuador, Fiji, and Mexico. India hosted an IOC regional SOP training in June 2014 in which the ITIC Director was an invited expert. Pacific topics covered tsunami warning and emergency response Standard Operating Procedures (SOP), and included a tabletop exercise, Tsunami Warning Decision Support Tools, and consultations on implementation of the new PTWS PTWC enhanced products in the Pacific. On 1 October 2014 for the PTWS only, PTWC will officially change over to its new enhanced products that will be based on numerical forecasts of maximum tsunami wave amplitude. Important feedback on the use of the new products by country stakeholders was received during trainings conducted over the past several years. 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 country tsunami warning and mitigation system.

**ITIC Training Programme, Meso America – Caribbean (ITP-CAR3), 1-5 April 2014**

[http://itic.ioc-unesco.org/index.php?option=com\\_content&view=article&id=1896:regional-training-workshop-western-caribbean-and-meso-america-april-](http://itic.ioc-unesco.org/index.php?option=com_content&view=article&id=1896:regional-training-workshop-western-caribbean-and-meso-america-april-2014&catid=2133&Itemid=2561)

[2014&catid=2133&Itemid=2561](http://itic.ioc-unesco.org/index.php?option=com_content&view=article&id=1897:regional-training-workshop-pacific-island-countries-may-2014&catid=2133&Itemid=2561)

ITP-CAR3: The ITIC Training Programme (ITP) International Training for the Western Caribbean and Meso America, (ITP-CAR3) was held from 1-5 April 2014 in Mexico City. Trainers were Alison Brome (Caribbean Tsunami Information Centre), Christa Von Hillebrandt (NOAA Caribbean Tsunami Warning Program), Masahiro Yamamoto (IOC retired), Laura Kong and Nicolas Arcos (ITIC). The training included 29 operational staff from Tsunami Warning Centers and Disaster Management Agencies from 11 countries in the Western Caribbean (Belize, Colombia, Costa Rica, El Salvador, Guatemala, Honduras, Jamaica, Mexico, Nicaragua, Panama, UK-Cayman Islands). Training for Northeastern Caribbean and Southeastern Caribbean Countries previously took place 4-8 November 2013 in the Dominican Republic (ITP-CAR1), and 18-22 November 2013 in Barbados (ITP-CAR2), respectively. These series of workshops were the first end-to-end tsunami operational procedures training conducted in the region since the inception in 2006 of the Intergovernmental Coordination Group for the Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (ICG/CARIBE-EWS).

**ITIC Training Programme, Pacific Island Countries (ITP-PIC), 22-24 May 2014**

[http://itic.ioc-unesco.org/index.php?option=com\\_content&view=article&id=1897:regional-training-workshop-pacific-island-countries-may-2014&catid=2133&Itemid=2561](http://itic.ioc-unesco.org/index.php?option=com_content&view=article&id=1897:regional-training-workshop-pacific-island-countries-may-2014&catid=2133&Itemid=2561)

**ITIC News**, *continued*

The ITIC Training Programme (ITP) International Training Workshop for Pacific Island Countries (ITP-PIC) on the new PTWC Enhanced Products was organized by ITIC and held in Nadi, Fiji from 22-24 May 2014. Trainers were Ken Gledhill (New Zealand Institute of Geological and Nuclear Sciences), Rajendra Prasad (IOC), Stuart Weinstein (PTWC) and Laura Kong (ITIC). On 1 October 2014, the PTWC will implement these new international tsunami threat products for the PTWS. There were 30 operational staff in attendance, including Tsunami Warning Focal Points and Disaster Management senior officials from 14 countries (Cook Islands, FSM, Fiji, Kiribati, Nauru, Niue, Palau, PNG, RMI, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu).

