

Intergovernmental Oceanographic Commission
Reports of Meetings of Experts and Equivalent Bodies



**Regional Working Group
on Tsunami Warning
and Mitigation System
for the South China Sea Region
(SCS-WG)**

Fifth Meeting
Manila, Philippines
2–3 March 2016

UNESCO

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1. WELCOME AND OPENING

Mr Renato Solidum, Director of the [Philippine Institute of Volcanology and Seismology PHIVOLCS](#) delivered the welcome speech on behalf of the Government of Philippines. He recalled that Philippines is a country that is exposed to several natural hazards. He indicated that PHIVOLCS is happy to host the 5th meeting of the Pacific Tsunami Warning and Mitigation System (PTWS) South China Sea Region Working Group (SCS-WG), and emphasized the importance of monitoring real time data from regional and global seismic networks in order to detect and rapidly locate, size, and characterize the source of tsunami, forecast coastal impacts and assess potential hazards. He officially opened the meeting.

Mr Bernardo Aliaga, Technical Secretary of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS) of the Intergovernmental Oceanographic Commission (IOC) of the United Nations Educational, Scientific and Cultural Organization (UNESCO), recalled that this Working Group will report to the 28th session of the ICG/PTWS in 2017, on one of its key expected outcomes, which is the establishment of a South China Sea Tsunami Advisory Center (SCSTAC).

The Chair of the SCS-WG, and Senior Scientific Officer of the Hong Kong Observatory (HKO), Mr Hing-Yim Mok (China), welcomed all participants to the meeting and thanked PHIVOLCS for hosting the meeting in its premises, in Manila, Philippines. He indicated that Member States have been contributing more and more sea level and seismic stations. He called Member States to continue its efforts, for the sake of the lives of people living in the South China Sea region.

2. ORGANIZATION OF THE SESSION

2.1 ADOPTION OF AGENDA

Chair H Y Mok recalled that the meeting has representatives from China, Indonesia, Philippines, Thailand and Vietnam as well as invited representatives from Japan (NWPTAC) and SACI. The provisional agenda, circulated prior to the meeting, was adopted without any comments, and is included under ANNEX I.

2.2 DESIGNATION OF RAPPORTEUR

The Delegation of Philippines volunteered Mr Ishmael Narag to serve as rapporteur. This recommendation was accepted by the Group.

2.3 CONDUCT OF THE SESSION, TIMETABLE AND DOCUMENTATION

Mr Mok provided an overview of the schedule of all agenda items as indicated in the provisional timetable. The Chair suggested an intra-session meeting of members of the Task Team on the establishment of the South China Sea Tsunami Advisory Center (SCSTAC) at the end of the first day of the meeting. The timetable was adopted with the suggestion indicated by Chair Mr Mok. The Chair indicated some of the documents pertinent to the meeting were available at the [ICG/PTWS-WG SCS/V](#) meeting website, and some of them were printed in advance for all Delegates.

3. REVIEW OF DECISIONS, RECOMMENDATIONS AND ACTIONS ARISING FROM ICG/PTWS-WG-SCS-IV MEETING

[Proposal of organizing a Technical/Experts meeting on Earthquake and Tsunami Hazard in the South China Sea](#)

The Secretariat reported that a [Scientific meeting of experts for coordinated scenario analysis of future tsunami events and hazard mitigation schemes for the South China sea region](#), was held in Xiamen, China, 16-18 November 2015. The report of that meeting was discussed under agenda item 5 below.

Establishment of a network of seismic and sea level operators, with contact points identified by each of the Member States

The Secretariat reported that a network of operators had not yet been fully completed and suggested each Member State to nominate an administrative and technical contact for seismic and for sea level data as soon as possible.

Progress on the establishment and work plan of the Task Team on the Establishment of a South China Sea Tsunami Advisory Center (SCSTAC)

Mr Yuan (China), Chair of the SCSTAC Task Team reported that the Task Team continued its work and prepared a report for this meeting with updated information on the South China Sea tsunami advisory products.

The Secretariat reported that PTWC nominated Dailin Wang (USA) to the SCSTAC Task Team, and Cambodia and Singapore had not nominated members. He recalled that the nomination of members to the Task Team could be done in plenary or through email from Tsunami National Contacts (TNCs).

4. REPORTS

4.1 NATIONAL PROGRESS REPORTS

4.1.1 China

Dr Jingming Ho, scientist at the [National Marine Environmental Forecasting Center \(NMEFC\)](#) of the [State Oceanic Administration \(SOA\)](#), reported that NMEFC is responsible, in China, for operating the tsunami warning and mitigation system.

NMEFC operates 24 hours a day, 7 days a week, and identifies and characterizes events that may generate tsunamis. NMEFC receives seismic data from the Global Seismic Network (GSN) and IRIS and adopted SeisComp3 and Antelope to detect earthquakes in the global and regional field. 25 coastal seismic stations were installed by SOA to detect earthquakes that may trigger local and regional tsunamis. Besides, earthquake information is made available to NMEFC from the [China Earthquake Administration \(CEA\)](#), the Pacific Tsunami Warning Center (PTWC) and the North West Pacific Tsunami Advisory Center (NWPTAC).

In 2015, China changed the tsunami warning levels from 4 categories to 3 in the tsunami emergency response plan. The new on-duty facilities for tsunami warning were put into operation. The new facilities also could provide accommodation for the SCSTAC in the near future. NMEFC/SOA started using a new Decision Support System (DSS) to further enhance tsunami warning efficiency. The tsunami scenario database extends to the North West Pacific with total potential scenarios reaching up to 70,000 cases. Beside, real-time tsunami modelling tools covering the Pacific, North West Pacific and the South China Sea region are developed based on fast CMT solution.

On earthquake monitoring, NMEFC/SOA has set up Earthquake Early Warning System and Focal mechanism inversion system by working with China Earthquake Administration

(CEA). 25 seismic stations of NMEFC/SOA have merged into the global network to enhance regional monitoring capability.

As to tsunami services, NMEFC/SOA has developed a tsunami risk assessment approach, which was used in tsunami risk assessment projects of Zhejiang province, China.

Dr Jingming Hou further reported that on 11 February 2015, a delegation from China attended the [4rd Regional Working Group Meeting of the SCS Tsunami Warning and Mitigation System](#) that was hosted by the [Indonesian Agency for Meteorological, Climatological and Geophysics \(BMKG\)](#). The delegation of China also visited BMKG office to enhance the bi-lateral cooperation between the two agencies. A Scientific meeting of experts for coordinated scenario analysis of future tsunami events and hazard mitigation schemes for the South China Sea region was locally hosted by NMEFC on 16-18 November 2015 in Xiamen, China.

Dr Solidum from PHIVOLCS inquired about the concept of vulnerability that China is using to address tsunami vulnerability in the framework of tsunami risk assessment.

Dr Yuan responded that vulnerability at inundation area is evaluated by land-use types, with residential communities, infrastructures et al. giving higher scores due to their susceptibility to inundation processes. Dr Ngyuen Hong Phuong Deputy Director of the [Institute of Geophysics \(IGP\)](#) of Vietnam inquired about the use of seismic stations from CEA and the possibility of NMEFC to deal with earthquake solutions. Dr Yuan responded that NMEFC is working together with the Chinese Earthquake Administration (CEA). The CEA headquarter has approved the sharing of data stream of 54 CEA National Seismic Stations with NMEFC, and implementation should be accomplished by 2016.

Ms Handayani from BMKG asked how many scenarios have been developed and if there is an annual target to develop scenarios. Dr Yuan reported that NMEFC follows the JMA's methodology to develop scenarios, with focal mechanism determined by [Global Earthquake Model \(GEM\)](#) with now around 60,000 scenarios completed. He commented that the number is not necessary informing the quality of the scenarios.

Mr Bart Bautista from PHIVOLCS asked about the difference in terms of resolution between the scenario database and the real time modelling. Dr Yuan indicated that the question is very relevant. The real time simulation follows the methodology developed for PTWC by NOAA [Pacific Marine Environmental Laboratory \(PMEL\)](#). The merit of it is the fast results obtained with acceptable accuracy. There are very big differences in terms of resolution between the scenario database and the real time modelling because in real time the CMT solution is calculated and is then much more accurate, while the database scenarios provide only an approximate solution.

Mr Rattanakhongviput from the National Tsunami Warning Center of Thailand inquired about the tsunami buoy. Is the data of the existing tsunami buoy shared with other countries? Dr Yuan indicated that the data of the buoy was made available through the Global Telecommunications System (GTS) following the 2nd meeting of the SCS-WG but it has been vandalised several times therefore the data is unstable and is currently not sent through GTS.

Mr Nagata from the [Japan Meteorological Agency \(JMA\)](#) reported that they do share seismic data for national purposes, with existing national boundaries, and it includes near shore earthquakes as well.

