



## **EXERCISE PACIFIC WAVE 13**

### **A Pacific-wide Tsunami Warning and Enhanced Products Exercise**

**1–14 May 2013**

**Exercise Manual**

**Volume 1**

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**UNESCO**

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**UNESCO 2013**

IOC Technical Series, 106 (volume 1Rev.)  
Honolulu and Paris, April 2013  
English only

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**For bibliographic purposes, this document should be cited as follows:**

*Exercise Pacific Wave 13. A Pacific-wide Tsunami Warning and Enhanced Products Exercise, 1–14 May 2013. Volume 1: Exercise Manual.* IOC Technical Series No 106 rev. UNESCO/IOC 2013 (English only)

Report prepared by: The Intergovernmental Coordination Group  
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and Mitigation System (ICG/PTWS)  
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Published in 2013  
by United Nations Educational, Scientific  
and Cultural Organization  
7, Place de Fontenoy, 75352 Paris 07 SP

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(IOC/2013/TS/106Vol.1rev.)

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## 1. BACKGROUND

Most of the world's earthquakes and tsunamis occur in the Pacific Ocean and its marginal seas. On average, the Pacific is struck by a locally damaging tsunami every year or two, and by a major Pacific-wide tsunami a few times each century.

Over the past five years (2009–2013), the Pacific witnessed four destructive and deadly tsunamis that each placed PTWS (Pacific Tsunami Warning and Mitigation System) countries in various levels of warning for regional or distant tsunamis. Locally, six countries were impacted nearly immediately with people having only 10 to 30 minutes before the first large waves hit.

On 29 September 2009, Samoa, American Samoa, and Tonga were hit by a deadly tsunami that was the largest since the 1998 Sissano, Papua New Guinea, event. Altogether, 192 lives were lost locally. This was followed, five months later by the 27 February 2010 Chile tsunami where 124 lives were lost. And one year later, the Pacific and the world watched the 11 March 2011 Japan tsunami devastate the Honshu coastlines within 30 minutes claiming over 18,000 lives. Finally, on 6 February 2013, a local tsunami was generated by a powerful 8.0 magnitude earthquake that struck near the town of Lata, provincial capital of Temotu on Santa Cruz island, the eastern-most province in the Solomon Islands. Nine people were killed and hundreds of homes in five villages were damaged or destroyed.

In reviewing the Pacific Tsunami Warning System (IOC Technical Series, 92 [IOC/2010/TS/92] for 27 February 2010; and IOC Technical Series, 96 [IOC/2011/TS/96] for 11 March 2011), it can be said that while countries in general responded well to the 2010 and 2011 tsunamis as distant sources, there is still a need to reflect on how Member States can improve in responding to local tsunamis.

The Intergovernmental Oceanographic Commission (IOC) of UNESCO established the International Coordination Group for the Tsunami Warning System in the Pacific (ICG/ITSU) in 1965 in response to the 1960 magnitude 9.5 earthquake off the coast of Chile that generated a tsunami killing 1,203 people locally, and 139 persons 22 hours later in Japan. The main focus of the Group is to facilitate the issuance of timely international warnings, and advocate for comprehensive national programmes in hazard assessment, warning guidance, and preparedness (ITSU Master Plan, 2004 [IOC/INF-1124 rev.]; PTWS Medium-Term Strategy 2009–2013 [ICG/PTWS-XXIII/3 (Annex V) and working document ICG/PTWS-XXIII/13]). In 2006, ITSU was renamed as the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS).

A Pacific-wide tsunami exercise is an effective tool for evaluating the readiness of PTWS countries and to identify changes that can improve its effectiveness. The international tsunami exercises were conceived and conducted in 2006 by the ICG/PTWS under the leadership of the PTWS Exercises Task Teams with strong contributions from the International Tsunami Information Centre (ITIC), the Pacific Tsunami Warning Center (PTWC), and the Japan Meteorological Agency (JMA). The first Pacific-wide exercise, Exercise Pacific Wave 06 (IOC/INF-1244), was carried out on 16 and 17 May 2006 using Philippines and Chile tsunami sources. Exercise Pacific Wave 08: A Pacific-wide Tsunami Warning and Communication Exercise (IOC/2008/TS/82), was carried out from 28 to 30 October 2008 using a northeast Japan source.

At the Twenty-third Session of the ICG/PTWS held in Apia, Samoa, from 16 to 18 February 2009 (ICG/PTWS-XXIII/3), Member States reviewed the findings and recommendations of Exercise Pacific Wave 08. Acknowledging the common occurrence of large earthquakes in the Southwest Pacific and its ensuing local tsunami hazard, and recognising exercises as a good vehicle to improve response and publicise awareness of tsunamis, Member States recommended to hold a third Pacific-wide tsunami exercise. Further, in the aftermath of the

2010 Chile and 2011 Japan local tsunamis, it was decided to conduct Exercise Pacific Wave 11 ([IOC/2011/TS/97VOL.1](#)) to encourage countries to evaluate their response readiness for local tsunamis.

At the Twenty-fourth Session of the ICG/PTWS ([ICG/PTWS-XXIV/3](#)) held in Beijing, China, from 24 to 27 May 2011, Member States approved the development of improved tsunami procedures and enhanced products by the PTWC, and the conduct of Exercise Pacific Wave 11 the 9 and 10 November 2011 to introduce and obtain feedback on the new products. PacWave11 provided countries with 10 destructive local tsunami scenarios to choose from. The PacWave11 Summary Report and other exercise documents are available on the PacWave11 website:

[http://itic.ioc-unesco.org/index.php?option=com\\_content&view=article&id=1686&Itemid=2331&lang=en](http://itic.ioc-unesco.org/index.php?option=com_content&view=article&id=1686&Itemid=2331&lang=en)

In May 2012, the Task Team 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 13 (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 is intended that the Pacific Tsunami Warning and Mitigation System (PTWS) Steering Committee would review the results of PacWave13 beforehand. 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 11 to 13 September 2013. The goal continues to be for an official changeover in 2014.

## **2. EXERCISE PURPOSE**

The aim of Exercise Pacific Wave 13 is to validate the understanding and use of the Pacific Tsunami Warning Center (PTWC) enhanced products.

The exercise provides 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 is encouraged to participate.

## **3. EXERCISE OBJECTIVE**

The overall objectives for Exercise Pacific Wave 13 are 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 Products.

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

Each country may expand and/or customise its own objectives for the exercise.

#### 4. NEW ENHANCED PRODUCTS

At the Twenty-fourth Session of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS-XXIV/3) held in Beijing, China, from 24 to 27 May 2011, based on the work of the PTWS Task Team on Enhancing Tsunami Warning Products (Recommendation ICG/PTWS-XXIII.1, 2009) and recognition of improved capabilities of the PTWC in terms of its speed of response and growing ability to forecast impacts, Member States approved PTWC's proposal for new enhanced products.