**ITIC Training Programme Latin American Countries (ITP-LAC), 2-4 June, 2014**

[http://itic.ioc-unesco.org/index.php?option=com\\_content&view=article&id=1898:regional-training-workshop-latin-american-countries-june-2014&catid=2133&Itemid=2561](http://itic.ioc-unesco.org/index.php?option=com_content&view=article&id=1898:regional-training-workshop-latin-american-countries-june-2014&catid=2133&Itemid=2561)

The ITIC Training Programme (ITP) International

Training Workshop for Latin American Countries (ITP-LAC) on the new PTWC Enhanced Products was organized by ITIC and held in Guayaquil, Ecuador from 2-4 June 2014. Trainers were Julie Leonard (USAID), Charles McCreery (PTWC), Laura Kong and Nicolas Arcos (ITIC). There were 35 participants from Tsunami Warning Centers, Disaster Management Agencies and academic institutions from 9 countries (Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Panama, Peru). Also, the trainers participated in an IOC PTWS Southeast Pacific Working Group meeting 5-6 June 2014.

**IOC Regional Training on Standard Operating Procedures for Tsunami Warning and Emergency Response for Northern and Western Indian Ocean Countries**

[http://www.ioc-tsunami.org/index.php?option=com\\_content&view=featured&Itemid=93&lang=en](http://www.ioc-tsunami.org/index.php?option=com_content&view=featured&Itemid=93&lang=en)

The IOC Regional Workshop on Standard Operating Procedures for Tsunami Warning and Emergency Response for Northern and Western Indian Ocean Countries was held in Hyderabad, India from 23-27



Participants of the ITIC Training Programme for Meso America - Caribbean Countries (ITP-CAR3) in Mexico City, Mexico, 1-5 April 2014. Photo courtesy of Mexico Navy.



PTWS Meetings, *continued*

*Participants of the ITIC Training Programme for Pacific Island Countries (ITP-PIC) in Fiji, 22-24 May 2014, Photo courtesy of ITIC.*

June 2014, organized by the IOC and hosted by the Government of India through the Indian Centre for Ocean Information Services (INCOIS). A team of 10 trainers conducted the workshop from Australia, India, Indonesia, USA, the Asia-Pacific Broadcasting Union, UNESCO IOC and its Disaster Risk Reduction and Tsunami Information Unit, Jakarta. The ITIC Director (Dr. Laura Kong) attended as an invited expert resource person.

The workshop was attended by 30 participants from 11 countries (Comoros, India, Iran, Kenya, Madagascar, Maldives, Mauritius, Mozambique, Seychelles, Tanzania and Yemen). The participants represented National Tsunami Warning Centers and Disaster Management Organizations and national media organizations. The primary objectives of the workshop were to identify potential gaps and possible challenges for warning chain SOPs at the national level, to familiarize the media with the Regional Tsunami Service Provider (RTSP) products, and preparation for the IOWave14 Exercise in September 2014. Immediately after the 2004 Indian Ocean tsunami, ITIC was a principal expert resource on tsunami warning systems and capacity building for the 2005 then newly created IOC / Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS).

### **Summary of ITIC Trainings in the Marshall Islands, Micronesia, and Palau, March – October 2014**

The following is a summary of ITIC involvement in a series of Compact Nations trainings conducted in

the Pacific Ocean to build national country capacities in tsunami warning and response from March – October 2014. The trainings were hosted by Pacific Island nations with historic affiliation in the Compact of Free Association between the Federated States of Micronesia (FSM) and the United States. These countries include FSM, Republic of Marshall Islands (RMI), and Republic of Palau (ROP). More information on the Compact can be found at <http://uscompact.org/about/cofa.php>

The trainings focused on stakeholder agency briefings on the implementation of PTWC New Products Standard Operating Procedures (SOP). PTWC New Products were scheduled for implementation throughout the Pacific Basin on 1 October 2014. The new products are based on numerical forecasts of maximum tsunami wave amplitude measured from sea level to peak or sea level to trough. Topics covered New Products SOP development with Compact Weather Service Offices (WSO), National Disaster Management Offices, and other country stakeholder agencies. Important feedback on the use of the new products by stakeholders was received during trainings. Moreover, training was conducted on use of Tsunami Warning Decision Support Tools for near real time earthquake and sea level tsunami monitoring. The following is a listing of trainings:

- Micronesia WSO Managers (FSM, RMI, ROP) training on 14 March at NOAA Inouye Regional Center (IRC). Trainers were ITIC Director Laura Kong, PTWC Director Charles McCreery, and NOAA Guam Weather Forecast Office (WFO) Warning Coordination Meteorologist (WCM) Chip

IOC Trainings, *continued*

*Participants of the International Training Programme (ITP-LAC) International Training for Latin American countries in Guayaquil, Ecuador, 2-4 June 2014. Photo courtesy of Ecuador INOCAR.*

Guard. Also, pre-coordination of Compact field training schedules were discussed.

