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1
SECTION 1 – INTRODUCTION

The present Interim Operations Guide was prepared by the Task Team on the Regional Tsunami Warning System Architecture to guide the conduct of tsunami watch messaging tests among candidate Regional Tsunami Watch Centres (RTWCs) to national Tsunami Warning Focal Points (TWFPs) and National Tsunami Warning Centres (NTWCs). The Interim Operations Guide is complementary to the Development Plan for the RTWCs and has the validity of one year, after which it will be substituted by an Operations Guide.

The second session of the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North-eastern Atlantic, the Mediterranean and Connected Seas (ICG/NEAMTWS-II, Nice, 22-24 May 2006) agreed that the architecture of the NEAMTWS should be based on a system of RTWCs, TWFPs and NTWCs. In particular the functions of the RTWCs were defined as follows:

- Collection, recording, processing and analysis of earthquake data for the rapid initial assessment (location, focal depth, magnitude and origin time) as a basis for the alert system
- Computing the tsunami arrival time for specific forecast points
- Collection, recording, processing and analysis of sea level data for tsunami confirmation and monitoring or for cancellation of a tsunami alert at an early state
- To follow a decision making process in accordance with the Communication Plan to create tsunami alert messages
- Dissemination of these messages to the Member States focal points (and national warning centres) in accordance with the Communication Plan, including the tsunami travel time, amplitudes and periods of recorded tsunamis, and cancellation messages
SECTION 2 – ADMINISTRATIVE PROCEDURES

2.1 COORDINATION, FACILITATION AND CAPACITY STRENGTHENING ENTITIES OF THE NEAMTWS

2.1.1 Intergovernmental Oceanographic Commission of UNESCO (IOC)

The IOC was created in 1960 to promote international cooperation and coordinate programs in research, sustainable development, protection of the marine environment, capacity-building for improved management, and decision-making. It assists developing countries in strengthening their institutions to obtain self-driven sustainability in marine sciences. On a regional level, it is coordinating the development of tsunami early warning and mitigation systems in the Pacific, the Indian Ocean, the North-eastern Atlantic and the Mediterranean, and the Caribbean. It also facilitates interagency coordination through the UN-Oceans mechanism and works with the United Nations Environment Programme (UNEP) in establishing a process for global reporting and assessment of the state of the marine environment. Through the Global Ocean Observing System (GOOS)—the ocean component of the Global Climate Observing System (GCOS)—the IOC helps improve operational oceanography, weather and climate forecasts and monitoring and support the sustained observing needs of the United Nations Framework Convention on Climate Change (UNFCCC).

2.1.2 IOC Tsunami Co-ordination Unit (TSU)

In the Pacific Ocean, where roughly 60% of all tsunamis take place, the IOC established a Tsunami Warning System (TWS) in 1965 which has been successfully operating for more than 40 years and ensuring that people living on the ocean’s rim receive prompt forecasts and warnings of impending tsunamis. This fully operational system has proven itself to be effective for many years.

Following the sub-sea earthquake on 26 December 2004 and the subsequent strongest tsunami in living memory, IOC took the lead in coordinating activities and immediate action to establish a Tsunami Warning System (TWS) in the Indian Ocean. The response included the establishment of an interim Tsunami Warning System (TWS) while the interim Tsunami Advisory Information is provided through the Pacific Tsunami Warning Center (PTWC) in Hawaii and the Japan Meteorological Agency (JMA).

The IOC General Assembly XXIII in Paris, 21-30 June 2005, confirmed the immediate action and response to the 2004 tsunami and adopted resolutions to create three additional regional Intergovernmental Coordination Groups (ICGs) for the Indian Ocean (IOTWS), the North-East Atlantic and Mediterranean (NEAMTWS) (Annex I) as well as the Caribbean (CARIBE-EWS) to establish basin-wide tsunami warning systems. Together with the existing System for the Pacific and other relevant UN bodies they are also contributing to the work of a global Working Group on Tsunamis and Other Hazards related to Sea Level Warning and Mitigation Systems (TOWS-WG).

2.1.3 Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North-eastern Atlantic, the Mediterranean and Connected Seas (ICG/NEAMTWS)

The Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North-eastern Atlantic, the Mediterranean and connected seas (ICG/NEAMTWS) was formed in response to the tragic tsunami on December 26th 2004, in which over 250,000 lives were lost around the Indian Ocean region. The Intergovernmental
Oceanographic Commission of UNESCO (IOC-UNESCO) received a mandate from the international community to coordinate the establishment of the System during the course of several international and regional meetings, including the World Conference on Disaster Reduction (Kobe, Japan, 18 – 22 January 2005), and the Phuket Ministerial Meeting on Regional Cooperation on Tsunami Early Warning Arrangements (Phuket, Thailand, 28 and 29 January 2005). The IOC Assembly, during its twenty-third Session (21-30 June 2005), formally established the ICG/NEAMTWS through Resolution IOC-XXIII-14. The objectives of the ICG/NEAMTWS are:

1. To coordinate the activities of the ICG/NEAMTWS;
2. To organize and facilitate, as appropriate, the exchange of seismic, geodetic, sea-level and other data in or near real-time and information required for interoperability of the ICG/NEAMTWS;
3. To promote the sharing of experience and expertise related to tsunami warning and mitigation for the north-eastern Atlantic, the Mediterranean and connected seas;
4. To promote tsunami research;
5. To promote the establishment and further development of national tsunami warning and mitigation capacities in accordance with standard protocols and methods;
6. To develop, adopt and monitor implementation of work plans of the ICG/NEAMTWS, and to identify required resources;
7. To promote implementation of relevant capacity-building;
8. To liaise and coordinate with other tsunami warning systems;
9. To liaise with other relevant organizations, programmes and projects;
10. To promote the implementation of the ICG/NEAMTWS within a multi-hazard framework;
11. To develop a comprehensive programme of capacity-building on tsunami protection for the north-eastern Atlantic, the Mediterranean and connected seas, including the Black Sea;
12. To keep under constant scrutiny the status of the system and how it satisfies the needs.