The PTWC Enhanced Products will be 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>)

The PTWC Enhanced Products were first introduced in Exercise Pacific Wave 11 (PacWave11) and feedback received through the post-exercise evaluation. Exercise Pacific Wave 13 will continue the development of the PTWC final products by introducing improved versions that address the feedback and comments received from PacWave11 and other meetings in 2011–2013.

**Countries should also take note that the PTWC will begin the issuance of its new enhanced products in live trial phase to Member States of the ICG/PTWS on 15 April 2013. The PTWC will issue 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. At the Twenty-fifth Session of the ICG/PTWS (September 2013), Member States will be asked to review and discuss the new products, and if ready, approve the products and agree on a official changeover date in 2014.

#### 5. EXERCISE SCENARIO

Exercise Pacific Wave 13 should be held within the period of 1 to 14 May 2013. PacWave13 is recommended to be a Tabletop Exercise and will not be a live exercise. All messages will be available beforehand. Participant countries may choose to run their exercise at any time between 1 to 14 May 2013, allowing flexibility to avoid conflict with other important national events.

Three scenarios are available that will allow all Pacific countries to select and exercise a distant/regional/local source tsunami event. Countries are 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)

The exercise will require Member State evaluation of PTWC new enhanced products, issuing of appropriate country specific alerts by National Tsunami Warning Centres (NTWCs), decision-making, including steps taken just prior to public notification. Member States may conduct the exercise through to the community level if they wish (however, this is not a requirement of the exercise).

Each country will be responsible for designing its own national, provincial and/or local level exercise(s) in line with the international Exercise Pacific Wave exercise framework.

## **6. TYPE OF EXERCISE**

It is recommended that Exercise Pacific Wave 13 be carried out in a tabletop format (also referred to as a 'discussion exercise', or 'DISCEX').

Participants are presented with a situation or problem that they are required to discuss and for which they have to formulate the appropriate response or solution. Normally, the exercise requires no simulation other than the scenario and/or prewritten exercise injects. An exercise controller or moderator introduces a simulated scenario to participants and, as the exercise advances (in time), exercise problems and activities (injects) are further introduced. This type of exercise is used to practice problem solving and coordination of services with or without time pressures. There is no deployment or actual use of equipment or resources.

An example of a Tabletop Exercise may involve only key stakeholders, such as the National Tsunami Warning Center and the National Disaster Management Office, discussing their response to a tsunami threat in a particular area, where the only injects are tsunami messages from the international tsunami warning centres such as the PTWC in Hawaii, which describe the nature of the threat.

## **7. FURTHER GUIDANCE – HOW TO PLAN, CONDUCT AND EVALUATE TSUNAMI EXERCISES GUIDELINE**

The IOC Manuals and Guides 58, *How to Plan, Conduct and Evaluate UNESCO/IOC Tsunami Wave Exercises* (IOC/2012/MG/58 REV, available in English and Spanish), has been developed to aid countries in planning, conducting, and evaluating a tsunami exercise at a national and/or provincial level. The guide is available at the [PacWave13](#) website.

## **8. ASSUMPTIONS**

Each country will be responsible for determining what assumptions should be considered as part of its national, provincial, and/or local tsunami exercise.

## **9. EXERCISE PARTICIPATION**

All Pacific countries are encouraged to participate in the exercise. However, it is up to each country to decide what level of governmental participation they will undertake. To meet the objectives of PacWave13, it is recommended the participation of the National Tsunami Warning Center and the National Disaster Management Office.



Each country's lead agency and its PacWave13 National Contact will be responsible for:

- **During the initial phase of exercise planning:**
  - Determining their country's level of participation.
  - Planning their exercise through the country's Exercise Planning Team.
- **During the exercise:**
  - Responding as necessary to fulfil their all-of-government and national, provincial and/or local arrangement obligations.
- **After the exercise:**
  - Encouraging the conduct of debriefs and evaluations by in-country agencies.
  - Completing the PacWave13 Exercise Evaluation Form based on in-country feedback.

## 10. EXERCISE DOCUMENTATION

The Exercise Pacific Wave 13 planning, conduct, and evaluation should take into account the following documents:

- **IOC Circular Letter No 2481:** PTWC Start of Issuance of Pacific Experimental Products, 15 April 2013 User's Guide for the PTWC Enhanced Products for PTWS (IOC TS-105); PTWS Pacific-wide Tsunami Exercise "PacWave13", 1–14 May 2013 (revised dates).
- *Exercise Pacific Wave 13. A Pacific-wide Tsunami Warning and Enhanced Products Exercise, 1–14 May 2013. Volume 1.* IOC Technical Series No 106. UNESCO/IOC 2013 (English only). (IOC/2013/TS/106Vol.1)
- *User's Guide for the Pacific Tsunami Warning Center Enhanced Products for the Pacific Tsunami Warning System.* IOC Technical Series No 105. UNESCO/IOC 2013 (English only). (IOC/2013/TS/105)
- *Exercise Pacific Wave 11. A Pacific-wide Tsunami Warning and Communication Exercise, 9–10 November 2011. Summary Report, Volume 2.* IOC Technical Series No 97. UNESCO/IOC 2013 (English only) (IOC/2013/TS/97Vol.2)
- **IOC Circular Letter No 2460:** PTWC Start of Issuance of Pacific Experimental Products, 1 February 2013; PTWS Pacific-wide Tsunami Exercise "PacWave13", April 2013, dated 7 December 2012.
- **ICG/PTWS-Steering Committee 3**, Summary Report Actions Items, May 2012.
- ICG/PTWS-XXIV, Recommendation 3 on PTWS Exercises, May 2011. (ICG/PTWS-XXIV.3)
- ICG/PTWS-XXIII, Recommendation 2 on PTWS Exercises, March 2009. (ICG/PTWS-XXIII.2)
- *Operational Users Guide for the Pacific Tsunami Warning and Mitigation System (PTWS).* IOC Technical Series No 87, Second Edition. UNESCO/IOC 2009 (English only.) (IOC/2011/TS/87rev).
- *How to plan, conduct and evaluate UNESCO/IOC tsunami wave exercises.* IOC. Manuals and guides; 58. UNESCO/IOC 2012. (English/Spanish). (IOC/2012/MG/58Rev.)

- *Tsunami Glossary*, 2013. Paris, UNESCO. IOC Technical Series No 85. (English/Arabic) ([IOC/2008/TS/85rev](#)). It includes general definitions relevant to the PTWS New Enhanced Products.

All information related to Exercise Pacific Wave 13 is available at the exercise website: <http://www.pacwave.info>

## 11. EXERCISE PRODUCTS

Unlike previous exercises, Pacific Wave 13 will NOT be played in real time, and thus will have no “dummy” kickoff exercise message. Participant countries should select a relevant scenario and its most convenient date and time to conduct the Tabletop Exercise within the 1-14 May 2013 time period.

All international products will be provided online at the Exercise Pacific Wave 13 website (<http://www.pacwave.info>) in advance to help countries plan and prepare. It is recommended to download from the PacWave13 website the international products and messages for the appropriate scenario prior to the day of the exercise.