- RMI training from 28 April – 2 May. Trainers were Laura Kong (ITIC) and Chip Guard (Guam WFO).
- ITIC Training Programme (ITP) Regional Training Workshop for Pacific Island Countries on new PTWC Enhanced Products was conducted in Nadi, Fiji from 22-24 May. Trainers included Ken Gledhill (NZ), Laura Kong (ITIC), and Stuart Weinstein (PTWC). Compact nations also attended.
- Annual two week ITIC Tsunami Training Programme (ITP-Hawaii) at NOAA IRC from 18-29 August. Trainers included Charles McCreery (PTWC), Dailin Wang (PTWC), and ITIC staff. Compact nations were in attendance.
- ROP and FSM trainings:
  - ROP and Yap State training from 2-12 August. Trainers were Laura Kong (ITIC) and Chip Guard (Guam WFO).
  - Chuuk and Kosrae State trainings from 16 – 30 September. Trainers were Laura Kong (ITIC) and Chip Guard (Guam WFO).
  - Pohnpei State training from 13-17 October. Trainers were Laura Kong (ITIC), Chip Guard (Guam WFO) and Marcus Aydtlett (Guam WFO).

Evaluations by the participants rated the trainings overwhelmingly excellent to good. The course topics were useful, comprehensive, essential, and practical

for training their staff, and for strengthening their country tsunami warning and mitigation system.

#### **ITIC Training Programme - Hawaii (ITP-Hawaii), Honolulu, Hawaii, USA, 18-29 August 2014**

The International Tsunami Information Center (ITIC) and the Pacific Tsunami Warning Center (PTWC) annually conduct a 2-week training course in Hawaii for different countries in the Pacific Basin, in focusing on SOPs and actions to mitigate the effects of tsunamis. This course was conducted between 18-29 August, in Honolulu, USA, and consisted of classroom and professional visits to PTWC and emergency management agencies. The main focus of the 2014 ITP – Hawaii was implementation of PTWC New Products Standard Operating Procedures (SOP). The new products were scheduled for implementation throughout the Pacific Basin on 1 October 2014. Moreover, participating countries expanded and improved on their existing tsunami SOPs for local, regional and distant tsunamis, which consist of pre-planned actions for the receipt, analysis, dissemination and monitoring of seismic and oceanographic parameters. Week 1 covered all aspects of tsunami warning and emergency response, and preparedness, using Hawaii as a case study for operational tsunami warning and mitigation system. Week 2 focused on the PTWC New Enhanced Products, including the explanation of the products, their use, and the limitations and uncertainties inherent in tsunami forecasting.

A total of 30 participants with National Tsunami Warning Center responsibilities from 14 Pacific Basin countries (China, Colombia, Cook Islands, Ecuador, Federated States of Micronesia, Honduras, Indonesia, Kiribati,



**IOC Trainings, *continued***

Marshall Islands, Nicaragua, Palau, Philippines, Tonga, Tuvalu) and 1 Indian Ocean country (Oman) were represented.

As a final ITP-Hawaii 2014 activity, each country was asked to submit a Country Trip Report describing what they learned and what they plan to do with the training, upon return to their home country. Answers below were compiled and summarized by ITIC to a six-question course assessment. Also, comments from the participants representing his/her home country are followed by his/her country's name.