Mr Solidum from PHIVOLCS commented that there are disputed boundaries in the South China Sea region. In this regard, it would be better to focus on the technical level and avoid the use of maps and documents that can lead to disputes in the Working Group. He

stated that this is a lasting comment, which applies to maps used in the past, as well as to those that will be used in the future. Dr Nguyen from IGP supported the idea of avoiding including national boundaries in official documents of the working group.

Chair Mr. Mok agreed that documents should not lead to disputes and that the Working Group documents should be restricted to technical level aspects.

4.1.2 Indonesia

Mr Riyadi, from the [Indonesia Tsunami Early Warning System \(InaTEWS\)](#) of BMKG, reported on the current status of InaTEWS.

There are currently 164 broadband stations and 137 sea level stations. 2 DART buoys were available, both in the Indian Ocean, but due to vandalism they are no longer reporting. He reported that in 2016 Indonesia will be installing 5 seismic networks in the northern part of Indonesia that are of interest to the South China Sea region.

Mr Riyadi provided details on the multi-mode dissemination system that includes 5000 SMS users and in the future Cell Broadcasting Services (CBS).

He also recalled the International Tsunami Service Provider (TSP) role of InaTEWS, in the framework of the Indian Ocean Tsunami Warning and Mitigation System (IOTWMS). In this same framework he reported that Indonesia participated of the IOTWMS regional exercise and in the PTWS PacWave 15 exercise.

Dr Solidum asked if Indonesia intends to extend its service to the South China Sea region, only for national concern or also internationally Dr Riyadi indicated that also internationally but not as a TSP, but for data sharing.

Dr Nguyen inquired how the IOTWMS handles the system of three TSPs., for example how Indonesia handles the reception of messages from other TSPs. Mr Riyadi indicated that the TSPs do provide notifications and the TSPs do not conflict between them.

Dr Solidum further inquired what is the rule of precedence of messages in Indonesia with respect to TSPs. Mr Riyadi responded that in case of earthquakes in Indonesia the protocol is to follow InaTEWS own services. In the case of earthquakes generated in other countries or zones, for example in Makran, then Indonesia follow the guidance provided by the TSP India. Dr Solidum suggested that Indonesia and Philippines do share parameters of scenarios in the area of Celebes and Sulu seas.

Dr Solidum inquired about the ranges of warning categories defined in InaTEWS. Dr Riyadi indicated that InaTEWS issues warnings for three categories: less than 0.5 m, 0.5 to 3 m and then larger than 3 m.

4.1.3 Philippines

Mr Ishmael Narag, Supervising Science Research Specialist at PHIVOLCS reported on the National Tsunami Programme, that includes 82 seismic stations providing increased capacity of detection and more precise estimates of magnitude for earthquake events in Philippines.

He described the monitoring and observing system available for tsunami warning in Philippines and thresholds to trigger national tsunami warnings. With respect to sea level stations, Mr Narag reported that they were often very close to the source and far from the population. PHIVOLCS does use tsunami Decision Support Systems (DSS) and specific

software to generate hazard assessment evaluations and graphics for emergency management.

4.1.4 Thailand

Mr Chaiwat Rattanakhongviput from the THAI National Disaster Warning Center (THAI NDWC), showed THAI NDWC's response system for multi-hazards such as landslide, flash-flood, forest fire, heavy rain and tsunami. The concept of THAI NDWC's operation is to collect the data from domestic and international agencies and then do the decision making, using systems like Tsunami Simulation and calculating the Tsunami Travel Time-TTT, and then issue the information bulletin about the impact of natural disasters to those who are responsible for disaster management, and also to the affected communities. THAI NDWC already has Standard Operating procedures (SOP) for tsunami warning. Many methods for dissemination have been used, for example: SMS, Fax, TV Pool, email and also siren towers. THAI NDWC currently has installed more than 300 towers in the risk area, 654 small towers, 180 warning box sets and 287 radio relay stations for the provincial Governor houses, provincial disaster prevention and mitigation offices and for the village leaders. Thailand also monitors the sea level through tidal gauges on both the Indian Ocean and the Pacific Ocean and it has 3 Tsunami buoys in the Indian Ocean. From those buoys, one was donated by United States of America, a STB DART II and the others two were bought by THAI NDWC. In August 2014, the STB' surface buoy drift out of the installation area and finally disappeared. THAI NDWC has to redeploy a new one finished in Jan 2014. THAI NDWC also does capacity building for people who live in the tsunami prone area. For the future THAI NDWC plans to do the maintenance of the STB buoy, replace THAI NDWC' buoys with a new one, ETD, and install a few more warning towers in 2016.

Dr Solidum inquired how systems can be sustained over long periods of time. Rear Admiral Song, Acting Director of the Warning and Dissemination section of THAI NDWC responded that in one hand the system in THAI NDWC is a multi-hazard early warning center, which facilitates long term support, and in the other hand Thailand continues to cooperate with agencies and technical agencies that provide technical support and maintenance services. Mr Riyadi inquired about the price of the siren towers. Mr Song responded that the price is around USD 26,000 for each unit, and that they are remotely activated through satellite signals.

4.1.5 Vietnam

Dr Nguyen Hong Phuong, Deputy Director of the [Institute of Geophysics \(IGP\)](#) of Vietnam, noted that since 1958 the IGP within the Vietnam Academy of Science and Technology ([VAST](#)) had become the institution responsible for earthquake monitoring in Vietnam. He explained that at present, the IGP is operating a national seismic network, which consists of 25 seismic stations and many local networks throughout the country.

Dr Nguyen reported that after the catastrophic 2004 Indian Ocean tsunami, an Earthquake Information and Tsunami Warning Centre (EITWC) was established on 4 September 2007 by the Prime Minister's Decision No 1798/QD-KHCNVN under the Institute of Geophysics. He also indicated that inside the country, the EITWC had the responsibility of issuing earthquake information and tsunami warnings.

He highlighted that as Vietnam became a Member State of the ICG/PTWS, the EITWC played the role of National Tsunami Warning Centre, as a Tsunami Warning Focal Point (TWFP) formally nominated for receiving tsunami bulletins from PTWS.

Dr Nguyen stated that the Standard Operating Procedures (SOPs) for local and distant tsunamis brought into operation at the EITWC is available 24/7 to provide timely earthquake-

tsunami watches. He explained that whenever an earthquake occurs, the IGP immediately determines the hypocentre and magnitude of the quake using SeisComP3 software. If the earthquake epicentre is located in an ocean area with tsunamigenic potential, EITWC would conduct the tsunami forecast operation using the database containing tsunami amplitude and travel time calculated by numerical simulation. This system allows EITWC to deliver national warnings within 20–25 minutes. He also indicated that to re-assess the current tsunami threat, real time sea level data from the [IOC Sea Level Station Monitoring Facility](#) (IOC SLMF) is referred to monitor tsunami arrivals at coasts, and he informed that in future, sea level data from a network of 22 sea level stations operated by the [Ministry of Natural Resources and Environment](#) (MONRE) could be used for this purpose. He added that the PTWC and/or JMA NWPTAC information is also taken into account before issuing the warnings.

Dr Nguyen emphasized that the IGP participated in Exercise Pacific Wave 15 ([IOC/2015/TS/117 VOL.1.](#)) held from 2 to 6 February 2015 and was currently upgrading the earthquake monitoring network up to more than 30 stations, all equipped with broadband seismometers and GPS.

To conclude, he mentioned that among the on-going national programs, he would like to stress the implementation of the National project on establishment of a multi-hazard warning network with 100 siren towers distributed along the coast of Vietnam.

Dr Solidum commented with respect to tsunami sources affecting the region, that one source that has not been frequently mentioned is landslides off Brunei. Sediments cumulated in that area could collapse and generate a landslide tsunami. This could generate a potential threat for Vietnam.

4.2 REPORT FROM NWPTAC ON PACWAVE16

Mr Kohei Nagata from JMA introduced the report on the Exercise [PacWave16](#). He introduced the experimental Northwest Pacific Tsunami Advisory Center (NWPTAC) Enhanced Products used in PacWave16 and the outline of the exercise. He provided a description of the products and their limitations.

He expressed appreciation to the participating countries to the exercise for their cooperation to improve the products.

He then provided a timeline of the development of NWPTAC Enhanced Product which includes a final changeover to NWPTAC Enhanced Products in 2018. He also provided information on the objectives of the Exercise Pacific Wave 17 ([PacWave17](#)).

Dr Nguyen inquired, referring to the kind of exercise to be implemented for [PacWave17](#), on what means “over and above a table top exercise”. Mr Nagata explained that Member States will be asked to run a table top exercise as a minimum but they could include limited or full evacuation depending on their own decision about the level of engagement of other levels of participation.

4.3 REPORT FROM OTHER ORGANISATIONS

Mr Kohei Nagata from JMA introduced the report of NWPTAC on its activities as from the previous meeting of the WG-SCS. He indicated that NWPTAC issued advisories for 27 events between February 2015 and February 2016.