Each scenario will have a suite of PTWC enhanced product messages and forecasts. The Japan and Manila Trench will also have Tsunami Advisories from the Northwest Pacific Tsunami Advisory Center (NWPTAC) of the Japan Meteorological Agency (JMA). Please note that each centre carries out its forecasting independently, so the forecasts may differ. Likewise, the sea level observations may also differ in the messages of the two international centres since they are based on independent simulations and/or historical observations of the centre.

The earthquake origin time default date and time of the messages (e.g. 1 May 2013 @ 0000 hours) can be adjusted by participant countries to coincide with their selected Tabletop Exercise local date and time. Subsequent message traffic issuance date and times should then also be adjusted accordingly.

All documentation and correspondence relating to this exercise is to be clearly identified as **Exercise Pacific Wave 13** and **For Exercise Purposes Only**.

Each country is also welcome to modify estimated arrival times or estimated wave amplitudes to suit their preference; for example, to have the arrival of tsunami sooner and with a larger amplitude.

## 12. EXERCISE DELIVERY/FORMAT

Only the suite of PTWC new enhanced products are being reviewed in Pacific Wave 13. The Northwest Pacific Tsunami Advisory Center (NWPTAC) of the JMA will be issued messages for the Off Northern Japan and Philippines–South China Sea scenarios for information purposes only, and all messages are listed in the Master Schedule of Events List (ANNEX I).

Distribution of the series of international messages for each scenario, available on the exercise website, will be the responsibility of each country.

Each Exercise Pacific Wave 13 National Contact and their Exercise Planning Team should decide whether the exercise scenario messages are made known to the other national, provincial and local agencies prior to the exercise.

During the exercise, the Exercise Control Team may choose to feed the bulletins into the exercise at times of their own choosing, or alternatively put them in envelopes with the time

they must be opened written on each, with each key participant agency having their own set of envelopes.

Country Exercise Planning Teams may want to add their own national and/or local injects.

#### 12.1 MASTER SCHEDULE OF EVENTS LIST (MSEL) – EXERCISE SCRIPT

The Master Schedule of Events List (MSEL) is a detailed sequence of events used by Exercise Control Team to ensure that the exercise runs smoothly.

The International Master Schedule of Events List (MSEL) giving the timeline for issuance of international products, and the product types are given in ANNEX I.

Each country's Exercise Control Team will be responsible for executing Master Schedule of Events List.

### 13. POST-EXERCISE EVALUATION

All exercises should have a learning focus. Learning is maximised when there is a continuous process of review to draw out the lessons identified. Review is the process of evaluating and validating the exercise. The exercise should also test an agency's Standard Operating Procedures (SOPs). Areas that agencies are encouraged to evaluate include, but are not limited to:

- Are the format, content, and staging of the PTWC Enhanced Products satisfactory?
- Is the content of PTWC Enhanced Products understandable by stakeholders?
- Is your country prepared to officially receive and utilize the PTWC Enhanced Products?
- Is your National Tsunami Warning Centre prepared to issue appropriate country alert levels (e.g. warning, watch, advisory, etc.) after initial receipt and interpretation of the PTWC Enhanced Products?
- Are your country stakeholders aware that the current PTWC international warning/watch products will expire with the official implementation and changeover to the PTWC Enhanced Products in 2014?
- With the PTWC Enhanced Products, have your country's stakeholders been educated on what they should expect, when, and what they should do with the alerts that will now be issued by your National Tsunami Warning Centre?
- Is additional training, either by international experts or by country tsunami warning focal points, necessary to ensure the understanding, utilization, and limitations of the PTWC Enhanced Products?

A review and hot and cold debrief should evaluate the effectiveness of arrangements in place and identify if there are any corrective actions and gaps to fill. The hot and cold debriefs are then used to complete the Exercise Pacific Wave 13 post-exercise evaluation form.

**All participating countries are asked to provide feedback through the Pacific Wave 13 evaluation form (ANNEX II) by 31 May 2013.** Forms should be submitted online by visiting [https://www.surveymonkey.com/s/pacwave13\\_eval](https://www.surveymonkey.com/s/pacwave13_eval). This feedback will greatly assist in the evaluation of Exercise Pacific Wave 13 and the finalization of the PTWC Enhanced Products.

### 13.1 DEBRIEFING

A post-exercise debrief is a critical review of the entire exercise. It identifies those areas that were handled well, those areas where issues were experienced, and recommendations for improvement.

The aim of organisational debriefing is for staff to communicate their experiences of the exercise so that lessons can be identified. Arrangements (plans, procedures, training etc.) can then be modified to reflect lessons identified along with best practice, and therefore improve the agency's ability to respond in future exercises/real events.

Each agency that participates in PacWave13 is expected to conduct its own debriefs after the exercise. This may take the form of a hot debrief (or hotwash) on the day of the exercise, with each participating agency conducting its own cold (formal) debrief within the week(s) following the exercise.

A formal exercise debrief inclusive of all participants in the respective countries will be required to facilitate a collective and official evaluation. The method (in person meeting, survey, teleconference, or other means) used to collect the data required is to be decided upon by the individual participant countries.

The feedback received from this structured debrief is then used to complete standard evaluation forms which are to be based on the overall exercise objectives, plus any additional evaluation forms or tools developed by each country.

A useful guide to debriefing is the one intitled Organisational Debriefing Information for the CDEM Sector [IS6/06], used by New Zealand Ministry of Civil Defence & Emergency Management. It can be found at:

[http://www.civildefence.govt.nz/memwebsite.nsf/Files/Information\\_Series/\\$file/DeBriefing Info Book.pdf](http://www.civildefence.govt.nz/memwebsite.nsf/Files/Information_Series/$file/DeBriefing%20Info%20Book.pdf) (ISBN 0-478-25467-9).

### 13.2 EXERCISE VALIDATION

The final stage of the exercise process is to determine whether or not the exercise has met its objectives. At the country level, a national exercise should compare the performance of the involved agencies during the exercise against the performance expected. After validation, countries and agencies may need to change or develop new plans, procedures, and training programmes. Exercise outcomes may be retested in future tsunami exercises, or new exercises written to meet newly identified needs.

### 13.3 EVALUATION CRITERIA

There will be two types of evaluation criteria. The first type will be international criteria based on the overall exercise objectives (see Section 3, EXERCISE OBJECTIVE). These are provided in ANNEX II. The second type will be criteria to be determined by each individual country to measure its own objectives.

In compiling the Exercise Pacific Wave Summary Report, the Exercise Task Team will only require the international evaluation from each participating country.

### 13.4 EVALUATORS

Countries may appoint Exercise Evaluators to observe and evaluate selected objectives during their exercise. Evaluators should be subject matter experts in the field they are

evaluating, such as in warning centre operations, emergency response, or in specific agency areas of responsibility.

Appointing and assigning evaluators is the responsibility of each participating country.