2.2 STRUCTURAL ELEMENTS OF THE NEAMTWS

Regional Tsunami Watch Centres (RTWCs), Tsunami National Contacts (TNCs), Tsunami Warning Focal Points (TWFPs) and National Tsunami Warning Centres (NTWCs) are basic structural elements of the TWS in the NEAM region. The functions of such components of the NEAMTWS have been adopted by the ICG at the second session of the NEAMTWS held in Nice, 22-24 May 2006. Member States nominated TNCs and TWFPs according to a specific form (Annex II). The different levels of functions of the architecture of the NEAMTWS are represented in Fig. 2-1.
2.2.1 Tsunami National Contact (TNCs)

The person designated by an ICG Member State government to represent his/her country in the coordination of international tsunami warning and mitigation activities. The person is part of the main stakeholders of the national tsunami warning and mitigation system program. The person may be the Tsunami Warning Focal Point, from the national disaster management organization, from a technical or scientific institution, or from another agency with tsunami warning and mitigation responsibilities.

2.2.2 Tsunami Warning Focal Point (TWFP)

The Tsunami Warning Focal Point (TWFP) is a 7x24 contact person, or other official point of contact or address designated by a government, available at the national level for rapidly receiving and issuing tsunami event information (such as warnings). The Tsunami Warning Focal Point either is the emergency authority (civil defense or other designated agency responsible for public safety), or has the responsibility of notifying the emergency authority of the event characteristics (earthquake and/or tsunami), in accordance with national standard operating procedures. The Tsunami Warning Focal Point receives international tsunami warnings from the NEAMTWS or other regional warning centers. The TWFP contact information requires 7x24 telephone, facsimile, or e-mail information. The TWFP may be contacted for clarification concerning the designated communication method or in an emergency if all designated communication methods fail.

- Reception of the messages transmitted by the Regional Tsunami Watch Centres
- Evaluate and issue national warnings in accordance with the National Emergency Plan
- Transmission of warning messages to the National Emergency Authorities
2.2.3 Regional Tsunami Watch Centres (RTWCs)

- Collection, record, processing and analysis of earthquake data for the rapid initial assessment (locate the earthquake, the depth, the magnitude, the origin time) as a basis for the alert system
- Computing the arrival time of the tsunami in the forecasting points listed in the Communication Plan
- Collection, record, processing and analysis of sea level data for confirming and monitoring the tsunami or for canceling elements of the alert system
- A decision making process in accordance with the Communication Plan to elaborate messages
- Dissemination to the Member States focal points (and national warning centres) of the messages in accordance with the Communication Plan, included the tsunami travel time, the amplitude and period of tsunami measured, and cancellation messages

2.2.4 National Tsunami Warning Centres (NTWCs)

- Collect, record, and process earthquake data for the rapid initial warning (locate the earthquake, the depth, the magnitude, the origin time)
- Compute the arrival time of the tsunami in the national forecasting points
- Collect, record, and process sea level data for confirming or cancelling the warning

Warning Centres strive to be:

- Rapid, by providing warnings as soon as possible after a potential tsunami generation
- Accurate, by issuing warnings for all destructive tsunamis while minimizing false warnings
- Reliable, by making sure they operate continuously, and that their messages are sent and received promptly and understood by the users of the system.

As of 28 August 2009, the following Member States from the NEAM region have nominated TNCs and TWFPs (Table 2-1).

<table>
<thead>
<tr>
<th>Member State</th>
<th>TNC</th>
<th>TWFP</th>
</tr>
</thead>
<tbody>
<tr>
<td>BELGIUM</td>
<td></td>
<td>Algemene Directie Crisiscentrum*†</td>
</tr>
<tr>
<td>BULGARIA</td>
<td>Bulgarian Institute of Oceanology (BAS)</td>
<td>Bulgarian Institute of Oceanology (BAS)</td>
</tr>
<tr>
<td>CAPE VERDE</td>
<td>Instituto Nacional de Meteorologia e Geofisica</td>
<td>Instituto Nacional de Meteorologia e Geofisica</td>
</tr>
<tr>
<td>CROATIA</td>
<td>Institute of Oceanography and Fisheries*†</td>
<td></td>
</tr>
<tr>
<td>CYPRUS</td>
<td>Cyprus Oceanography Centre, University of Cyprus</td>
<td>Cyprus Oceanography Centre, University of Cyprus</td>
</tr>
<tr>
<td>Member State</td>
<td>TNC</td>
<td>TWFP</td>
</tr>
<tr>
<td>--------------</td>
<td>----------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td><strong>Cyprus</strong></td>
<td><strong>Cyprus</strong></td>
</tr>
<tr>
<td><strong>DENMARK</strong></td>
<td>Danish Meteorological Institute</td>
<td>Danish Meteorological Institute</td>
</tr>
<tr>
<td><strong>EGYPT</strong></td>
<td>National Research Institute of Astronomy and Geophysics (NRIAG)</td>
<td>National Research Institute of Astronomy and Geophysics (NRIAG)</td>
</tr>
<tr>
<td></td>
<td>National Institute of Oceanography and Fisheries (NIOF)</td>
<td>National Institute of Oceanography and Fisheries (NIOF)</td>
</tr>
<tr>
<td><strong>ESTONIA</strong></td>
<td>Estonian Marine Institute, University of Tartu*</td>
<td>Estonian Marine Institute, University of Tartu*</td>
</tr>
<tr>
<td><strong>FINLAND</strong></td>
<td>Finnish Institute of Marine Research</td>
<td>Monitoring Center for Natural Disasters, Finnish Meteorological Institute</td>
</tr>
<tr>
<td><strong>FRANCE</strong></td>
<td>Ministère de l’Ecologie, du Développement et de l’Aménagement Durables</td>
<td>Laboratoire de Géophysique, Commissariat à l’Energie Atomique (CEA)</td>
</tr>
<tr>
<td><strong>GERMANY</strong></td>
<td>Federal Maritime and Hydrographic Agency (BSH)</td>
<td></td>
</tr>
<tr>
<td><strong>GREECE</strong></td>
<td>Technical University of Crete, Department of Environmental Engineering*</td>
<td>National Observatory of Athens (NOA)*</td>
</tr>
<tr>
<td></td>
<td>National Observatory of Athens (NOA)*</td>
<td></td>
</tr>
<tr>
<td><strong>IRELAND</strong></td>
<td>Geological Survey of Ireland*</td>
<td></td>
</tr>
<tr>
<td><strong>ISRAEL</strong></td>
<td>Israel Oceanographic and Limnological Research*</td>
<td></td>
</tr>
<tr>
<td><strong>ITALY</strong></td>
<td>Dipartimento della Protezione Civile</td>
<td>Dipartimento della Protezione Civile</td>
</tr>
<tr>
<td><strong>LEBANON</strong></td>
<td>Geophysical National Center, National Council for Scientific Research*</td>
<td>Geophysical National Center, National Council for Scientific Research*</td>
</tr>
<tr>
<td><strong>MALTA</strong></td>
<td>Ministry of Foreign Affairs*</td>
<td>Ministry of Foreign Affairs*</td>
</tr>
<tr>
<td><strong>MONACO</strong></td>
<td>Centre Scientifique de Monaco</td>
<td>Compagnie des Sapeurs-Pompiers de Monaco</td>
</tr>
<tr>
<td><strong>NETHERLANDS</strong></td>
<td>KNMW Royal Netherlands Meteorological Institute</td>
<td></td>
</tr>
<tr>
<td><strong>NORWAY</strong></td>
<td>Directorate for Civil Protection and Emergency Planning (DSB)</td>
<td></td>
</tr>
<tr>
<td><strong>POLAND</strong></td>
<td>National Centre for Coordination of Rescue Operations and Protection of Population, National Headquarters of the State Fire Service</td>
<td></td>
</tr>
<tr>
<td><strong>PORTUGAL</strong></td>
<td>Instituto de Meteorologia</td>
<td>Instituto de Meteorologia</td>
</tr>
<tr>
<td><strong>ROMANIA</strong></td>
<td>National Institute for Earth Physics</td>
<td>National Institute for Earth Physics</td>
</tr>
<tr>
<td><strong>RUSSIAN FEDERATION</strong></td>
<td>State Institute Research and Production Association “Typhoon”</td>
<td>State Institute Research and Production Association “Typhoon”</td>
</tr>
<tr>
<td><strong>SLOVENIA</strong></td>
<td>Environmenta Agency of the Republic of Slovenia (EARS)</td>
<td></td>
</tr>
<tr>
<td><strong>SPAIN</strong></td>
<td>Instituto Español de Oceanografía</td>
<td>Jefe del Área de Riesgos Naturales, Dirección General de Protección Civil y Emergencias</td>
</tr>
<tr>
<td><strong>SYRIA</strong></td>
<td>Syrian Wireless Organization (SWO), Ministry of Telecommunication and Technology</td>
<td>Syrian Wireless Organization (SWO), Ministry of Telecommunication and Technology</td>
</tr>
<tr>
<td><strong>SWEDEN</strong></td>
<td>Swedish Civil Contingencies Agency*†</td>
<td>Swedish Meteorological and Hydrological Institute (SMHI)*†</td>
</tr>
<tr>
<td><strong>TURKEY</strong></td>
<td>Kandilli Observatory and Earthquake Research Institute (KOERI)</td>
<td>Kandilli Observatory and Earthquake Research Institute (KOERI)</td>
</tr>
<tr>
<td><strong>UKRAINE</strong></td>
<td>Marine Hydrophysical Institute, National</td>
<td></td>
</tr>
</tbody>
</table>
2.3 USERS GUIDE RESPONSIBILITIES