**Question 1: What ITP Topics / Learning Activities were most useful for your agency to implement in your country?**

The Training Programme provided an overview on tsunami science and demonstrated the implementation of the end-to-end warning system as well as presenting varying tsunami preparedness strategies. All participants agreed the opportunity to develop their own country's Standard Operating Procedures (SOP) was most useful. Additionally, participants' felt learning about the international coordination involved in reducing tsunami impact was important. Other useful activities highlighted in the course assessment included: (1) learning how to apply the California Integrated Seismic Network (CISN) software to monitor real-time earthquake information and global distribution (Federated States of Micronesia) and (2) sharing lessons learned, such vertical evacuation options and interfacing with the media, from the March 2011 Honshu, Japan, Earthquake and Tsunami. (Philippines)

**Question #2: What ITP Topics / Learning activities were most useful to implement in your job?**

The participants found preparing and implementing the exercises in the SOPs to be the most relevant to their job - "We can learn what worked and did not work well during the exercise, so that we will know which parts need increased preparation" (Indonesia). Several participants noted the importance of PTWS New Products, "As part of the monitoring team, the most useful topic for me is the discussion of the Pacific Tsunami Warning Center (PTWC) products; this will help me on deciding what tsunami advisory to issue." (Philippines)

- Since the Colombian Tsunami Warning Centre is

still not the Tsunami Warning Focal Point (TWFP) for the country, we have agreed to support Corporación OSSO with information evaluation as back up. (Colombia)

- BMKG is a government institution, which has the role as National Tsunami Warning Centre. Recommendation in terms of improving the SOP based on the training experience is important to be implemented. BMKG needs to continue update and improve the warning Centre SOP. (Indonesia)
- Currently, the National Disaster Management Office (NDMO) is designated to disseminate such information. Such setup works well with distance tsunamis but would become totally ineffective with locally generated or near distance tsunamis. In the event that the threat is very near and imminent the TWC need to get the information out immediately, but existing policies prevent the TWC to do so. There need to be a vessel (MOU) in place delegating such authority to the TWC. (Republic of the Marshall Islands)
- With regular practice (and training), hopefully it will ensure that we can produce these products with ease in the event of a destructive tsunami that may pose as a potential threat to our islands. (Republic of Palau)
- I recommend to my colleagues from the NTWC to be familiarized with our local SOPs and the PTWC new forecast products, so that anyone on duty will be prepared and can issue the correct and prompt tsunami advisories. I will also recommend to them to know how to simulate the tsunami decision tools; this will really help especially for local tsunami since we do not have much time to prepare. (Philippines)

**Question #4: What are your Recommendations to strengthen your National Disaster Management Operations in Tsunami Response?**

The two most common recommendations among the participants were to increase (or initiate) routine drills and exercises as well as improve communication between their NDMO and NTWC. Additional recommendations addressed building capacity in their emergency services and tsunami vulnerable communities.



### IOC Trainings, *continued*

#### **Question #5: What are your Recommendations to strengthen public awareness, preparedness and mitigation in your country?**

All participants agreed that increased outreach in the community is a critical need to reduce tsunami risk at both the national and local levels. Several countries felt their mitigation efforts could be enhanced with themed campaigns. Examples of such activities in the Philippines have included the Information, Education and Communication (IEC) Campaign and Community Based Early Warning System (CBEWS). The Republic of the Marshall Islands would like to see a creation of a MOU delegating their TWC the authority to issue tsunami warning messages and a National Tsunami Information Plan.

All participants responded with the need of increased information, education, and communication and provided lists of country-specific resources needed to achieve these goals. Several countries raised concern for they feel their communities are unprepared on the threat and have no evacuation plan (Palau, RMI, and Indonesia).

#### **Question #6: Is your country ready for the PTWC New Products changeover? If not, please list the actions still to be done, and any gaps that still need to be filled. Also, what are your Recommendations to strengthen your National Disaster Management Operations in Tsunami Response with the PTWC**

### **New Products?**

All participants agreed the Training Programme equipped them with the knowledge to employ the PTWC New Products. However, participants from Palau, RMI and Philippines cautioned much work still remains for their country's tsunami early warning and/or mitigation systems.

Areas of opportunity to bridge gaps in support of the launch of the new products were recognized by several of the participants. Internet speed was identified as an issue for many of the participants from the Pacific Islands. In Indonesia, Badan Meteorologi, Klimatologi dan Geofisika (BMKG) will work closely to enhance coordination between their NTWC and NDMO to update their information relating to the new products and strengthen warning messages to communities at risk.

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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.