### 13.5 OBSERVERS

Exercise Pacific Wave 13 may generate interest within the wider sector or local community. Visitors from other agencies (whether local or international) may be invited to observe various exercise activities. Media may also be invited to observe as a way of helping to increase tsunami awareness. Some media may also participate or be simulated, if they are part of the official warning and evacuation dissemination chain.

The invitation of internal or external agency personnel invited to view the exercise is the responsibility of each participating country.

### 13.6 EVALUATION TOOLS

The goal of exercise evaluation is to validate strengths and identify opportunities for improvement within the participating organisations. This is to be accomplished by collating supporting data, analysing the data to compare effectiveness against requirements, and determining what changes need to be made by participating organisations. At the international level, this would involve the ICG/PTWS as the intergovernmental coordinating group supporting effective tsunami warning and decision making.

Evaluation of the exercise should focus on the adequacy of plans, policies, procedures, assessment capabilities, communication, resources and inter-agency/inter-jurisdictional relationships that support effective tsunami warning and decision-making at all levels of government. Participants that choose to include additional objectives, for example by exercising public warning and/or response plans, can expand the evaluation form accordingly. The evaluation of such additional objectives will be for the use of the particular participating agency only, and is not required for the PTWS Exercise Pacific Wave 13 Summary Report.

The evaluation tool aims to inform and facilitate individual participant country evaluations as well as the Exercise Pacific Wave 13 Summary Report.

All participating countries are asked to complete the official PacWave13 Exercise Evaluation Form (ANNEX II) **by 31 May 2013**. Forms should be submitted online by visiting [https://www.surveymonkey.com/s/pacwave13\\_eval](https://www.surveymonkey.com/s/pacwave13_eval).

### 13.7 EXERCISE PACIFIC WAVE 13 SUMMARY REPORT

The Exercise Task Team will compile the Exercise Pacific Wave 13 Summary Report based on the official exercise evaluation forms received. The report will include the following:

- Exercise description.
- Post-exercise evaluation summary and findings.
- Identification of best practices or strengths.
- Identification of areas for improvement.
- Recommendations on plans of action for improvement.

#### **14. REAL EVENTS DURING EXERCISE PLAY**

In the case of a real event occurring during the exercise, PTWC and JMA/NWPTAC will issue their normal message products for the event. Such messages will be given full priority and a decision will be made by each international centre whether to continue or cease their participation in the exercise. Smaller earthquakes that only trigger a Tsunami Information Bulletin will not disrupt the exercise.

Nationally, each country may suspend or terminate the exercise for their own reasons.

#### **15. RESOURCING**

Although participating countries will have advance notice of the exercise and may elect to stand up a special dedicated shift to allow normal core business to continue uninterrupted, it is requested that realistic resource levels be deployed in order to reflect some of the issues that are likely to be faced in a real event.

#### **16. MEDIA ARRANGEMENTS**

The UNESCO Bureau of Public Information will issue an international Media Advisory one week before conduct of the Exercise Pacific Wave 13 providing details of the exercise, and announcing the trial introduction of tsunami forecast products by the PTWC.

ICG/PTWS Member States may optionally consider to issue a press release to their respective country's media. Member States' press releases would inform their country's population on the exercise and new services, and give local media opportunities to conduct interviews with key stakeholder agencies.

### **ANNEX III**

SAMPLE PRESS RELEASE contains a sample press release that can be further customised by Member States. The sample press release is provided in English.

ANNEX I

INTERNATIONAL MASTER SCHEDULE OF EVENTS LISTS

Scenario	Off Northern Japan 38.1N, 142.9E, 20km, Mw=9.0			
Centre	PTWC		JMA/NWPTAC	
Time (UTC)	#	TYP	#	TYP
0:00	Earthquake Rupture Begins			
0:08		PTWC initial Mw=8.4. First tsunami forecast computed.		
0:10	1	Threat Message with M8.4		
0:15				JMA determines Mw=9.0
0:17			1	Advisory with M9.0
0:25		W-phase CMT completes. Mw=9.0. Forecast updated.		
0:35	2	Threat Message with M9.0		
0:45			2	Advisory with M9.0
		Initial deep ocean tsunami readings. Forecast updated.		
1:30	3	Threat Message with M9.0		
1:40			3	Advisory with M9.0
		More deep ocean tsunami readings. Forecast updated.		
2:30	4	Threat Message with M9.0		
2:40			4	Advisory with M9.0
3:30	5	Threat Message with M9.0		
3:40			5	Advisory with M9.0
4:30	6	Threat Message with M9.0		
4:40			6	Advisory with M9.0
5:30	7	Threat Message with M9.0		
5:40			7	Advisory with M9.0
6:30	8	Threat Message with M9.0		
6:40			8	Advisory with M9.0
7:30	9	Threat Message with M9.0		
7:40			9	Advisory with M9.0
8:30	10	Threat Message with M9.0		
8:40			10	Advisory with M9.0
9:30	11	Threat Message with M9.0		
9:40				
10:30	12	Threat Message with M9.0		
10:40				
11:30	13	Threat Message with M9.0		
11:40				
12:30	14	Threat Message with M9.0		
12:40				
13:30	15	Threat Message with M9.0		
13:40				
14:30	16	Threat Message with M9.0		
14:40				
15:30	17	Threat Message with M9.0		
15:40				
16:30	18	Threat Message with M9.0		
16:40				
17:30	19	Threat Message with M9.0		
17:40				
18:30	20	Threat Message with M9.0		
18:40				
19:30	21	Threat Message with M9.0		
19:40				
20:30	22	Threat Message with M9.0		
20:40				
21:30	23	Threat Message with M9.0		
21:40				
22:30	24	Threat Message with M9.0		
22:40				
23:30	25	Final Threat Message		

Scenario	Manila Trench Off Western Philippines 17.0N, 119.0E, 20km, Mw=9.0			
Centre	PTWC		JMA/NWPTAC	
Time (UTC)	#	TYP	#	TYP
0:00	Earthquake Rupture Begins			
0:08		PTWC initial Mw=8.8. First tsunami forecast computed.		
0:10	1	Threat Message with M8.8		
0:17			1	Advisory with M8.8
0:25		W-phase CMT completes. Mw=9.0. Forecast updated.		
0:35	2	Threat Message with M9.0		
0:45			2	Advisory with M9.0
		Initial coastal tsunami readings. Forecast updated.		
1:30	3	Threat Message with M9.0		
1:40			3	Advisory with M9.0
2:30	4	Threat Message with M9.0		
2:40			4	Advisory with M9.0
3:30	5	Threat Message with M9.0		
3:40			5	Advisory with M9.0
4:30	6	Threat Message with M9.0		
4:40			6	Advisory with M9.0
5:30	7	Threat Message with M9.0		
5:40			7	Advisory with M9.0
6:30	8	Threat Message with M9.0		
6:40			8	Advisory with M9.0
7:30	9	Final Threat Message		