The Operational Users Guide is prepared by the Task Team on the Regional Tsunami Warning System Architecture — established by ICG/NEAMTWS-IV (Lisbon, 2007) and confirmed by ICG/NEAMTWS-V (Athens, 2008) and ICG/NEAMTWS-VI (Istanbul, 2009) — and the Secretariat. They are also responsible for its periodic update.

The fifth session of the ICG/NEAMTWS (Athens, 3–5 November 2009) adopted roles, requirements and performance indicators for RTWCs and NTWCs, in addition to the roles of TWFPs, as follows. Mandatory requirements are indicated in bold (Table 2-2).

<table>
<thead>
<tr>
<th>Regional Tsunami Watch Centres (RTWCs)</th>
<th>National Tsunami Warning Centres (NTWCs)</th>
<th>Tsunami Warning Focal Points (TWFPs)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Roles and requirements</strong></td>
<td><strong>Recommended roles and performances</strong></td>
<td><strong>Roles</strong></td>
</tr>
<tr>
<td><strong>Watch</strong></td>
<td><strong>Warning/Watch</strong></td>
<td></td>
</tr>
<tr>
<td>• Reception and interpretation of RT seismic and sea-level measurements</td>
<td>• Reception and interpretation of RT seismic &amp; sea level measurements</td>
<td>• Reception of the messages transmitted by the Regional Tsunami Watch Centres</td>
</tr>
<tr>
<td>• Determination of seismic parameters</td>
<td>• Reception of RTWC messages</td>
<td>• Evaluate and issue national warnings in accordance with the National Emergency Plan</td>
</tr>
<tr>
<td>• Forecasting of tsunami arrival times and level of alert at each forecasting point specified by MS</td>
<td>• Dissemination of warning and cancellation messages to national authorities according to the national response plan</td>
<td>• Transmission of warning messages to the National Emergency Authorities</td>
</tr>
<tr>
<td>• Exchange seismic parameters and information with other RTWCs and NTWCs</td>
<td>• Monitoring tsunami propagation and update information to national authorities</td>
<td></td>
</tr>
<tr>
<td>• Disseminate watch and cancellation messages based on the alert-level decision matrix to NTWCs and the TWFPs</td>
<td>• Determination of seismic parameters</td>
<td></td>
</tr>
<tr>
<td>• Monitoring of tsunami propagation and disseminate updated information in priority tsunami amplitude measurements</td>
<td>• Forecasting of tsunami arrival time, amplitude and run-up for the national coastline</td>
<td></td>
</tr>
<tr>
<td>• Capability of acting as a backup centre to other RTWCs</td>
<td>• Provision of information to other national TWCs and RTWCs</td>
<td></td>
</tr>
<tr>
<td>• Function as a NTWC</td>
<td>• Acting as National Tsunami Warning Focal Point (TWFP)</td>
<td></td>
</tr>
</tbody>
</table>