He also introduced the results of the regular NWPTAC communication tests, including detailed information about some contact points that are not reported receiving the bulletins. He emphasized the importance of updating contact information of National Tsunami Warning

Centers (NTWC) and TWFP of each Member State registered by the IOC Secretariat, in particular when there has been any change in the information.

Dr Solidum inquired about the fax numbers that were not working for PHIVOLCS, to be able to correct it. JMA indicated that the information has been passed on to the Secretariat for follow up.

5. REPORT OF THE SCIENTIFIC MEETING OF EXPERTS FOR COORDINATED SCENARIO ANALYSIS OF FUTURE TSUNAMI EVENTS AND HAZARD MITIGATION SCHEMES FOR THE SOUTH CHINA SEA REGION

The Secretariat introduced the draft report of the [Scientific meeting of experts for coordinated scenario analysis of future tsunami events and hazard mitigation schemes for the South China sea region](#), was held in Xiamen, China, 16 - 18 November 2015.

During this 3-day scientific meeting, the major topics for discussion were paleo seismology and historic events in the South China Sea region and Philippines Trench, seismic studies and potential tsunamigenic sources in the South China Sea region and technical/scientific development of tsunami modelling for the South China Sea region, including key parameters.

The meeting has provided a good opportunity for relevant experts to review historical records, discuss the most likely sources and probability of occurrence of earthquakes and tsunamis for coordinated scenario analysis of future events and hazard mitigation schemes for the South China Sea region. The meeting resulted in a better understanding of the tsunami hazard and risk in the South China Sea region, which would be useful for the planning for the establishment of the sub-regional tsunami advisory centre, as well as allow Member States to better understand their level of tsunami exposure.

The meeting identified the following earthquake sources as possible generators of tsunami events, capable of generating surface-rupturing events (>M6.5) that may generate and propagate tsunami waves to affect the countries within the South China Sea region:

- (a) Regional Source: Manila Trench, Negros Trench, Sulu Trench, Cotabato Trench, Sulawesi Trench, Ryukyu Trench;
- (b) Local Source: 1781-82 Taiwan Tsunami Source, Aglubang River Fault in Mindoro Island, Chinese Mainland Coastal Faults;
- (c) Transoceanic: Pacific Sources (Yap, Chile)

The Secretariat reported that while the draft is still open to improvements there is a significant consensus on the list of potential sources that could affect the South China Sea region.

The meeting also made the following recommendations for consideration by the Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region:

- (a) To form a small group of relevant seismologists among the invited experts to work out an agreed sets of earthquake source parameters for the regional tsunami sources including the Manila Trench.

- (b) To coordinate on a regional level by a group of experts to be identified to conduct a search for tsunami deposits along the shores of the South China Sea and to look at historical literatures to find ancient records of tsunamis.
- (c) To identify potential landslides regions that may generate localized tsunamis, such as by examining pertinent databases.
- (d) The tsunami modelling region for the South China Sea region should be different from and larger than the warning region to cover features outside the domain and sources outside the domain.
- (e) To develop a baseline bathymetric database for the modelling region, to be derived from publicly available data, where available, for all tsunami modellers to use.
- (f) All models should be validated with established benchmark procedures.
- (g) To look at operational capability gaps in Member States and find ways of filling them.
- (h) To ask NOAA/PMEL to integrate regional earthquake sources at Negros, Cotabato, Sulawesi, Sulu and Molucca into ComMIT/MOST.

Dr Solidum suggested two research topics that could be integrated into the list of research priorities:

- (a) coastal uplift
- (b) GPS research to identify coupling

Dr Nguyen indicated that in the scenarios proposed by the Institute of Geology of China the displacement parameter of the fault segment was too small. With respect to the scenarios introduced by Dr Wu Tso-Ren they have a more reasonable displacement but the scenarios were too simplified.

The Secretariat indicated that the draft report will be completed with contributions from Dr Bautista to introduce the Manila Trench geology and tectonics, and then a refined draft report will be circulated to all participants of the Meeting of Experts.

The Group **agreed** to continue the process of finalising and refining the report for this meeting before it is distributed to all Member States.

6. UPDATED INVENTORY OF SEISMIC AND SEA LEVEL STATIONS IN THE SOUTH CHINA SEA REGION AND PRIORITIZATION OF ADDITIONAL SEISMIC AND SEA LEVEL STATIONS IN THE REGION

Chair Mr Mok introduced this agenda item. He indicated that at the previous meeting the group identified administrative and technical contact points for updating the inventory of seismic and sea level stations on an annual basis. The Group also agreed that Member States should nominate pending contact points after the meeting. He recalled that he requested Dr Yuan as Chair of the SCSTAC Task Team to circulate the Excel files containing the list of seismic and sea level stations among the contact points in order to update the list of stations and suggested including the tsunami buoys in the list.

Dr Yuan reported on the seismic and sea-level monitoring capabilities available to SCSTAC within and surrounding the SCS region. He reported that 65 seismic stations are

available to the SCSTAC by Feb 2016 and about 110 stations will be available to SCSTAC in 2016 with support of the [CEA](#) national network.

With respect to sea level stations available to SCSTAC, Dr Yuan reported that 16 stations are providing data through the [IOC Sea Level Station Monitoring Facility](#) (IOC SLMF), 29 additional stations are available from SOA, China and 1 HX2 Tsunami buoy has been intermittently available due to vandalism. He indicated that China may redeploy this Tsunami buoy in 2016. He highlighted that the analysis of the list of stations indicates that there are sea level monitoring gaps in Sulu Sea, Celebes Sea and North Borneo.

Ms Handayani, staff of the Tsunami Early Warning Sub Division of [BMKG](#) reported that with respect to the gaps in Sulawesi sea the Indonesian agency [Geospatial Information, Badan Informasi Geospasial \(BIG\)](#) has a publicly available website that provides Indonesia's real time sea level data: <http://tides.big.go.id:8888/realtime/>. From this website there are several stations that could help fill the gaps in the South China Sea region, including in the area of Sulu Sea, Celebes Sea and North Borneo, as follow: Melonguane, Tahuna, Jailolo, Manado, Tolitoli, Tarakan, Natuna, Tarempa, Pemangkat and Jambi. Some of these sea level stations may be available through the [IOC Sea Level Station Monitoring Facility](#) (IOC SLMF). She indicated that it could be explored with BIG to increase the number of stations available through the IOC SLMF from the above listed stations.

Dr Solidum commented that with respect to additions of new stations to the network capabilities, there is a need to balance the geographical coverage, to make sure that the detection capabilities increase in the entire region. He emphasized the need to have a protocol and selection criteria to identify stations that are necessary, with respect to their locations.

The Secretariat provided the example of the core list of stations defined in the [Implementation Plan of the CARIBE EWS](#) which is an agreed list of technically defined core stations for tsunami warning purposes. Dr Solidum commented that based on that example, the South China Sea region could develop a list of what is available in the region and from there define a list of core stations for tsunami warning purposes.

Chair Mok commented that the SCS-WG could agree on defining criteria for the selection of seismic or sea level stations to be made available for all Member States.

Dr Yuan indicated that a better balance of stations' coverage could be achieved through bilateral and international cooperation under the framework of the SCS-WG.

The Group **agreed** to develop a protocol to select stations to monitor earthquake and tsunami in the South China Sea and **agreed also** to continue to compile a comprehensive inventory list of both seismic and sea level stations, available in real time or not.

With respect to the existing list of stations Dr Solidum indicated that the main issue with respect to updating the list is that to share new stations Philippines needs to resolve first some technical aspects. If all Member States agree that the SCS-WG will just list what each country has then the SCS-WG would be afterwards able to select only some of the available stations to be shared.

Mr Mok suggested that the SCS-WG would seek inputs of the Member States to compile a complete list of available stations (real time and non-real time) for the group to discuss a list of selected stations useful for operation of the tsunami warning and mitigation system for the South China Sea region. The SCS-WG would then discuss on any provision of technical support for making those selected non-real time stations into real time stations. Dr Solidum suggested that the Group needs to define first a list of criteria to select stations.

Dr Solidum stated that the South China Sea region has political challenges that need to be taken into account. The Philippines has reservations with respect to locations of stations in disputed territories. He recalled his intervention during the second meeting of the SCS-WG that alerted the Group about these matters, particularly that sea level stations can only be included with the agreement of countries concerned. The Philippines would like to manifest that two stations proposed by China should not be included in the inventory because they are in disputed territories. The two sea level stations can be taken out as to provide guidance to the Working Group on avoidance of inclusion of stations in disputed territories. The protocol should also address such political issues, and not only technical matters. With reference to stations in Sabah, Dr Solidum stated that his position on Sabah remains unchanged and requested that this be reflected in the record of the meeting.