Scenario	Off Northern Chile 22.5S, 70.7W, 20km, Mw=9.1	
Centre	PTWC	
Time (UTC)	#	TYP
0:00	Earthquake Rupture Begins	
0:06		PTWC initial Mw=8.6. First tsunami forecast computed.
0:08	1	Threat Message with M8.6
0:25		W-phase CMT completes. Mw=9.1. Forecast updated.
0:35	2	Threat Message with M9.1
		Initial deep ocean tsunami readings. Forecast updated.
1:30	3	Threat Message with M9.1
2:30	4	Threat Message with M9.1
3:30	5	Threat Message with M9.1
4:30	6	Threat Message with M9.1
5:30	7	Threat Message with M9.1
6:30	8	Threat Message with M9.1
7:30	9	Threat Message with M9.1
8:30	10	Threat Message with M9.1
9:30	11	Threat Message with M9.1
10:30	12	Threat Message with M9.1
11:30	13	Threat Message with M9.1
12:30	14	Threat Message with M9.1
13:30	15	Threat Message with M9.1
14:30	16	Threat Message with M9.1
15:30	17	Threat Message with M9.1
16:30	18	Threat Message with M9.1
17:30	19	Threat Message with M9.1
18:30	20	Threat Message with M9.1
19:30	21	Threat Message with M9.1
20:30	22	Threat Message with M9.1
21:30	23	Threat Message with M9.1
22:30	24	Threat Message with M9.1
23:30	25	Final Threat Message



## ANNEX II

### POST-EXERCISE EVALUATION

Exercise evaluation forms are to be completed by each participating agency and forwarded to the country Exercise Pacific Wave 13 National Contact, or the country Tsunami National Contact. **The Pacific Wave 13 National Contact will compile the country Evaluation Form and complete and submit this online no later than 31 May 2013.**

Note: Only one on-line evaluation form is to be completed per country.

The Pacific Wave 13 Evaluation Form can be found at  
[https://www.surveymonkey.com/s/pacwave13\\_eval](https://www.surveymonkey.com/s/pacwave13_eval)

Alternatively, the country evaluation forms can be submitted by email or fax to the Exercise Pacific Wave 13 Task Team Chairs:

- Laura Kong (email: [laura.kong@noaa.gov](mailto:laura.kong@noaa.gov), fax: +1 808 532 5576), or
- Jo Guard (email: [jo.guard@dia.govt.nz](mailto:jo.guard@dia.govt.nz), fax: +64 4 473 9596).

EXERCISE PACIFIC WAVE 13		
Instructions on how to complete this Evaluation Form		
Step	Who completes this step?	Description
1	Each participating Agency/Country	Decide if your agency/country will include additional evaluation questions for each objective. Country/agency evaluation questions can be added at the <b>end</b> of each section. However, do NOT change the reference numbers to the questions.
2	Each participating Agency/Country	Print this form and mark your evaluation answers on it.
3	Each participating Agency/Country	<ul style="list-style-type: none"> <li>• Answer each statement with either Y (Yes) or N (No)</li> <li>• Comments can be used to explain/expand upon your Yes or No answer.</li> <li>• Write your comments on the page following the evaluation questions.</li> <li>• Note the question number in the left column and write your comments alongside.</li> </ul>
4	Each participating Agency/Country	Send completed agency evaluation form to country PacWave13 National Contact so he/she can compile to complete Country PacWave13 Evaluation Form (this URL).
5	PacWave11 National Contact	PacWave13 National Contact should complete and submit the PacWave13 Evaluation Form by <b>31 May 2013</b> ( <a href="https://www.surveymonkey.com/s/pacwave13_eval">https://www.surveymonkey.com/s/pacwave13_eval</a> ). If there are problems or questions, please contact the PacWave13 Task Team co-Chairs (Laura Kong, <a href="mailto:laura.kong@noaa.gov">laura.kong@noaa.gov</a> ; Jo Guard, <a href="mailto:jo.guard@dia.govt.nz">jo.guard@dia.govt.nz</a> )

**EXERCISE PACIFIC WAVE 2013  
EVALUATION FORM**

CONTACT DETAILS

- Country
- Agency:
- Contact Name:
- Contact Position
- Contact Phone:
- Contact Mobile:
- Contact E-mail:

COUNTRY EXERCISE SCENARIO

Select Scenario Used:

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

**OBJECTIVE 1**

Evaluate the format and content of PTWC Enhanced Products for each scenario exercised.

- 1.1 Are the following products useful in helping you assess your national tsunami threat? Indicate Y or N, and provide comments as needed. If your answer is N, please comment on why it is not useful.

- ☐ Y    ☐ N    Text Message
- ☐ Y    ☐ N    Forecast Polygon Map
- ☐ Y    ☐ N    Forecast Polygon Table
- ☐ Y    ☐ N    Energy Forecast Map
- ☐ Y    ☐ N    Coastal Forecast Map
- ☐ Y    ☐ N    Coastal KMZ file

Comments:

- 1.2 Please rank the products in order of their usefulness from 1 to 6, where 1 is the most useful product and 6 is the least useful product?

- ☐ Text Message
- ☐ Forecast Polygon Map
- ☐ Forecast Polygon Table
- ☐ Energy Forecast Map
- ☐ Coastal Forecast Map
- ☐ Coastal KMZ file

Comments:

- 1.3 Format and Content: Is your country satisfied with the format and content of PTWC Enhanced Products?

Indicate Y or N, and provide comments as needed. If your answer is N, please provide comments on what improvements are needed.

☐ Y    ☐ N    Text Message  
☐ Y    ☐ N    Forecast Polygon Map  
☐ Y    ☐ N    Forecast Polygon Table  
☐ Y    ☐ N    Energy Forecast Map  
☐ Y    ☐ N    Coastal Forecast Map  
☐ Y    ☐ N    Coastal KMZ file

Comments:

- 1.4 Format: The Forecast Polygon Map is intended to provide a very quick and general view of where a tsunami threat is forecast and the level of that threat. Is this map useful for that purpose? Indicate Yes or No, and provide comments as needed.

☐ Y    ☐ N

Comments:

- 1.5 Content: Are the proposed Forecast Polygons and their names appropriate and useful for your country or area of responsibility? Indicate Y or N. If N, please suggest alternatives that would be better.

☐ Y    ☐ N

Comments:

- 1.6 Content: Are there other information or products that should be included in the suite of Enhanced Products? Consider earthquake and tsunami information, and/or threat assessment products. Please provide comments as needed.

☐ Y    ☐ N

Comments:

- 1.7 Public Release: Which of the enhanced products (or suggest other products) could be made public during events by PTWC and/or be redistributed by the NTWCs? The media and public will seek information about the threat during events and that information can help save lives. Whatever is made public, however, needs to be easily understood and not conflict with information from local authorities. Indicate Y or N. Please also provide your comments and suggestions.

☐ Y    ☐ N    Text Message  
☐ Y    ☐ N    Forecast Polygon Map  
☐ Y    ☐ N    Forecast Polygon Table  
☐ Y    ☐ N    Energy Forecast Map

- ☐ Y    ☐ N    Coastal Forecast Map  
☐ Y    ☐ N    Coastal KMZ file  
☐ Y    ☐ N    Other. Please suggest other products.