**Table 2-2 Roles and requirements for RTWCs, NTWCs and TWFPs**

**Bold:** all information provided

* Official form not provided

† Validation needed through either the Permanent Delegate to UNESCO, the Head of the UNESCO National Commission or the Minister of Foreign Affairs
<table>
<thead>
<tr>
<th>Roles and requirements</th>
<th>Recommended roles and performances</th>
<th>Tsunami Warning Focal Points (TWFPs)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Above and beyond watch time</strong></td>
<td><strong>Above and beyond watch time</strong></td>
<td><strong>Roles</strong></td>
</tr>
<tr>
<td>• Monthly tests of the watch system</td>
<td>• National Tsunami Emergency Plan</td>
<td></td>
</tr>
<tr>
<td>• Procedures and documentation</td>
<td>• National Procedures (SOP), documentation</td>
<td></td>
</tr>
<tr>
<td>• Regional tsunami exercises</td>
<td>• National tsunami exercises</td>
<td></td>
</tr>
<tr>
<td>• Conduct training courses with other RTWCs and IOC</td>
<td>• Catalogue of inundation scenarios</td>
<td></td>
</tr>
<tr>
<td>• Participate actively and report to the ICG and WGs</td>
<td>• National tsunami data base</td>
<td></td>
</tr>
<tr>
<td><strong>Requirements</strong></td>
<td><strong>Requirements</strong></td>
<td></td>
</tr>
<tr>
<td>• Seismic as well as tsunami/oceanographic expertise</td>
<td>• Seismic as well as tsunami/oceanographic expertise</td>
<td></td>
</tr>
<tr>
<td>• Direct access to a tsunami and large earthquakes data base</td>
<td>• Access to tsunami &amp; large earthquakes data base</td>
<td></td>
</tr>
<tr>
<td>• Real-time transmission systems for reception of data</td>
<td>• Real-time transmission systems for reception of data</td>
<td></td>
</tr>
<tr>
<td>• Real-time alert reception and transmission systems like GTS, Internet...</td>
<td>• Real-time alert reception system - e.g. GTS</td>
<td></td>
</tr>
<tr>
<td>• Backup/independent power supply</td>
<td>• Backup/independent power supply</td>
<td></td>
</tr>
<tr>
<td>• Permanent staff on 24/7 watch</td>
<td>• Permanent staff on 24/7 watch</td>
<td></td>
</tr>
<tr>
<td>• Tsunami modelling capacity to produce and update canned scenarios</td>
<td>• Inundation modelling capacity</td>
<td></td>
</tr>
<tr>
<td><strong>Operating 24/7</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SECTION 3 – NEAMTWS PROCEDURES

3.1 OPERATIONAL PROCEDURES

Functioning of the system begins with the detection of an earthquake of sufficient size to trigger an alarm at the TWC. Generally, this will occur within a few minutes of the occurrence of any earthquake in the NEAM region with a magnitude above about 5.0. Duty personnel respond immediately and begin their analysis of the event. The TWCs are staffed on a 7x24 basis to be able to immediately respond. The analysis includes automatic and interactive processes for determining the earthquake's epicentre, depth, and origin time, as well as its magnitude. Based on these parameters, a decision is made concerning further action. If the event meets the criteria defined by the appropriate decision matrix, then a tsunami message is issued.

Whenever there is a potential for a tsunami threat at any coastal area, the TWC will continuously check sea level data from the stations closer to the epicentre for evidence of a tsunami. Based on these data and on any credible reports of tsunami wave activity from the media or national agencies, and using historical data and numerical model outputs as a reference, further evaluation of the threat is made. If a tsunami has been generated that poses a continuing threat, the TWC will issue additional messages until the tsunami threat is ended. In response to a tsunami alert message (advisory or watch), national or regional authorities implement their own pre-determined procedures that include issuing evacuation instructions to coastal areas when appropriate. If sea level data indicate, however, that either a negligible or no tsunami has been generated the TWC will issue a cancellation of its previously disseminated alert. This is most often the case since most large earthquakes with the potential to generate a destructive tsunami do not actually do so.

The criteria used in the NEAM region for the issuance of tsunami messages was given in paragraph 3.3, as defined by Decision Matrixes adequate for the NE Atlantic and for the Mediterranean.

3.2 TSUNAMI MESSAGES

3.2.1 Types of Messages

Tsunami messages refer to all messages issued by RTWCs in the NEAM region that are destined to the National TWFPs and/or NTWCs for further processing by emergency management agents (directly or second hand). Its content must convey the basic information required by these authorities. If there is a threat of any sort to the coastal areas, the messages related to this threat are called tsunami alert messages.

Ideally, the name of the tsunami alert message should already provide 3 of the main instances of information required by emergency management agencies (following CAP notation): urgency, severity, and certainty. The forth required information, the affected area, would appear immediately in the text of the message as the list of countries concerned by that particular message type. In this way, the very first few lines of a tsunami message would convey already the basic tsunami information to the recipient. The details of the threat evaluation would appear later in the message.

For each information instance, urgency, severity, and certainty, we suggest 2 levels of threat:

<table>
<thead>
<tr>
<th></th>
<th>Level I (high)</th>
<th>Level II (low)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Urgency</strong></td>
<td>Tsunami to arrive in less than 2 hours</td>
<td>Tsunami to arrive in more than 2 hours</td>
</tr>
<tr>
<td><strong>Severity</strong></td>
<td>Tsunami wave height greater than</td>
<td>Tsunami wave height less than 0.5m and/or</td>
</tr>
</tbody>
</table>
And for each level we suggest the use of the following keywords to classify them:

<table>
<thead>
<tr>
<th>Level definition for the 3 parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Level I (high)</strong></td>
</tr>
<tr>
<td>Urgency</td>
</tr>
<tr>
<td>Severity</td>
</tr>
<tr>
<td>Certainty</td>
</tr>
</tbody>
</table>

1 Already agreed by the ICG/NEAMTWS

Using all combinations possible we could have 8 message types that are formed by combinations of the words selected for each level in the table above. This is a very high number of messages that could be confusing for the users and so we propose the following simplifications.

Firstly, in the NEAM region the reception of a tsunami alert message requires an immediate action to be taken by the agents and so the urgency field can be omitted.

As regards certainty, the information will be provided in the content of the message and proper training of the agents involved will help the emergency managers to grasp fast this content. In fact, the first message related to a tsunami threat will be always based exclusively on seismic information. This information, by itself, is not sufficient to decide if a tsunami was indeed generated and so its certainty is low 1. The Tsunami Response Plan in each country should define the actions to be taken in this case. When sea-level data is gathered and processed, following messages should confirm, update the threat or cancel it with a very high degree of certainty. And so, in a series of messages related to the same tsunami threat, the sequential order of messages do represent an implicit increase in certainty and this fact should be understood by the message recipients.