Mr Jun Feng, Programme Officer of the [State Oceanic Administration \(SOA\)](#) commented his surprise about the previous comments on this matter because the meeting is technical in nature and its purpose is to increase the capabilities for tsunami warning in the region. These two stations are very critical for early warning of tsunamis generated in the Manila Trench, especially at this stage when tsunami buoys in the South China Sea region are not available due to continuous vandalism. He indicated that he was reluctant to speak on these matters but because it has been mentioned by other experts he felt compelled to provide these comments. He recalled that the international cooperation in the framework of IOC is confined to technical matters, and SCS-WG has been very effective and should continue to focus on technical matters only.

Dr Nguyen indicated that Xisha and Nansha sea level stations provided by China are highly appreciated but unfortunately we live in a world that is not only made of technical matters. Mr Nguyen indicated that he has no doubt about the importance of the location of these two stations for tsunami warning purposes but Vietnam has a very strong and consistent position that Vietnam has sovereignty rights on Paracel and Spratly Islands.

He indicated that Vietnam has been aware of the fact that the [IOC Sea Level Station Monitoring Facility](#) (IOC SLMF) obtains information about the “Xisha” and “Nansha” sea level stations of China on the Paracel and Spratly archipelagos of Vietnam. On this matter, he indicated that Vietnam holds the view that the display of information on the website of the IOC may lead to the misunderstanding that the IOC recognizes and acquiesces the two stations are placed on Chinese territory. This is totally contrary to Vietnam's consistent position that Vietnam has sovereignty over the Paracel and Spratly archipelagos.

Dr Nguyen indicated that Vietnam requests the IOC not to include the “Xisha” and “Nansha” sea level stations in the list of sea level stations of the South China Sea Region Tsunami Warning and Mitigation System; or to make adjustments to the display of information about the two above mentioned stations on its website as well as in other official documents, referring to the disputed territories by their international names to avoid any misunderstanding that the two stations are placed on Chinese territory.

Mr Feng Jun further indicated the PTWS Working Group on the South China Sea region is not the right platform for tsunami specialists and technicians to negotiate the territorial dispute. Mr Feng appreciated the friendship of Vietnam and China as expressed by Dr Nguyen, and further emphasized that the matters at issue should only be looked at from a technical point of view. He reiterated China's will to work with Member States to strengthen regional cooperation on tsunami early warning for the welfare of regional population.

Dr Solidum expressed that Philippines will continue to collaborate in the framework of the Working Group but it needs to manifest its points of view with respect to these political aspects. There are geopolitical realities and we need to manifest what is happening on the ground. Dr Nguyen seconded this statement.

Rear Admiral Song appreciated the work of the Group and indicated that it will continue to cooperate with Dr Yuan to make sure that sea level and seismic stations are shared with Member States.

The Secretariat recalled the Terms of Reference and the parental relation of this body with respect to the ICG/PTWS and the IOC Assembly and Executive Council.

Chair Mr Mok summarised the discussions and indicated that the Group should continue to focus on technical matters in accordance with the terms of reference of the SCS-WG and continue the compilation of available stations, and avoid political issues because the Group is not in a right position to discuss it.

Dr Solidum reiterated that the Philippines has expressed its concerns and will continue to make sure the Group make progress for the sake of lives of South China Sea region populations.

Mr Feng agreed with the statement of the Chair and expressed its recognition to the guidance provided by Secretariat.

Dr Yuan recalled that the existing compilation of stations was circulated to Member States before the meeting and Thailand provided new stations to the list. He indicated that China would be able to add three additional stations to increase the capabilities for seismic monitoring in the northern are of the South China Sea region.

Dr Solidum expressed that the Group needs to look at technical specifications to define which stations the Group requires. That is why he suggests to list all stations available in the region and then look at the technical requirements to define which stations would be shared.

The Group **agreed** to task Dr Yuan to continue the compilation of available seismic and sea level stations.

The Secretariat suggested that with funding provided by the Government of China that is already available in UNESCO a Training for Sea Level Network Operators is organised in 2016.

The Group **agreed** and accepted in principle the offer of Philippines to host the Sea Level Network Operators training.

7. UPDATED INVENTORY OF EDUCATIONAL MATERIALS IN THE SOUTH CHINA SEA REGION

Chair Mr Mok reported that Mr Ardito Kodijat, Head of the [Indian Ocean Tsunami Information Centre](#) (IOTIC), [UNESCO Office Jakarta](#), provided an updated compilation of general tsunami information, education and awareness materials that could be useful for the South China Sea region. The report has been made available in the meeting website.

Ms Mylene Villegas, Chief Science Research Specialist at PHIVOLCS, provided a comprehensive report of tsunami Public Awareness and Educational (PAE) materials developed in Philippines.

Dr Yuan commented that a public website for the South China Sea region will be developed by NMFEC in the first half of 2016, which could be used to distribute and disseminate the PAE materials. He indicated that later in the year he will be sending a questionnaire to Member States to identify their own national tsunami warning websites and

establish appropriated links with them, as well as inquire about PAE materials that could be uploaded for wider dissemination in the region.

Mr Riyadi inquired which is the responsible organisation that order evacuation in Philippines. Dr Solidum responded that PHIVOLCS does not order evacuation but recommends actions to the public. At the community level the action is on the local responsible officers.

8. PROGRESS REPORT ON THE ESTABLISHMENT AND WORK PLANS OF THE TASK TEAM ON THE ESTABLISHMENT OF A SOUTH CHINA SEA TSUNAMI ADVISORY CENTER (SCSTAC)

Dr Ye Yuan, Director of the Tsunami Warning Division of [National Marine Environmental Forecasting Center \(NMEFC\)](#), presented a report of the ICG/PTWS Task Team on Establishment of the South China Sea Tsunami Advisory Center (ICG/PTWS-TT-SCSTAC).

Dr Yuan first reviewed activities and tasks completed by the Task Team since the [4rd Regional Working Group Meeting of the SCS Tsunami Warning and Mitigation System](#). Progress has been made with regard to SCSTAC facilities, staff recruitment and training, as well as Decision Support System (DSS) tailored for SCSTAC. TT-SCSTAC continued to develop Tsunami Advisory Products for the South China Sea Tsunami Warning and Mitigation System in 2015. The main document describing the timeline and products of the SCSTAC was circulated among the TT members for collecting reviews and comments in February 2015 and in October 2015. All comments were fully considered in the revised versions. Dr Yuan briefly introduced the contents of the tsunami advisory products to the SCS-WG, and recommended SCS-WG to approve the document "[Tsunami Advisory Products for the South China Sea Regional Tsunami Warning and Mitigation System](#)". The TT-SCSTAC also recommends the SCS-WG to approve the proposal of having a 2nd Task Team meeting on the establishment of SCSTAC, with meeting venue provided by [NMEFC](#) in Beijing. According to Action Plan of 2016, with the final version of the Tsunami Advisory Products available, an exercise would be arranged in 2017 to test the operation of the SCSTAC amongst SCS-WG Member States. Exercise details would be discussed in the 2nd Task Team Meeting on SCSTAC.

Dr Nguyen suggested that no borders or limits are put in the figures or maps of the documents of the SCSTAC. Dr Yuan agreed to remove political boundaries from the SCSTAC documents.

With reference to documents presented under this item, Dr Solidum manifested the same comment as Dr Nguyen, and recalled his comment from the first day of the meeting, which that maps with disputed boundaries should be removed from the documentation from past and future meetings of the Working Group. Dr Yuan confirmed that the relevant figures would be re-plotted accordingly.

Dr Wandono, Head of the Early Information for Earthquake and Tsunami from [BMKG](#), requested additional forecast points to be added to the document in some specific areas that are prone to tsunami, and provided the list to Dr Yuan.

The Group **agreed** to circulate the document on "Tsunami Advisory Products for the South China Sea Regional Tsunami Warning and Mitigation System" to all SCS-WG Member States by IOC Secretariat immediately after the meeting for final comments with a time limit of one month, and finalize the SCS Tsunami Advisory Products according to comments provided by SCS-WG Member States.

The Group discussed the Performance Indicators suggested by the Task Team and **approved them** as is at the initial operation stage.

The Group confirmed the membership of the Task Team as follows:

- NWPTAC
 - Mr Tomoe Ozaki
 - Mr Kohei Nagata
- Brunei
 - Dr Hj. Sidup Hj. Sirabaha (BDMD)
 - Ms Leong Wai Fong (NSC)
 - Pg Sabli Pg Damit (NDMC)
- China
 - Dr Ye Yuan (NMEFC)
 - Dr Dakui Wang(NMEFC)
 - Mr Zhiguo Xu (NMEFC)
- Indonesia
 - Dr Wandono (BMKG) - Vice Chair
 - Ms Tri Handayani (BMKG)
 - Mr Mohammad Irpan Septiawan (BMKG)
- Malaysia
 - Mr Muhammad Nazri Noordin (MMD)
- Philippines
 - Dr Renato Solidum (PHIVOLCS)
- Thailand
 - Rear Admiral Song Ekmahachai RTN (THAI NDWC)
 - Mr Chaiwat Rattanakhongviput (THAI NDWC)
- Vietnam
 - Dr Nguyen Hong Phuong (Institute of Geophysics)
 - Mr Tran Van Chung (Institute of Oceanography)
- PTWC
 - Dr Dailin Wang

9. NEXT MEETING

China offered to host the Sixth meeting of the Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region.