Comments:

- 1.8    Staging: Should a forecast be included in the initial first product, knowing that earthquake magnitudes and tsunami forecasts are likely to change over the first hour as later-arriving seismic data and sea level data are received and analysed?

☐ Y    ☐ N

Comments:

- 1.9    Do any features, other than listed above, need to be changed?

If Yes, please comment.

☐ Y    ☐ N

Comments:

- 1.10    Do any new features, other than listed above, need to be added?

If Yes, please comment.

☐ Y    ☐ N

Comments:

## OBJECTIVE 2

Provide feedback that your country is prepared to officially utilize the PTWC Enhanced Products.

- 2.1    Does your National Tsunami Warning Centre (NTWC) understand the contents of the Enhanced Products, how to use the Products, and the limitations of the Products?  
Indicate Y or N.

☐ Y    ☐ N

Comments:

- 2.2    Does your National Disaster Management Office (NDMO) understand the contents of the Enhanced Products, how to use the Products, and the limitations of the Products?  
Indicate Y or N.

☐ Y    ☐ N

Comments:

**2.3** Will your country's NTWC and NDMO be prepared to utilize the PTWC Enhanced Products in 2014? Your NTWC should be prepared to issue appropriate national alerts (e.g., Warning/Watch/Cancellations) based on the PTWC Enhanced Products. Indicate Y or N, and provide comments as needed on country status.

☐ Y ☐ N Currently ready.

☐ Y ☐ N Will be ready in 2014.

☐ Y ☐ N Need to develop new or revise existing SOPs.

☐ Y ☐ N Need to inform and prepare other key stakeholders

☐ Y ☐ N Need NTWC or NDMO to conduct training for their national and local stakeholders

☐ Y ☐ N Need international experts to conduct more training for national stakeholders

☐ Y ☐ N Will not be ready in 2014

Comments:

OBJECTIVE 3
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Provide feedback that your country's stakeholders (national/provincial/local government agencies) will be informed of the PTWC Enhanced Products to enable appropriate changes to their Tsunami Emergency Response Plans.

**3.1** Do your country's stakeholder agencies understand that current PTWC international Watch/Warning products will be discontinued when the enhanced products are officially started, probably in early 2014? Member States will decide on the changeover date at the 25<sup>th</sup> Session of the ICG/PTWS (September, 2013, Vladivostok, Russia). Indicate Y or N, and provide comments as needed.

☐ Y ☐ N

Comments:

**3.2** Do your country's stakeholder agencies understand that their National Tsunami Warning Centre, not PTWC, will be responsible for issuing national alerts (e.g., Watches/Warnings/Cancellations)? Indicate Y or N, and provide comments as needed.

☐ Y ☐ N

Comments:

- 3.3** Will your country's stakeholders be prepared for the official changeover to the PTWC Enhanced Products, probably in early 2014? Indicate Y or N, and provide comments as needed, including list of applicable agencies needing SOPs and/or training.

☐ Y    ☐ N    Currently ready.  
☐ Y    ☐ N    Will be ready in 2014.  
☐ Y    ☐ N    Need to develop new or revise existing SOPs.  
☐ Y    ☐ N    Need NTWC or NDMO to conduct more training.  
☐ Y    ☐ N    Will not be ready in 2014.

Comments:

- 3.4** Are you considering how to prepare your country's **stakeholder agencies** for the PTWC Enhanced Products changeover? Indicate Y or N, and provide comments as needed.

☐ Y    ☐ N    Orientation Workshop, Table Top, or other Exercise.  
☐ Y    ☐ N    Development and distribution of outreach materials.  
☐ Y    ☐ N    Training.  
☐ Y    ☐ N    Awareness Campaign.  
☐ Y    ☐ N    Other. Please list any other preparations.

Comments:

- 3.5** Are you considering how to prepare your country's **media organizations** for the PTWC Enhanced Products changeover? Indicate Y or N, and provide comments as needed.

☐ Y    ☐ N    Orientation Workshop, Table Top, or other Exercise.  
☐ Y    ☐ N    Development and distribution of outreach materials.  
☐ Y    ☐ N    Training.  
☐ Y    ☐ N    Awareness Campaign.  
☐ Y    ☐ N    Other. Please list any other preparations.

Comments:

- 3.6** Are you considering how to prepare your country's **general public** for the PTWC Enhanced Products changeover? Indicate Y or N, and provide comments as needed.

☐ Y    ☐ N    Orientation Workshop, Table Top, or other Exercise.  
☐ Y    ☐ N    Development and distribution of outreach materials.  
☐ Y    ☐ N    Training.  
☐ Y    ☐ N    Awareness Campaign.  
☐ Y    ☐ N    Other. Please list any other preparations.

Comments:

GENERAL EXERCISE OBSERVATIONS
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OVERALL ASSESSMENT. Please provide comments as needed.

☐ Y ☐ N Country stakeholder agencies have a better understanding of the goals, responsibilities and roles in tsunami emergencies.

☐ Y ☐ N Gaps in capability and capacity have been identified.

Comments:

EXERCISE PLANNING. Please provide comments as needed.

☐ Y ☐ N Overall, the exercise planning, conduct, format and style were satisfactory.

☐ Y ☐ N Exercise planning went well.

☐ Y ☐ N The PacWave 13 exercise website pages were useful.

☐ Y ☐ N This evaluation form was easy to use.

☐ Y ☐ N PacWave13 Exercise Manual provided an appropriate level of detail.

☐ Y ☐ N IOC Manual & Guides 58: How to Plan, Conduct, and Evaluate IOC Tsunami Wave Exercises was useful.

Comments:

EXERCISE PACIFIC WAVE 13 EXPERIENCE

Please provide general statements on your Exercise Pacific Wave 13 experience.

- EXERCISE PLANNING

Please provide a general statement about what went well.

Please provide a general statement about what did not go well.

Please provide a general statement about what could be improved.

- EXERCISE CONDUCT

Please provide a general statement about what went well.

Please provide a general statement about what did not go well.

Please provide a general statement about what could be improved.

- EXERCISE DEBRIEF OR EVALUATION

Please provide a general statement about what went well.

Please provide a general statement about what did not go well.

Please provide a general statement about what could be improved.



ANNEX III

**SAMPLE PRESS RELEASE**

TEMPLATE FOR NEWS RELEASE

USE AGENCY MASTHEAD

Contact: (insert name)  
(insert phone number)  
(insert email address)

**FOR IMMEDIATE RELEASE**  
(insert date)

**FOURTH PACIFIC-WIDE TSUNAMI DRILL SET FOR MAY 2013**

(Insert country name) will join over 40 other countries around the Pacific Rim as a participant in a mock tsunami scenario during 1-14 May 2013. The purpose of this Pacific-wide exercise is to evaluate and provide feedback on the content of proposed new enhanced forecast products provided by the U.S. Pacific Tsunami Warning Center (PTWC) to Pacific countries. The enhanced products will include tsunami wave forecasts and increase preparedness and response capabilities in each country.