These simplifying options leave us with only two types of tsunami alert messages that convey only the severity information in its name:

<table>
<thead>
<tr>
<th>Message Type</th>
<th>Tsunami Wave</th>
<th>Effects on the coast</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tsunami Watch</td>
<td>Tsunami wave height greater than 0.5m and/or tsunami run-up greater than 1m</td>
<td>Coastal inundation</td>
</tr>
<tr>
<td>Tsunami Advisory</td>
<td>Tsunami wave height less than 0.5m and/or tsunami run-up less than 1m</td>
<td>Currents, Bore, recession, damage in harbours, small inundation on beaches</td>
</tr>
</tbody>
</table>

In addition to the tsunami alert messages, we have to consider two additional types of messages, tsunami information and tsunami communication test.

The Tsunami Information is a message issued to advise the NEAM recipients of the occurrence of a major earthquake in the area but with an evaluation that there is no tsunami

1 The certainty level also depends on the magnitude of the tsunamigenic earthquake. See discussion in paragraph 4.4.1.
threat. The thresholds for the issuing of this type of messages are defined in the Decision Matrixes for the Mediterranean and for the NE Atlantic, as agreed by the ICG/NEAMTWS (see below).

For the National Tsunami Warning Centres (NTWCs) it is recommended that a National Tsunami Information message could be sent in the case of an earthquake felt at or close to the coast, of any magnitude. The tsunami information message will then be used to prevent unnecessary evacuations most frequently.

The Tsunami Communication Test is a message issued by the RTWCs at unannounced times to test the operation of the tsunami warning systems.

3.2.2 Structure of Messages, Affected Area and Sequence

In the NEAM region, due to its basin structure, there is no tsunami that can affect all countries with the same threat level. However, it could be confusing to send different messages to different countries referring to the same tsunami event. We propose that all National TWFP in the NEAM region will receive the same tsunami message. This means that the same message will contain in the same body more than one type of messages: tsunami watch, tsunami advisory, and tsunami information. We propose that the header part of the tsunami message should contain the sequence of pairs of fields, message type and affected area, by a decreasing order of threat. The type of such a composed message will be the one that corresponds to the highest level of tsunami threat. This means that some coastal area in the NEAM region is subject to that type of tsunami threat. Thus, a Tsunami Watch message will also contain a Tsunami Advisory and a Tsunami Information types of messages, while a Tsunami Advisory will contain also a Tsunami Information type of message.

The area affected by a certain tsunami threat is defined in the Decision Matrixes agreed by the ICG/NEAMTWS, according to 3 spatial ranges of tsunamis:

<table>
<thead>
<tr>
<th>Tsunami range</th>
<th>Mediterranean</th>
<th>NE Atlantic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>&lt; 100 km</td>
<td>&lt; 100 km</td>
</tr>
<tr>
<td>Regional</td>
<td>100 km to 400 km</td>
<td>100 km to 1000 km</td>
</tr>
<tr>
<td>Basin</td>
<td>&gt; 400 km</td>
<td>&gt; 1000 km</td>
</tr>
</tbody>
</table>

The tsunami message type related to one given country is defined by the worst case that can be found on any coastal area of that country, set up according to the Decision Matrix.
### Decision Matrix for Mediterranean

<table>
<thead>
<tr>
<th>Depth</th>
<th>Location</th>
<th>Mw</th>
<th>Tsunami Potential</th>
<th>Type of Bulletin</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 100 km</td>
<td>Offshore or close to the coast (≤ 40 km inland)</td>
<td>5.5 à 6.0</td>
<td>weak potential of local tsunami</td>
<td>Information Bulletin</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6.0 à 6.5</td>
<td>Potential of destructive local tsunami &lt; 100 km</td>
<td>Regional Tsunami Advisory</td>
</tr>
<tr>
<td></td>
<td>Offshore or close to the coast (≤ 100 km inland)</td>
<td>6.5 à 7.0</td>
<td>Potential of destructive regional tsunami &lt; 400 km</td>
<td>Regional Tsunami Watch - Basin-wide Tsunami Advisory</td>
</tr>
<tr>
<td></td>
<td></td>
<td>≥ 7.0</td>
<td>Potential of destructive tsunami in the whole basin &gt; 400 km</td>
<td>Basin-wide Tsunami Watch</td>
</tr>
<tr>
<td></td>
<td>Inland (&gt; 40 km and ≤ 100 km)</td>
<td>5.5 à 7.0</td>
<td>weak potential of local tsunami</td>
<td>Information Bulletin</td>
</tr>
<tr>
<td>≥ 100 km</td>
<td>Offshore or inland (≤ 100 km)</td>
<td>≥ 5.5</td>
<td>Nil</td>
<td>Information Bulletin</td>
</tr>
</tbody>
</table>

*No message if the earthquake is localized inland beyond 100 km distance*

### Decision Matrix for the NE Atlantic

<table>
<thead>
<tr>
<th>Depth</th>
<th>Location</th>
<th>Mw</th>
<th>Tsunami Potential</th>
<th>Type of Bulletin</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 100 km</td>
<td>Offshore or close to the coast (≤ 40 km inland)</td>
<td>5.5 à 6.0</td>
<td>weak potential of local tsunami</td>
<td>Information Bulletin</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6.0 à 6.5</td>
<td>Potential of destructive local tsunami &lt; 100 km</td>
<td>Regional Tsunami Advisory</td>
</tr>
<tr>
<td></td>
<td>Offshore or close to the coast (≤ 100 km inland)</td>
<td>6.5 à 7.0</td>
<td>Potential of destructive regional tsunami &lt; 400 km</td>
<td>Regional Tsunami Watch - Basin-wide Tsunami Advisory</td>
</tr>
<tr>
<td></td>
<td></td>
<td>≥ 7.0</td>
<td>Potential of destructive tsunami in the whole basin &gt; 400 km</td>
<td>Basin-wide Tsunami Watch</td>
</tr>
<tr>
<td></td>
<td>Inland (&gt; 40 km and ≤ 100 km)</td>
<td>5.5 à 7.0</td>
<td>weak potential of local tsunami</td>
<td>Information Bulletin</td>
</tr>
<tr>
<td>≥ 100 km</td>
<td>Offshore or inland (≤ 100 km)</td>
<td>≥ 5.5</td>
<td>Nil</td>
<td>Information Bulletin</td>
</tr>
</tbody>
</table>