The Group suggested having the next meeting in early March 2017.

The **Group decided** to accept the offer of China to host the next meeting in early March 2017, with a venue to be defined in consultation with the Secretariat.

10. OTHER BUSINESS

Mr Nagata from JMA reported that a recent report indicated that not all countries have submitted its report on PacWave16. He reminded that those Member States that have not responded to the survey could still do it within the next two weeks.

11. SUMMARY OF DECISIONS, RECOMMENDATIONS AND ACTIONS

Based on the reports and discussions, the **SCS-WG adopted** Recommendation ICG/PTWS-WG-SCS-V.1

12. CLOSE OF THE MEETING

The Chair closed the meeting at 4:00 pm, and thanked PHIVOLCS and Philippines for its kind hosting of the present meeting.

Dr Solidum on behalf of PHIVOLCS and Philippines expressed its thanks to all participants, the leadership of Mr Mok, as Chair of the Group, the support of the Secretariat and the staff of PHIVOLCS lead by Dr Ishmael Narag for its able leadership in organising the meeting.

Mr Riyami appreciated and expressed its thanks to PHIVOLCS and Philippines for hosting the meeting.

China expressed its thanks to Philippines, including for the cultural performance offered to the meeting.

ANNEX I

AGENDA

1. WELCOME AND OPENING
2. ORGANIZATION OF THE SESSION
 - 2.1. ADOPTION OF AGENDA
 - 2.2. DESIGNATION OF RAPPORTEUR
 - 2.3. CONDUCT OF THE SESSION, TIMETABLE AND DOCUMENTATION
3. REVIEW OF DECISIONS, RECOMMENDATIONS AND ACTIONS ARISING FROM ICG/PTWS WG-SCS-IV MEETING
4. REPORTS
 - 4.1. NATIONAL PROGRESS REPORTS
 - 4.2. REPORT FROM NWPTAC ON PACWAVE16
 - 4.3. REPORTS FROM OTHER ORGANIZATIONS
5. REPORT OF THE SCIENTIFIC MEETING OF EXPERTS FOR COORDINATED SCENARIO ANALYSIS OF FUTURE TSUNAMI EVENTS AND HAZARD MITIGATION SCHEMES FOR THE SOUTH CHINA SEA REGION
6. UPDATED INVENTORY OF SEISMIC AND SEA LEVEL STATIONS IN THE SOUTH CHINA SEA REGION AND PRIORITIZATION OF ADDITIONAL SEISMIC AND SEA LEVEL STATIONS IN THE REGION
7. UPDATED INVENTORY OF EDUCATIONAL MATERIALS IN THE SOUTH CHINA SEA REGION
8. PROGRESS REPORT ON THE ESTABLISHMENT AND WORK PLANS OF THE TASK TEAM ON THE ESTABLISHMENT OF A SOUTH CHINA SEA TSUNAMI ADVISORY CENTER (SCSTAC)
9. NEXT MEETING
10. OTHER BUSINESS
11. SUMMARY OF DECISIONS, RECOMMENDATIONS AND ACTIONS
12. CLOSE OF MEETING

ANNEX II

ADOPTED RECOMMENDATION

Recommendation ICG/PTWS-WG-SCS-V.1

PTWS South China Sea region Working Group

The Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region,

Recalling that the Twenty-sixth Session of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System ([ICG/PTWS-XXVI](#)) decided to continue the Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region (ICG/PTWS-WG-SCS),

Also recalling the recommendations agreed at the Fourth Meeting of the Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region ([ICG/PTWS-WG-SCS-IV](#)), held in Jakarta, Indonesia, on 11 and 12 February 2015, and hosted by the BMKG,

Considering the draft report of the “Scientific meeting of experts for coordinated scenario analysis of future tsunami events and hazard mitigation schemes for the South China sea region, Meeting of Experts, Xiamen, China, 16 - 18 November 2015”,

Having discussed and commented on the Report on the update of the inventory of seismic and sea level stations in the South China Sea region presented by China,

Also considering the Progress Report on the Establishment and Work Plans of the Task Team on the Establishment of the South China Sea Tsunami Advisory Center (SCSTAC),

Bearing in mind the risk posed to coastal populations of Member States by tsunamigenic zones in the South China Sea region,

Acknowledging that the present coverage and performance of the seismic and sea level monitoring networks of the South China Sea region are insufficient for tsunami warning purposes,

Instructs the Secretariat to continue the process of refining and finalising the report for the “Scientific meeting of experts for coordinated scenario analysis of future tsunami events and hazard mitigation schemes for the South China sea region, Meeting of Experts, Xiamen, China, 16 - 18 November 2015” before it is distributed to all Member States and for discussion on the way forward by the Working Group;

Decides to continue to compile a comprehensive inventory list of both seismic and sea level stations, available in real time or not and **decides also** to develop a protocol to select seismic and sea level stations for tsunami warning in the South China Sea region. Dr Yuan (China) is requested to continue the compilation of available seismic and sea level stations;

Decides further to organize a UNESCO/IOC Sea Level Network Operators training in 2016 with funding provided by China through UNESCO, and **accepts** in principle the offer of the Philippines to host it;

Encourages the Task Team on the Establishment of the South China Sea Tsunami Advisory Center (SCSTAC) to continue its work with its renewed membership, and **instructs** the

Secretariat to distribute through Circular Letter the document “Tsunami Advisory Products for the South China Sea Regional Tsunami Warning and Mitigation System” for comments within one month before final approval;

Further approves the proposal of having the 2nd Task Team meeting of establishment of the SCSTAC, with meeting venue kindly provided by NMEFC, China in Beijing in October 2016;

Accepts the offer of China to host the Sixth meeting of the Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region, in early March 2017.

ANNEX III

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ANNEX IV

LIST OF ACRONYMS

BDMD	Brunei Darussalam Meteorological Department
BIG	Badan Information Geospacial
BMKG	Indonesian Agency for Meteorological, Climatological and Geophysics
CBS	Cell Broadcasting Services
CEA	China Earthquake Administration
CMT	Centroid Moment Tensor
ComMIT	COMmunity Model Interface for Tsunami
DART	Deep-ocean Assessment and Reporting of Tsunamis Project
DSS	Decision Support System
EITWC	Earthquake Information and Tsunami Warning Centre
GEM	Global Earthquake Model
GTS	Global Telecommunication System
HKO	Hong Kong Observatory
ICG	Intergovernmental Coordination Group
ICG/PTWS	Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System
IGP	Institute of Geophysics
InaTEWS	Indonesian Tsunami Early Warning System
IOC	Intergovernmental Oceanographic Commission
SLMF	Sea Level Station Monitoring Facility
IOTIC	Indian Ocean Tsunami Information Center
IOTWMS	Indian Ocean Tsunami Warning and Mitigation System
JMA	Japan Meteorological Agency
MMD	Malaysian Meteorological Department
MONRE	Ministry of Natural Resources and Environment
MOST	Method of Splitting Tsunami model

NDMC	National Disaster Management Center, Brunei
NMEFC	National Marine Environmental Forecasting Center
NOAA	National Oceanic and Atmospheric Administration
NSC	National Security Committee, Brunei
NTWC	National Tsunami Warning Center
NWPTAC	Northwest Pacific Tsunami Advisory Center
PAE	Public Awareness and Education
PHIVOLCS	Philippine Institute of Volcanology and Seismology
PMEL	Pacific Marine Environmental Laboratory
PTWC	Pacific Tsunami Warning Center
PTWS	Pacific Tsunami Warning and Mitigation System
SCSTAC	South China Sea Tsunami Advisory Center
SCS-WG	Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region
SOA	State Oceanic Administration of China
SOP	Standard Operating Procedure
THAI NDWC	National Disaster Warning Center, Thailand
TSP	Tsunami Service Provider
TNC	Tsunami National Contact
TT	Task Team
TTT	Tsunami Travel Time module
TWFP	Tsunami Warning Focal Point
UNESCO	United Nations Educational, Scientific and Cultural Organization
VAST	Vietnam Academy of Science and Technology
WG	Working Group

In this Series, entitled

Reports of Meetings of Experts and Equivalent Bodies, which was initiated in 1984 and which is published in English only, unless otherwise specified, the reports of the following meetings have already been issued:

1. Third Meeting of the Central Editorial Board for the Geological/Geophysical Atlases of the Atlantic and Pacific Oceans
2. Fourth Meeting of the Central Editorial Board for the Geological/Geophysical Atlases of the Atlantic and Pacific Oceans S. Fourth Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of 'El Niño' (**Also printed in Spanish**)
4. First Session of the IOC-FAO Guiding Group of Experts on the Programme of Ocean Science in Relation to Living Resources
5. First Session of the IOC-UN(OETB) Guiding Group of Experts on the Programme of Ocean Science in Relation to Non-Living Resources
6. First Session of the Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
7. First Session of the Joint CCOP(SOPAC)-IOC Working Group on South Pacific Tectonics and Resources
8. First Session of the IODE Group of Experts on Marine Information Management
9. Tenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies in East Asian Tectonics and Resources
10. Sixth Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration
11. First Session of the IOC Consultative Group on Ocean Mapping (**Also printed in French and Spanish**)
12. Joint 100-WMO Meeting for Implementation of IGOSS XBT Ships-of-Opportunity Programmes
13. Second Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
14. Third Session of the Group of Experts on Format Development
15. Eleventh Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of South-East Asian Tectonics and Resources
16. Second Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
17. Seventh Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration
18. Second Session of the IOC Group of Experts on Effects of Pollutants
19. Primera Reunión del Comité Editorial de la COI para la Carta Batimétrica Internacional del Mar Caribe y Parte del Océano Pacífico frente a Centroamérica (**Spanish only**)
20. Third Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
21. Twelfth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of South-East Asian Tectonics and Resources
22. Second Session of the IODE Group of Experts on Marine Information Management
23. First Session of the IOC Group of Experts on Marine Geology and Geophysics in the Western Pacific
24. Second Session of the IOC-UN(OETB) Guiding Group of Experts on the Programme of Ocean Science in Relation to Non-Living Resources (**Also printed in French and Spanish**)
25. Third Session of the IOC Group of Experts on Effects of Pollutants
26. Eighth Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration
27. Eleventh Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans (**Also printed in French**)
28. Second Session of the IOC-FAO Guiding Group of Experts on the Programme of Ocean Science in Relation to Living Resources
29. First Session of the IOC-IAEA-UNEP Group of Experts on Standards and Reference Materials
30. First Session of the IOCARIBE Group of Experts on Recruitment in Tropical Coastal Demersal Communities (**Also printed in Spanish**)
31. Second IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
32. Thirteenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of East Asia Tectonics and Resources
33. Second Session of the IOC Task Team on the Global Sea-Level Observing System
34. Third Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
35. Fourth Session of the IOC-UNEP-IMO Group of Experts on Effects of Pollutants
36. First Consultative Meeting on RNODCs and Climate Data Services
37. Second Joint IOC-WMO Meeting of Experts on IGOSS-IODE Data Flow
38. Fourth Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
39. Fourth Session of the IODE Group of Experts on Technical Aspects of Data Exchange
40. Fourteenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of East Asian Tectonics and Resources
41. Third Session of the IOC Consultative Group on Ocean Mapping
42. Sixth Session of the Joint IOC-WMO-CCPS Working Group on the Investigations of 'El Niño' (**Also printed in Spanish**)
43. First Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Indian Ocean
44. Third Session of the IOC-UN(OALOS) Guiding Group of Experts on the Programme of Ocean Science in Relation to Non-Living Resources
45. Ninth Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration
46. Second Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico
47. Cancelled
48. Twelfth Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans
49. Fifteenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of East Asian Tectonics and Resources
50. Third Joint IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
51. First Session of the IOC Group of Experts on the Global Sea-Level Observing System
52. Fourth Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean
53. First Session of the IOC Editorial Board for the International Chart of the Central Eastern Atlantic (**Also printed in French**)
54. Third Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico (**Also printed in Spanish**)
55. Fifth Session of the IOC-UNEP-IMO Group of Experts on Effects of Pollutants
56. Second Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Indian Ocean
57. First Meeting of the IOC *ad hoc* Group of Experts on Ocean Mapping in the WESTPAC Area
58. Fourth Session of the IOC Consultative Group on Ocean Mapping
59. Second Session of the IOC-WMO/IGOSS Group of Experts on Operations and Technical Applications

60. Second Session of the IOC Group of Experts on the Global Sea-Level Observing System
61. UNEP-IOC-WMO Meeting of Experts on Long-Term Global Monitoring System of Coastal and Near-Shore Phenomena Related to Climate Change
62. Third Session of the IOC-FAO Group of Experts on the Programme of Ocean Science in Relation to Living Resources
63. Second Session of the IOC-IAEA-UNEP Group of Experts on Standards and Reference Materials
64. Joint Meeting of the Group of Experts on Pollutants and the Group of Experts on Methods, Standards and Intercalibration
65. First Meeting of the Working Group on Oceanographic Co-operation in the ROPME Sea Area
66. Fifth Session of the Editorial Board for the International Bathymetric and its Geological/Geophysical Series
67. Thirteenth Session of the IOC-IHO Joint Guiding Committee for the General Bathymetric Chart of the Oceans (**Also printed in French**)
68. International Meeting of Scientific and Technical Experts on Climate Change and Oceans
69. UNEP-IOC-WMO-IUCN Meeting of Experts on a Long-Term Global Monitoring System
70. Fourth Joint IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
71. ROPME-IOC Meeting of the Steering Committee on Oceanographic Co-operation in the ROPME Sea Area
72. Seventh Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of 'El Niño' (**Spanish only**)
73. Fourth Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico (**Also printed in Spanish**)
74. UNEP-IOC-ASPEI Global Task Team on the Implications of Climate Change on Coral Reefs
75. Third Session of the IODE Group of Experts on Marine Information Management
76. Fifth Session of the IODE Group of Experts on Technical Aspects of Data Exchange
77. ROPME-IOC Meeting of the Steering Committee for the Integrated Project Plan for the Coastal and Marine Environment of the ROPME Sea Area
78. Third Session of the IOC Group of Experts on the Global Sea-level Observing System
79. Third Session of the IOC-IAEA-UNEP Group of Experts on Standards and Reference Materials
80. Fourteenth Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans
81. Fifth Joint IOG-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
82. Second Meeting of the UNEP-IOC-ASPEI Global Task Team on the Implications of climate Change on Coral Reefs
83. Seventh Session of the JSC Ocean Observing System Development Panel
84. Fourth Session of the IODE Group of Experts on Marine Information Management
85. Sixth Session of the IOC Editorial Board for the International Bathymetric chart of the Mediterranean and its Geological/Geophysical Series
86. Fourth Session of the Joint IOC-JGOFS Panel on Carbon Dioxide
87. First Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Pacific
88. Eighth Session of the JSC Ocean Observing System Development Panel
89. Ninth Session of the JSC Ocean Observing System Development Panel
90. Sixth Session of the IODE Group of Experts on Technical Aspects of Data Exchange
91. First Session of the IOC-FAO Group of Experts on OSLR for the IOCINCWIO Region
92. Fifth Session of the Joint IOC-JGOFS CO₂ Advisory Panel Meeting
93. Tenth Session of the JSC Ocean Observing System Development Panel
94. First Session of the Joint CMM-IGOSS-IODE Sub-group on Ocean Satellites and Remote Sensing
95. Third Session of the IOC Editorial Board for the International Chart of the Western Indian Ocean
96. Fourth Session of the IOC Group of Experts on the Global Sea Level Observing System
97. Joint Meeting of GEMSI and GEEP Core Groups
98. First Session of the Joint Scientific and Technical Committee for Global Ocean Observing System
99. Second International Meeting of Scientific and Technical Experts on Climate Change and the Oceans
100. First Meeting of the Officers of the Editorial Board for the International Bathymetric Chart of the Western Pacific
101. Fifth Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico
102. Second Session of the Joint Scientific and Technical Committee for Global Ocean Observing System
103. Fifteenth Session of the Joint IOC-IHO Committee for the General Bathymetric Chart of the Oceans
104. Fifth Session of the IOC Consultative Group on Ocean Mapping
105. Fifth Session of the IODE Group of Experts on Marine Information Management
106. IOC-NOAA *Ad hoc* Consultation on Marine Biodiversity
107. Sixth Joint IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
108. Third Session of the Health of the Oceans (HOTO) Panel of the Joint Scientific and Technical Committee for GLOSS
109. Second Session of the Strategy Subcommittee (SSC) of the IOC-WMO-UNEP Intergovernmental Committee for the Global Ocean Observing System
110. Third Session of the Joint Scientific and Technical Committee for Global Ocean Observing System
111. First Session of the Joint GCOS-GOOS-WCRP Ocean Observations Panel for Climate
112. Sixth Session of the Joint IOC-JGOFS CO₂ Advisory Panel Meeting
113. First Meeting of the IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional - Global Ocean Observing System (NEAR-GOOS)
114. Eighth Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of "El Niño" (**Spanish only**)
115. Second Session of the IOC Editorial Board of the International Bathymetric Chart of the Central Eastern Atlantic (**Also printed in French**)
116. Tenth Session of the Officers Committee for the Joint IOC-IHO General Bathymetric Chart of the Oceans (GEBCO), USA, 1996
117. IOC Group of Experts on the Global Sea Level Observing System (GLOSS), Fifth Session, USA, 1997
118. Joint Scientific Technical Committee for Global Ocean Observing System (J-GOOS), Fourth Session, USA, 1997
119. First Session of the Joint 100-WMO IGOSS Ship-of-Opportunity Programme Implementation Panel, South Africa, 1997
120. Report of Ocean Climate Time-Series Workshop, Joint GCOS-GOOS-WCRP Ocean Observations Panel for Climate, USA, 1997
121. IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional Global Ocean Observing System (NEAR-GOOS), Second Session, Thailand, 1997