"The recent events of the 2009 Samoa Islands, 2010 Chile, 2011 Japan, and the February 2013 Solomon Islands tsunamis have increased our need to be more prepared for such events," said (insert name of appropriate official). "This important exercise will validate the enhanced products for future official use by countries of the Pacific Tsunami Warning and Mitigation System.

The exercise, titled Exercise Pacific Wave 13 (PacWave13), will simulate Pacific countries being put into a Tsunami Warning situation requiring government decision-making. It is the fourth such exercise with the first having been carried out in May 2006, the second in October 2008, and the third in November 2011. Participating countries will select from 3 different Pacific scenarios and conduct a Tabletop Exercise within *(insert date, or use 'the first two weeks of May')*. Destructive Pacific-wide tsunamis will be simulated through international bulletins from PTWC and Japan's Northwest Pacific Tsunami Advisory Centre and reviewed by focal points designated by each country that are responsible for their country's tsunami response.

*Insert paragraph tailored for specific country. Could identify participating agencies and specific plans. Could describe current early warning program, past evacuation drills (if any), ongoing mitigation and public education programs, etc. Could describe tsunami threat, history of tsunami hazards, if any.*

The exercise is sponsored by UNESCO's Intergovernmental Oceanographic Commission through its Intergovernmental Coordination Group of the Pacific Tsunami Warning and Mitigation System (ICG/PTWS)

###

**On the Web:**

Exercise Pacific Wave 13 information site:

<http://www.pacwave.info>

Media Resources:

[http://itic.ioc-unesco.org/index.php?option=com\\_content&view=category&layout=blog&id=1150&Itemid=1150&lang=en](http://itic.ioc-unesco.org/index.php?option=com_content&view=category&layout=blog&id=1150&Itemid=1150&lang=en)

Pacific Tsunami Warning and Mitigation System:

[http://www.ioc-tsunami.org/index.php?option=com\\_content&view=article&id=11&Itemid=12&lang=en](http://www.ioc-tsunami.org/index.php?option=com_content&view=article&id=11&Itemid=12&lang=en)

Pacific Tsunami Warning Center:

<http://ptwc.weather.gov>

Northwest Pacific Tsunami Advisory Centre:

[http://www.jma.go.jp/en/distant\\_tsunami/WEPA40/index.html](http://www.jma.go.jp/en/distant_tsunami/WEPA40/index.html)

West Coast / Alaska Tsunami Warning Center:

<http://wcatwc.arh.noaa.gov/>

[Insert country URLs]

## ANNEX IV

### LIST OF ACRONYMS

<b>CDEM</b>	Civil Defence and Emergency Management (Australia)
<b>DISCEX</b>	Discussion Exercise' or Tabletop Exercise
<b>ICG/ITSU</b>	International Coordination Group for the Tsunami Warning System in the Pacific (re-established as ICG/PTWS in 2005)
<b>ICG/PTWS</b>	Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (formerly ITSU)
<b>IOC</b>	Intergovernmental Oceanographic Commission (of UNESCO)
<b>ITIC</b>	International Tsunami Information Center (UNESCO/IOC–NOAA)
<b>JMA</b>	Japan Meteorological Agency
<b>MSEL</b>	Master Schedule of Events List
<b>NDMO</b>	National Disaster Management Office
<b>NOAA</b>	National Oceanic and Atmospheric Administration of United States of America
<b>NTWC</b>	National Tsunami Warning Centre
<b>NWPTA</b>	Northwest Pacific Tsunami Advisory
<b>NWPTAC</b>	Northwest Pacific Tsunami Advisory Center (Japan)
<b>PTWC</b>	Pacific Tsunami Warning Center (USA)
<b>PTWS</b>	Pacific Tsunami Warning and Mitigation System
<b>PTWS-SC</b>	Pacific Tsunami Warning and Mitigation System Steering Committee
<b>SOP</b>	Standard Operating Procedures
<b>TNC</b>	Tsunami National Contact
<b>TT</b>	Task Team
<b>TWFP</b>	Tsunami Warning Focal Point
<b>UNESCO</b>	United Nations Educational, Scientific and Cultural Organization
<b>WCATWC</b>	West Coast and Alaska Tsunami Warning Center (USA)
<b>WG</b>	Working Group

# IOC Technical Series

No.	Title	Languages
1	Manual on International Oceanographic Data Exchange. 1965	(out of stock)
2	Intergovernmental Oceanographic Commission (Five years of work). 1966	(out of stock)
3	Radio Communication Requirements of Oceanography. 1967	(out of stock)
4	Manual on International Oceanographic Data Exchange - Second revised edition. 1967	(out of stock)
5	Legal Problems Associated with Ocean Data Acquisition Systems (ODAS). 1969	(out of stock)
6	Perspectives in Oceanography, 1968	(out of stock)
7	Comprehensive Outline of the Scope of the Long-term and Expanded Programme of Oceanic Exploration and Research. 1970	(out of stock)
8	IGOSS (Integrated Global Ocean Station System) - General Plan Implementation Programme for Phase I. 1971	(out of stock)
9	Manual on International Oceanographic Data Exchange - Third Revised Edition. 1973	(out of stock)
10	Bruun Memorial Lectures, 1971	E, F, S, R
11	Bruun Memorial Lectures, 1973	(out of stock)
12	Oceanographic Products and Methods of Analysis and Prediction. 1977	E only
13	International Decade of Ocean Exploration (IDOE), 1971-1980. 1974	(out of stock)
14	A Comprehensive Plan for the Global Investigation of Pollution in the Marine Environment and Baseline Study Guidelines. 1976	E, F, S, R
15	Bruun Memorial Lectures, 1975 - Co-operative Study of the Kuroshio and Adjacent Regions. 1976	(out of stock)
16	Integrated Ocean Global Station System (IGOSS) General Plan and Implementation Programme 1977-1982. 1977	E, F, S, R
17	Oceanographic Components of the Global Atmospheric Research Programme (GARP) . 1977	(out of stock)
18	Global Ocean Pollution: An Overview. 1977	(out of stock)
19	Bruun Memorial Lectures - The Importance and Application of Satellite and Remotely Sensed Data to Oceanography. 1977	(out of stock)
20	A Focus for Ocean Research: The Intergovernmental Oceanographic Commission - History, Functions, Achievements. 1979	(out of stock)
21	Bruun Memorial Lectures, 1979: Marine Environment and Ocean Resources. 1986	E, F, S, R
22	Scientific Report of the Intercalibration Exercise of the IOC-WMO-UNEP Pilot Project on Monitoring Background Levels of Selected Pollutants in Open Ocean Waters. 1982	(out of stock)
23	Operational Sea-Level Stations. 1983	E, F, S, R
24	Time-Series of Ocean Measurements. Vol.1. 1983	E, F, S, R
25	A Framework for the Implementation of the Comprehensive Plan for the Global Investigation of Pollution in the Marine Environment. 1984	(out of stock)
26	The Determination of Polychlorinated Biphenyls in Open-ocean Waters. 1984	E only
27	Ocean Observing System Development Programme. 1984	E, F, S, R
28	Bruun Memorial Lectures, 1982: Ocean Science for the Year 2000. 1984	E, F, S, R
29	Catalogue of Tide Gauges in the Pacific. 1985	E only
30	Time-Series of Ocean Measurements. Vol. 2. 1984	E only
31	Time-Series of Ocean Measurements. Vol. 3. 1986	E only
32	Summary of Radiometric Ages from the Pacific. 1987	E only
33	Time-Series of Ocean Measurements. Vol. 4. 1988	E only