*No message if the earthquake is localized inland beyond 100 km distance*
Revised decision matrices

### Mediterranean

<table>
<thead>
<tr>
<th>Profondeur</th>
<th>Mw</th>
<th>Localisation</th>
<th>Menace potentielle</th>
<th>Type de Bulletin</th>
<th>Menace à spécifier</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Local</td>
</tr>
<tr>
<td>&lt; 100 km</td>
<td>6.5</td>
<td>En mer ou distance à la côte (D_c &lt; 40 \text{ km})</td>
<td>Potentiel faible de tsunami destructeur local</td>
<td>Information</td>
<td>Information</td>
</tr>
<tr>
<td></td>
<td>6.0</td>
<td>En mer ou distance à la côte (D_c &lt; 40 \text{ km})</td>
<td>Potentiel de tsunami destructeur local</td>
<td>Advisory</td>
<td>Watch</td>
</tr>
<tr>
<td></td>
<td>6.5</td>
<td>En mer ou distance à la côte (D_c &lt; 100 \text{ km})</td>
<td>Potentiel de tsunami destructeur local</td>
<td>Watch</td>
<td>Watch</td>
</tr>
<tr>
<td></td>
<td>7.0</td>
<td>En mer ou distance à la côte (D_c &lt; 100 \text{ km})</td>
<td>Potentiel de tsunami destructeur local</td>
<td>Watch</td>
<td>Watch</td>
</tr>
<tr>
<td>≥ 100 km</td>
<td>5.5</td>
<td>En mer ou distance à la côte (D_c &lt; 100 \text{ km})</td>
<td>Potentiel nul</td>
<td>Information</td>
<td>Information</td>
</tr>
</tbody>
</table>

\(D_c = \text{distance à la côte (à terre)}\)

Pas de message si \(D_c > 100 \text{ km}\)

Pas de message si \(M_w < 6.5 \text{ et } D_c > 40 \text{ km}\)

Pas de message si \(M_w < 5.5\)

### North-eastern Atlantic

<table>
<thead>
<tr>
<th>Profondeur</th>
<th>Mw</th>
<th>Localisation</th>
<th>Menace potentielle</th>
<th>Type de Bulletin</th>
<th>Menace à spécifier</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Local</td>
</tr>
<tr>
<td>&lt; 100 km</td>
<td>5.5</td>
<td>En mer ou distance à la côte (D_c &lt; 40 \text{ km})</td>
<td>Potentiel faible de tsunami destructeur local</td>
<td>Information</td>
<td>Information</td>
</tr>
<tr>
<td></td>
<td>6.0</td>
<td>En mer ou distance à la côte (D_c &lt; 40 \text{ km})</td>
<td>Potentiel de tsunami destructeur local</td>
<td>Advisory</td>
<td>Watch</td>
</tr>
<tr>
<td></td>
<td>7.0</td>
<td>En mer ou distance à la côte (D_c = 100 \text{ km})</td>
<td>Potentiel de tsunami destructeur local</td>
<td>Watch</td>
<td>Watch</td>
</tr>
<tr>
<td></td>
<td>7.5</td>
<td>En mer ou distance à la côte (D_c &lt; 100 \text{ km})</td>
<td>Potentiel de tsunami destructeur local</td>
<td>Watch</td>
<td>Watch</td>
</tr>
<tr>
<td>≥ 100 km</td>
<td>5.5</td>
<td>En mer ou distance à la côte (D_c &lt; 100 \text{ km})</td>
<td>Potentiel nul</td>
<td>Information</td>
<td>Information</td>
</tr>
</tbody>
</table>

\(D_c = \text{distance à la côte (à terre)}\)

Pas de message si \(D_c > 100 \text{ km}\)

Pas de message si \(M_w < 6.5 \text{ et } D_c > 40 \text{ km}\)

Pas de message si \(M_w < 6.5\)

The Tsunami Information and Tsunami Communication Test messages will be singles. They will not be followed by any further message related to the same tsunami event. This will not be the case for Tsunami Alert Messages, Advisories and Watches.

When there is a tsunami threat that deserves the issuing of a Tsunami Alert Message, the threat must be followed by the NEAM RTWCs and a sequence of messages is expected until the alert is ended or is cancelled after the observation of sea-level measurements.
The first tsunami alert message in a sequence related to a tsunami threat is based exclusively on seismic information. This information, by itself, is not sufficient to decide if a tsunami was indeed generated and so its certainty is low. The subsequent messages will already contain an evaluation of the tsunami threat with sea-level measurements. These supplement second messages may confirm the previous alert, change the level of alert or cancel it. If there is a significant change in the revised earthquake parameters, like its magnitude, location or focal depth, that change the estimated tsunami threat, then a supplement tsunami alert message may be sent by the RTWC conveying this information.

A Tsunami Alert message is ended when the RTWC estimates that the tsunami threat is over and no more tsunami waves are expected and its effects subdued.

Two situations are considered:
- a tsunami has been observed: the message is end of watch or end of advisory
- no tsunami was generated: the message is tsunami watch cancelation or tsunami advisory cancelation

This message cannot be interpreted as an “all-clear” message. The issuing of “all-clear” messages is a national responsibility of the emergency managers and should take into account the local safety conditions (see also paragraph 4.6.4.).

Any Tsunami Alert Sequence is then composed of one initial message; zero, one or more supplement messages and is always finished by an end of alert or alert cancellation message. The sequencing of tsunami messages is summarized in the table below.