122. First Session of the IOC-IUCN-NOAA *Ad hoc* Consultative Meeting on Large Marine Ecosystems (LME), France, 1997
123. Second Session of the Joint GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC), South Africa, 1997
124. Sixth Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico, Colombia, 1996
(also printed in Spanish)
125. Seventh Session of the IODE Group of Experts on Technical Aspects of Data Exchange, Ireland, 1997
126. IOC-WMO-UNEP-ICSU Coastal Panel of the Global Ocean Observing System (GOOS), First Session, France, 1997
127. Second Session of the IOC-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LME), France, 1998
128. Sixth Session of the IOC Consultative Group on Ocean Mapping (CGOM), Monaco, 1997
129. Sixth Session of the Tropical Atmosphere - Ocean Array (TAO) Implementation Panel, United Kingdom, 1997
130. First Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System (GOOS), France, 1998
131. Fourth Session of the Health of the Oceans (HOTO) Panel of the Global Ocean Observing System (GOOS), Singapore, 1997
132. Sixteenth Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans (GEBCO), United Kingdom, 1997
133. First Session of the IOC-WMO-UNEP-ICSU-FAO Living Marine Resources Panel of the Global Ocean Observing System (GOOS), France, 1998
134. Fourth Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Indian Ocean (IOC/EB-IBCWIO-IW3), South Africa, 1997
135. Third Session of the Joint GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC), France, 1998
136. Seventh Session of the Joint IOC-JGOFS CO2 Advisory Panel Meeting, Germany, 1997
137. Implementation of Global Ocean Observations for GOOS/GCOS, First Session, Australia, 1998
138. Implementation of Global Ocean Observations for GOOS/GCOS, Second Session, France, 1998
139. Second Session of the IOC-WMO-UNEP-ICSU Coastal Panel of the Global Ocean Observing System (GOOS), Brazil, 1998
140. Third Session of IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional - Global Ocean Observing System (NEAR-GOOS), China, 1998
141. Ninth Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of 'El Niño', Ecuador, 1998 **(Spanish only)**
142. Seventh Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and its Geological/Geophysical Series, Croatia, 1998
143. Seventh Session of the Tropical Atmosphere-Ocean Array (TAO) Implementation Panel, Abidjan, Côte d'Ivoire, 1998
144. Sixth Session of the IODE Group of Experts on Marine Information Management (GEMIM), USA, 1999
145. Second Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System (GOOS), China, 1999
146. Third Session of the IOC-WMO-UNEP-ICSU Coastal Panel of the Global Ocean Observing System (GOOS), Ghana, 1999
147. Fourth Session of the GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC); Fourth Session of the WCRP CLIVAR Upper Ocean Panel (UOP); Special Joint Session of OOPC and UOP, USA, 1999
148. Second Session of the IOC-WMO-UNEP-ICSU-FAO Living Marine Resources Panel of the Global Ocean Observing System (GOOS), France, 1999
149. Eighth Session of the Joint IOC-JGOFS CO2 Advisory Panel Meeting, Japan, 1999
150. Fourth Session of the IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional – Global Ocean Observing System (NEAR-GOOS), Japan, 1999
151. Seventh Session of the IOC Consultative Group on Ocean Mapping (CGOM), Monaco, 1999
152. Sixth Session of the IOC Group of Experts on the Global Sea level Observing System (GLOSS), France, 1999
153. Seventeenth Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans (GEBCO), Canada, 1999
154. Comité Editorial de la COI para la Carta Batimétrica Internacional del Mar Caribe y el Golfo de Mexico (IBCCA), Septima Reunión, Mexico, 1998
IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico (IBCCA), Seventh Session, Mexico, 1998
155. Initial Global Ocean Observing System (GOOS) Commitments Meeting, IOC-WMO-UNEP-ICSU/Impl-III/3, France, 1999
156. First Session of the *ad hoc* Advisory Group for IOCARIBE-GOOS, Venezuela, 1999 **(also printed in Spanish and French)**
157. Fourth Session of the IOC-WMO-UNEP-ICSU Coastal Panel of the Global Ocean Observing System (GOOS), China, 1999
158. Eighth Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and its Geological/Geophysical Series, Russian Federation, 1999
159. Third Session of the IOC-WMO-UNEP-ICSU-FAO Living Marine Resources Panel of the Global Ocean Observing System (GOOS), Chile, 1999
160. Fourth Session of the IOC-WMO-UNEP-ICSU-FAO Living Marine Resources Panel of the Global Ocean Observing System (GOOS). Hawaii, 2000
161. Eighth Session of the IODE Group of Experts on Technical Aspects of Data Exchange, USA, 2000
162. Third Session of the IOC-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LME), France, 2000
163. Fifth Session of the IOC-WMO-UNEP-ICSU Coastal Panel of the Global Ocean Observing System (GOOS), Poland, 2000
164. Third Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System (GOOS), France, 2000
165. Second Session of the *ad hoc* Advisory Group for IOCARIBE-GOOS, Cuba, 2000 **(also printed in Spanish and French)**
166. First Session of the Coastal Ocean Observations Panel, Costa Rica, 2000
167. First GOOS Users' Forum, 2000
168. Seventh Session of the Group of Experts on the Global Sea Level Observing System, Honolulu, 2001
169. First Session of the Advisory Body of Experts on the Law of the Sea (ABE-LOS), France, 2001 **(also printed in French)**
170. Fourth Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System, Chile, 2001
171. First Session of the IOC-SCOR Ocean CO₂ Advisory Panel, France, 2000
172. Fifth Session of the GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC), Norway, 2000 **(electronic copy only)**
173. Third Session of the *ad hoc* Advisory Group for IOCARIBE-GOOS, USA, 2001 **(also printed in Spanish and French)**
174. Second Session of the Coastal Ocean Observations Panel and GOOS Users' Forum, Italy, 2001
175. Second Session of the Black Sea GOOS Workshop, Georgia, 2001
176. Fifth Session of the IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional – Global Ocean Observing System (NEAR-GOOS), Republic of Korea, 2000
177. Second Session of the Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Morocco, 2002 **(also printed in French)**
178. Sixth Session of the Joint GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC), Australia, 2001 **(electronic copy only)**
179. *Cancelled*