(continued)

No.	Title	Languages
34	Bruun Memorial Lectures, 1987: Recent Advances in Selected Areas of Ocean Sciences in the Regions of the Caribbean, Indian Ocean and the Western Pacific. 1988	Composite E, F, S
35	Global Sea-Level Observing System (GLOSS) Implementation Plan. 1990	E only
36	Bruun Memorial Lectures 1989: Impact of New Technology on Marine Scientific Research. 1991	Composite E, F, S
37	Tsunami Glossary - A Glossary of Terms and Acronyms Used in the Tsunami Literature. 1991	E only
38	The Oceans and Climate: A Guide to Present Needs. 1991	E only
39	Bruun Memorial Lectures, 1991: Modelling and Prediction in Marine Science. 1992	E only
40	Oceanic Interdecadal Climate Variability. 1992	E only
41	Marine Debris: Solid Waste Management Action for the Wider Caribbean. 1994	E only
42	Calculation of New Depth Equations for Expendable Bathymetographs Using a Temperature-Error-Free Method (Application to Sippican/TSK T-7, T-6 and T-4 XBTS. 1994	E only
43	IGOSS Plan and Implementation Programme 1996-2003. 1996	E, F, S, R
44	Design and Implementation of some Harmful Algal Monitoring Systems. 1996	E only
45	Use of Standards and Reference Materials in the Measurement of Chlorinated Hydrocarbon Residues. 1996	E only
46	Equatorial Segment of the Mid-Atlantic Ridge. 1996	E only
47	Peace in the Oceans: Ocean Governance and the Agenda for Peace; the Proceedings of <i>Pacem in Maribus</i> XXIII, Costa Rica, 1995. 1997	E only
48	Neotectonics and fluid flow through seafloor sediments in the Eastern Mediterranean and Black Seas - Parts I and II. 1997	E only
49	Global Temperature Salinity Profile Programme: Overview and Future. 1998	E only
50	Global Sea-Level Observing System (GLOSS) Implementation Plan-1997. 1997	E only
51	L'état actuel de l'exploitation des pêcheries maritimes au Cameroun et leur gestion intégrée dans la sous-région du Golfe de Guinée ( <i>cancelled</i> )	F only
52	Cold water carbonate mounds and sediment transport on the Northeast Atlantic Margin. 1998	E only
53	The Baltic Floating University: Training Through Research in the Baltic, Barents and White Seas - 1997. 1998	E only
54	Geological Processes on the Northeast Atlantic Margin (8 <sup>th</sup> training-through-research cruise, June-August 1998). 1999	E only
55	Bruun Memorial Lectures, 1999: Ocean Predictability. 2000	E only
56	Multidisciplinary Study of Geological Processes on the North East Atlantic and Western Mediterranean Margins (9 <sup>th</sup> training-through-research cruise, June-July 1999). 2000	E only
57	Ad hoc Benthic Indicator Group - Results of Initial Planning Meeting, Paris, France, 6-9 December 1999. 2000	E only
58	Bruun Memorial Lectures, 2001: Operational Oceanography – a perspective from the private sector. 2001	E only
59	Monitoring and Management Strategies for Harmful Algal Blooms in Coastal Waters. 2001	E only
60	Interdisciplinary Approaches to Geoscience on the North East Atlantic Margin and Mid-Atlantic Ridge (10 <sup>th</sup> training-through-research cruise, July-August 2000). 2001	E only
61	Forecasting Ocean Science? Pros and Cons, Potsdam Lecture, 1999. 2002	E only

No.	Title	Languages
62	Geological Processes in the Mediterranean and Black Seas and North East Atlantic (11 <sup>th</sup> training-through-research cruise, July- September 2001). 2002	E only
63	Improved Global Bathymetry – Final Report of SCOR Working Group 107. 2002	E only
64	R. Revelle Memorial Lecture, 2006: Global Sea Levels, Past, Present and Future. 2007	E only
65	Bruun Memorial Lectures, 2003: Gas Hydrates – a potential source of energy from the oceans. 2003	E only
66	Bruun Memorial Lectures, 2003: Energy from the Sea: the potential and realities of Ocean Thermal Energy Conversion (OTEC). 2003	E only
67	Interdisciplinary Geoscience Research on the North East Atlantic Margin, Mediterranean Sea and Mid-Atlantic Ridge (12 <sup>th</sup> training-through-research cruise, June-August 2002). 2003	E only
68	Interdisciplinary Studies of North Atlantic and Labrador Sea Margin Architecture and Sedimentary Processes (13 <sup>th</sup> training-through-research cruise, July-September 2003). 2004	E only
69	Biodiversity and Distribution of the Megafauna / Biodiversité et distribution de la mégafaune. 2006 Vol.1 The polymetallic nodule ecosystem of the Eastern Equatorial Pacific Ocean / Ecosystème de nodules polymétalliques de l’océan Pacifique Est équatorial Vol.2 Annotated photographic Atlas of the echinoderms of the Clarion-Clipperton fracture zone / Atlas photographique annoté des échinodermes de la zone de fractures de Clarion et de Clipperton Vol.3 Options for the management and conservation of the biodiversity — The nodule ecosystem in the Clarion Clipperton fracture zone: scientific, legal and institutional aspects	E F
70	Interdisciplinary geoscience studies of the Gulf of Cadiz and Western Mediterranean Basin (14 <sup>th</sup> training-through-research cruise, July-September 2004). 2006	E only
71	Indian Ocean Tsunami Warning and Mitigation System, IOTWS. Implementation Plan, 7–9 April 2009 (2 <sup>nd</sup> Revision). 2009	E only
72	Deep-water Cold Seeps, Sedimentary Environments and Ecosystems of the Black and Tyrrhenian Seas and the Gulf of Cadiz (15 <sup>th</sup> training-through-research cruise, June–August 2005). 2007	E only
73	Implementation Plan for the Tsunami Early Warning and Mitigation System in the North-Eastern Atlantic, the Mediterranean and Connected Seas (NEAMTWS), 2007–2011. 2007 ( <i>electronic only</i> )	E only
74	Bruun Memorial Lectures, 2005: The Ecology and Oceanography of Harmful Algal Blooms – Multidisciplinary approaches to research and management. 2007	E only
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