<table>
<thead>
<tr>
<th>Message Type</th>
<th>Message Type</th>
<th>#1</th>
<th>#2 … #N-1</th>
<th>#N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tsunami Watch</td>
<td>Initial</td>
<td></td>
<td>supplement (0, 1 or more)</td>
<td>end of watch</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>or watch cancellation</td>
</tr>
<tr>
<td>Tsunami Advisory</td>
<td>Initial</td>
<td></td>
<td>supplement (0, 1 or more)</td>
<td>end of advisory</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>or advisory cancelation</td>
</tr>
<tr>
<td>Tsunami Information</td>
<td>Single</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tsunami Communication Test</td>
<td>Single</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 3.2.3 Tsunami Forecast Points

As part of their standard operating procedures for responding to potentially tsunamigenic events, the Regional Tsunami Watch Centres (RTWCs) in the NEAM region calculate expected tsunami arrival times (ETA) to various, pre-determined forecast points. Forecast points are agreed-upon points chosen by the RTWCs and countries. They may correspond to important coastal cities or populations, and/or to the locations of sea level gauges. In addition, some of the RTWCs (and/or NTWCs) may be able also to forecast tsunami wave amplitudes at the forecast points in order to decide on the level of potential tsunamigenic threat (see Figure 1 for a definition of the concepts).

In the NEAM region, the level of threat for a given country or region is defined in terms of its distance to the earthquake source and not by the estimated tsunami arrival time, as it happens in Pacific, for example (see the Decision Matrixes above).

When a country is in a Watch or Advisory status only, the ETAs for its forecast points that meet the criteria will be listed in the tsunami alert messages issued by the RTWCs.

Message recipients should be aware that the estimated arrival times given in tsunami alert messages should only be used as general guidance about when a tsunami impact might commence. This is due to the dependency of propagation speed on the bottom topography.
and morphology, especially near-shore where the accuracy of the calculation is most heavily dependent on the accuracy of the bathymetry. As a consequence actual arrival times of the first-arriving significant wave may vary substantially from the predicted times. Thus, the primary value of quickly calculating an estimated tsunami arrival time is to provide immediate guidance to the RTWC, National TWFP, NTWC, and to other emergency response stakeholders responsible for issuing and acting upon tsunami alerts to ensure public safety.

![Diagram of tsunami wave periods and amplitudes](image)

**Figure 1 – Definition of the main parameters that are communicated between RTWC, National TWFP, NTWC and emergency managers: (i) the estimated tsunami arrival time (ETA); (ii) the maximum tsunami amplitude. Adapted from the Tsunami Glossary, by IOC/ITIC.**

The list of Tsunami Forecast Points submitted to the IOC Secretariat as of 3 March 2011 is included in Annex III.

### 3.2.4 Tsunami Message Identifiers

To be prepared by the Task Team on Communication Test and Tsunami Exercises.
SECTION 4 – THE NEAM REGIONAL TSUNAMI WARNING CENTERS (NEAM-RTWC)

4.1 INTRODUCTION

This section is conceived to apply to any generic candidate to a Regional Tsunami Watch Centre in the NEAM region, the NEAM-RTWCs. The section will be updated as RTWCs will enter into operation.

4.2 SEA BASIN

The sea basins included in the NEAM region are all interconnected, but they can hardly be involved altogether by the same tsunami or other coastal inundation hazard event, irrespective of its size (see Figure 2). For example, straits like the Bosporus form an obstacle difficult to overcome for all tsunamis that occur in the Black Sea that cannot penetrate in the next Marmara Sea. Likewise, the Gibraltar straits are a natural barrier for tsunamis generated in the Atlantic Ocean (see the 1755 case) that attenuate strongly while crossing this strait as well as for tsunamis produced in the Mediterranean Sea. The same is true for tsunamis across the Messina straits, Italy, which divides the Tyrrenian Sea from the Ionian Sea. In addition, one may identify other less effective barriers preventing the free propagation of tsunamis, such as the broad and relatively shallow Sicily channel between eastern and western Mediterranean.

One consequence of this basin geometry is that there is a domain partition in the NEAM region that will dominate the area of responsibility of each RTWC, prevailing over the simple distance criteria defined in the Tsunami Decision Matrixes for the NEAM region.
4.3 OPERATIONAL PROCEDURES

4.3.1 Response and Analysis

The Tsunami Watch Centre initiates its functions with the detection of an earthquake of sufficient size to trigger a message at the NEAM-RTWC. Given the short distance of the tsunamigenic sources to the coast in the NEAM region, the seismic waveforms start to be collected at the RTWC only a few seconds after the onset of the earthquake. The RTWC duty personnel will respond immediately and begin their analysis of the event. The NEAM-RTWCs are staffed on a 24x7 basis to be able to respond quickly to any tsunamigenic earthquake. It is desirable that a first evaluation of the earthquake parameters is computed in less than 5 minutes after its origin time. The earthquake analysis includes automatic and interactive processes for determining the earthquake's epicentre, depth, and origin time, as well as its magnitude. The magnitude scale adopted by the ICG/NEAMTWS is the moment magnitude, $M_w$. Normally, the first estimates of $M_w$ have to be derived from a small length of the seismic waveforms by some standard procedures that have been agreed upon by the ICG/NEAMTWS. The earthquake evaluation will continue after the first message is issued, integrating more data and allowing more extensive analysis. If there are significant changes to the initial parameters, then the NEAM-RTWC may decide to issue a supplement message.

Applying the Tsunami Decision Matrix to the earthquake parameters will provide the appropriate message type that will be issued by the NEAM-RTWC. Whenever any kind of tsunami alert is issued (Watch or Advisory), as well as for near-warning-level events, the NEAM-RTWC will continuously monitor the water level data from the sea level stations located near the epicentre, and from deep ocean sea level gauges, for evidence of a tsunami. Based on these data and on any credible reports of tsunami wave activity from national agencies or the media, and using historical data and numerical forecast model outputs for decision guidance, an evaluation of the tsunami threat is made and updated. If a tsunami has been generated that poses a continuing threat, the current level of alert will continue, or be upgraded, or be downgraded, until the tsunami waves no longer cause a threat to the coastal areas.

In response to a NEAM-RTWC Watch or Advisory tsunami message, national or regional authorities must implement their own pre-determined procedures that can include issuing evacuation instructions to coastal areas when appropriate. If sea level and all other data indicate, however, that a destructive tsunami has not been generated, or that there is no tsunami threat, then the NEAM-RTWC issues a tsunami alert cancellation. This will be most often the case since most large earthquakes with the potential to generate a destructive tsunami do not actually do so, and also because the Decision Matrix thresholds are conservative.

It is desirable that in the NEAM region the RTWC should be able to issue the first tsunami message between 5 and 15 minutes after the onset of the earthquake, depending upon the spatial density of nearby seismic stations. This fast response maybe however not enough for the closest coastal areas, in case a local tsunami is generated. In the areas threatened by local tsunamis, at-risk populations need to be educated about natural warning signs such as strong shaking from the earthquake or a withdrawal of the sea, and be ready to immediately evacuate when such signs occur.