180. Second Session of the IOC-SCOR Ocean CO₂ Advisory Panel, Honolulu, Hawaii, U.S.A, 2002 **(electronic copy only)**
181. IOC Workshop on the Establishment of SEAGOOS in the Wider Southeast Asian Region, Seoul, Republic of Korea, 2001 (SEAGOOS preparatory workshop) **(electronic copy only)**
182. First Session of the IODE Steering Group for the Resource Kit, USA, 19–21 March 2001
183. Fourth Session of the IOC-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LMEs), France, 2002
184. Seventh Session of the IODE Group of Experts on Marine Information Management (GEMIM), France, 2002 **(electronic copy only)**
185. Sixth Session of IOC/WESTPAC Coordinating Committee for the North-East Asian Regional - Global Ocean Observing System (NEAR-GOOS), Republic of Korea, 2001 **(electronic copy only)**
186. First Session of the Global Ocean Observing System (GOOS) Capacity Building Panel, Switzerland, 2002 **(electronic copy only)**
187. Fourth Session of the ad hoc Advisory Group for IOCARIBE-GOOS, 2002, Mexico **(also printed in French and Spanish)**
188. Fifth Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Indian Ocean (IBCWIO), Mauritius, 2000
189. Third session of the Editorial Board for the International Bathymetric Chart of the Western Pacific, Chine, 2000
190. Third Session of the Coastal Ocean Observations Panel and GOOS Users' Forum, Vietnam, 2002
191. Eighth Session of the IOC Consultative Group on Ocean Mapping, Russian Federation, 2001
192. Third Session of the Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Lisbon, 2003 **(also printed in French)**
193. Extraordinary Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of 'El Niño', Chile, 1999 **(Spanish only; electronic copy only)**
194. Fifth Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System, France, 2002
195. Sixth Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System, South Africa, 2003
196. Fourth Session of the Coastal Ocean Observations Panel, South Africa, 2002 **(electronic copy only)**
197. First Session of the JCOMM/IODE Expert Team On Data Management Practices, Belgium, 2003 *(also JCOMM Meeting Report No. 25)*
198. Fifth Session of the IOC-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LMEs), Paris, 2003
199. Ninth Session of the IOC Consultative Group on Ocean Mapping, Monaco, 2003 **(Recommendations in English, French, Russian and Spanish included)**
200. Eighth Session of the IOC Group of Experts on the Global Sea level Observing System (GLOSS), France, 2003 **(electronic copy only)**
201. Fourth Session of the Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Greece, 2004 **(also printed in French)**
202. Sixth Session of the IOC-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LMEs), Paris, 2004 **(electronic copy only)**
203. Fifth Session of the Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Argentina, 2005 **(also printed in French)**
204. Ninth Session of the IOC Group of Experts on the Global Sea level Observing System (GLOSS), France, 2005 **(electronic copy only)**
205. Eighth Session of the IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional – Global Ocean Observing System (NEAR-GOOS), China, 2003 **(electronic copy only)**
206. Sixth Meeting of the Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Spain, 2006 **(also printed in French)**
207. Third Session of the Regional Forum of the Global Ocean Observing System, South Africa, 2006 **(electronic copy only)**
208. Seventh Session of the IOC-UNEP-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LMEs), Paris, 2005 **(electronic copy only)**
209. Eighth Session of the IOC-UNEP-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LMEs), Paris, 2006 **(electronic copy only)**
210. Seventh Meeting of the IOC Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Gabon, 2007 **(bilingual English/French)**
211. First Meeting of the IOC Working Group on the Future of IOC, Paris, 2008 **(Executive Summary in English, French, Russian and Spanish included)**
212. First meeting of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Paris, 3–4 April 2008 **(Executive Summary in English, French, Russian and Spanish included)**
213. First Session of the Panel for Integrated Coastal Observation (PICO-I), Paris, 10–11 April 2008 **(electronic copy only)**
214. Tenth Session of the IOC Group of Experts on the Global Sea level Observing System (GLOSS), Paris, 6–8 June 2007 **(electronic copy only)**
215. Eighth Meeting of the IOC Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Paris, 21–25 April 2008 **(bilingual English/French)**
216. Fourth Session of the Global Ocean Observing System (GOOS) Regional Alliances Forum (GRF), Guayaquil, Ecuador, 25–27 November 2008 **(electronic copy only)**
217. Second Session of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Paris, 27 March 2009 **(Executive Summary in English, French, Russian and Spanish included)**
218. Ninth Meeting of the IOC Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Paris, 30 March–3 April 2009 **(bilingual English/French)**
219. First Session of the IOC-SCOR International Ocean Carbon Coordination Project (IOCCP) Scientific Steering Group (also IOCCP Reports, 3), Broomfield, Colorado, U.S.A., 1 October 2005 **(electronic copy only)**
220. Second Session of the IOC-SCOR International Ocean Carbon Coordination Project (IOCCP) Scientific Steering Group (also IOCCP Reports, 6), Paris, France, 20 April 2007 **(electronic copy only)**
221. Third Session of the IOC-SCOR International Ocean Carbon Coordination Project (IOCCP) Scientific Steering Group (also IOCCP Reports, 10), Villefranche-sur-mer, France, 3–4 October 2008 **(electronic copy only)**
222. Fourth Session of the IOC-SCOR International Ocean Carbon Coordination Project (IOCCP) Scientific Steering Group (also IOCCP Reports, 15), Jena, Germany, 14 September 2009 **(electronic copy only)**
223. First Meeting of the joint IOC-ICES Study Group on Nutrient Standards (SGONS) (also IOCCP Reports, 20), Paris, France, 23–24 March 2010 **(Executive Summary in E, F, R, S included)**
224. Third Session of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Lisbon, Portugal, 5–6 May 2010 **(Executive Summary in English, French, Russian and Spanish included)**
225. Eleventh Session of the IOC Group of Experts on the Global Sea level Observing System (GLOSS), Paris, 13–15 May 2009 **(electronic copy only)**
226. Second Session of the Panel for Integrated Coastal Observation (PICO-II), Paris, 24–26 February 2009 **(electronic copy only)**
227. First meeting of the Task Team on Seismic Data Exchange in the South West Pacific of the ICG/PTWS Regional Working Group for the Southwest Pacific, Port Vila, Vanuatu, 19–20 October 2009 **(electronic copy only)**
228. Fourth Session of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Paris, France, 20–21 March 2011 **(Executive Summary in English, French, Russian and Spanish included)**
229. Second Session of the IODE Steering Group for Ocean Teacher (SG-OT), Miami, Florida, 11–15 April 2011
230. First Meeting of the Inter-ICG Task Team 1 on Sea Level Monitoring for Tsunami (Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Seattle, USA, 29 November–1 December 2010

231. First Meeting of the Inter-ICG Task Team 2 on Disaster Management and Preparedness (Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Seattle, USA, 29 November–1 December 2010
232. First Meeting of the Inter-ICG Task Team 3 on Tsunami Watch Operations (Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Seattle, USA, 29 November–1 December 2010
233. Primera Reunión del Grupo de Trabajo Regional para América Central del Grupo Intergubernamental de Coordinación del Sistema de Alerta contra los Tsunamis y Atenuación de sus Efectos en el Pacífico (ICG/PTWS), Managua (Nicaragua) del 4 al 6 de noviembre de 2009 (**Resumen dispositivo en español e inglés**)
234. Segunda Reunión del Grupo de Trabajo Regional para América Central del Grupo Intergubernamental de Coordinación del Sistema de Alerta contra los Tsunamis y Atenuación de sus Efectos en el Pacífico (ICG/PTWS), San Salvador (El Salvador) del 28 al 30 de septiembre de 2011 (**Resumen dispositivo en español e inglés**)
235. First Session of the Joint IODE-JCOMM Steering Group for the Global Temperature-Salinity Profile Programme (SG-GTSP), 16–20 April 2012, Ostend, Belgium
236. Ad hoc Session of the Joint JCOMM-IODE Steering Group for the Ocean Data Standards Pilot Project (SG-ODSPP), 23–25 April 2012, Ostend, Belgium
237. First Meeting of the Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region (SCS-WG), Sanya, China, 12–14 December 2011
238. First Meeting of the IODE Steering Group for OceanDocs (SG-OceanDocs), 24–27 January 2012, Ostend, Belgium
239. Fifth Session of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Tokyo, Japan, 15 February 2012 (**Executive Summary in English, French, Russian and Spanish included**)
240. Ad hoc Session of the IODE Group of Experts on Biological and Chemical Data Management and Exchange Practices (GE-BICH), Ostend, Belgium, 25 October 2012
241. Twelfth Session of the IODE Group of Experts on Marine Information Management (GE-MIM), Miami, USA, 22–25 January 2013
242. Twelfth Session of the IOC Group of Experts on the Global Sea level Observing System (GLOSS), Paris, 9–11 November 2011 (**electronic copy only**)
243. Meeting of the Pacific Tsunami Warning System Working Group 2 on Detection, Warning and Dissemination Task Team on PacWave11, Honolulu, USA, 21 May 2012 (**electronic copy only**)
244. Sixth Session of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Paris, 20–21 February 2013 (**Executive Summary in English, French, Russian and Spanish included**)
245. Second Meeting of the Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region (SCS-WG), Petaling Jaya, Malaysia, 16–18 October 2012 (**electronic copy only**)
246. Seventh Meeting of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems, UNESCO, Paris, 12–13 February 2014 (**Executive Summary in English, French, Russian and Spanish included**)
247. Third Meeting of the Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region (SCS-WG), Hong-Kong, China, 6–7 April 2014 (**electronic copy only**)
248. Tercera Reunión del Grupo de Trabajo Regional para América Central del Grupo Intergubernamental de Coordinación del Sistema de Alerta contra los Tsunamis y Atenuación de sus Efectos en el Pacífico (ICG/PTWS), Managua, Nicaragua, del 29 al 30 de septiembre de 2014 (**Resumen dispositivo en español e inglés**)
249. Workshop on Tsunami Modelling and Mitigation of the ICG/CARIBE-EWS Working Group 2: Tsunami Hazard Assessment, 1–3 December 2014, Cartagena de Indias, Colombia (**electronic copy only**)
250. Fourth meeting of the Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region (SCS-WG), Jakarta, Indonesia, 11–12 February 2015 (**electronic copy only**)
251. Eighth Session of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Paris, 12–13 March 2015 (**Executive Summary in English, French, Russian and Spanish included**)
252. Ninth Meeting of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems, UNESCO, Paris, 25-26 February 2016 (**Executive Summary in English, French, Russian and Spanish included**)
253. Fifth Meeting of the Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region (SCS-WG), Manila, Philippines, 2–3 March 2016 (**electronic copy only**)