Subsequent tsunami messages related to the same event, which include already information on sea-level measurements, will be issued as soon as this information is available and properly processed. The time line of these messages depends strongly on the distribution of coastal and deep-ocean sea-level gauges in the area surrounding the earthquake.

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Note by F. Schindelé. The only current recommended delay is 15 minutes (Pacific and Indian Ocean). The only country that delivers earlier is Japan with 5 people on duty at the same time! There is always a trade off between the accuracy of the computed parameters and the delay of dissemination. I would suggest to recommend a delay of 5 to 15 minutes, with an accuracy in magnitude less than 0.3 and in epicentre location, less than 20-30 km.
4.3.2 Message Types and Criteria

The NEAM-RTWC will adopt the tsunami message type and criteria as described in section 3.6 of this document.

4.4 OPERATIONAL LIMITATIONS

The science of rapidly and accurately forecasting tsunamis has made important strides in recent years but challenges remain. Limitations of NEAM-RTWC operational tsunami alerts should be known and understood in order to best plan for and execute an appropriate response.

4.4.1 Earthquake Parameters

Earthquake parameters provide the earliest indication of a potential tsunami because seismic waves travel much faster inside the earth than tsunami waves. Consequently, the earliest initial tsunami messages are based entirely on the preliminary earthquake parameters. However, most large earthquakes with the potential to generate a destructive tsunami actually do not do so, and consequently most tsunami alert messages based on the preliminary earthquake parameters will eventually be cancelled afterwards when significant tsunami waves are not observed.

A number of factors contribute to this limitation including: 1) the tsunami is generated primarily by earthquake induced vertical seafloor displacements and to estimate the vertical seafloor displacement, a precise determination of the focal depth and focal mechanism are needed, not currently available in the short delay of dissemination (less than 15 minutes); Consequently: 2) the magnitude threshold for warnings is set at a conservative level to ensure that a significant tsunami is not missed; 3) the magnitude threshold is further set at a conservative level to take into account uncertainties in the preliminary magnitude; and 4) there are many more earthquakes with magnitudes near the conservative threshold than ones far above it where a destructive tsunami is more certain.

4.4.2 Initial Estimated Tsunami Arrival Times

The NEAM-RTWC’s initial estimated tsunami arrival times (ETA) are typically computed from the epicentre of the earthquake to each forecast point using the minimum-path ray-tracing approximation: a wave will travel from point A to point B over whatever path in space (the ocean in this case) that gets it there the fastest. There are several limitations to this method. The first one is the inaccuracy of representing the tsunami source by a point located at the epicentre. For great earthquakes, the ones most likely to produce a tsunami, the ocean-bottom displacement caused by the earthquake rupture will start at the epicentre but it can extend for tens or even hundreds of kilometres away from the epicentre. As a consequence, the tsunami source may not be like a point and the largest displacement may not be located at the epicentre.

The second limitation is that the fastest path from the epicentre to the forecast point may not be a path over which much energy has travelled. A third limitation arises from the fact that the fast ray-tracing algorithms used neglect the non-linear interaction between the tsunami waves and the bottom relief in shallow waters. Incidentally, these effects tend to reduce the speed of the tsunami and so usually the ETA may be considered as the “fastest scenario” (but be aware of limitation one). Finally, this method also neglects the fine details of the near-shore bathymetry and the coastline that affect the tsunami impact on the shore.

Consequently, the first arriving tsunami waves may be small compared to later arriving waves and its travel time can be different from the estimated. The net result of these limitations is that significant tsunami waves may arrive tens of minutes sooner or later than the predicted arrival time and that such errors may be largest in the biggest events.
At present it is not possible to quickly know the precise dimensions or location of the extended tsunami source. A good estimation of these parameters may be available some minutes after the issuing of the first message and might be used to update the level of tsunami alert and re-compute the ETA using an extended source model.

In addition to ETA, some NEAM-RTWC (and/or NTWC) may provide also estimates for the tsunami wave height at the pre-defined coastal forecast points. The wave heights are obtained from a scenario database that must include all the possible tsunami locations and relevant earthquake magnitudes. The limitations of the computation of the wave heights, if these values are provided, must also be properly understood by the tsunami message recipients.

Tsunami Forecast models that use deep-ocean sea level readings to define in real-time the tsunami source and estimate ETA and tsunami wave heights at the coast have already been tested in the Pacific and Indian Oceans. The conclusion is that the methodology looks promising in areas where the tsunami wave takes hours to impact the coast. However, these Tsunami Forecast models are still untested for the NEAM region where tsunamigenic sources are very close to the shore and geometry of the sources not well known and the first tsunami waves take less than 30 minutes to reach the coast.

4.4.3 Area of Watches and Advisories

The NEAM-RTWC will put any particular coastal area in the NEAM region into a watch or advisory based on the Tsunami Decision Matrixes presented in section 3. The particular basin geometry of the NEAM region could prevail over the simple distance criteria used in the decision matrix, but this should be decided case by case (see paragraph 4.3).

Historical data and numerical model outputs show that tsunamis do not affect all areas equally, even inside the same basin. Significant differences can be due to directionality associated with the source, focusing and defocusing by bathymetry, attenuation by spreading and friction, and blockage by land masses. Consequently, some areas that are put into watch or advisory status may not actually be threatened. As the forecasting capabilities of the NEAM-RTWCs become quicker and more accurate in coming years due to improved earthquake analyses, more deep ocean data, and improved numerical forecast models, then tsunami alert messages can be based on expected tsunami amplitudes instead of expected arrival times or distances from the epicentre. For now, this more conservative and simplified approach is considered the most adequate.

4.5 TYPES OF NEAM-RTWC MESSAGES

As described in section 3, the NEAM-RTWC issues three basic types of messages in response to large earthquakes or other potential tsunami events. A fourth type of message is issued between events to test communication links. To avoid confusion among National TWFPs and emergency managers, only one message is issued related to the same tsunamigenic event, regardless of the tsunami threat level at any particular area. In this way, each message body may contain inside different levels of alert messages. The descriptions that follow apply not to whole messages, but to the part of the message with the corresponding alert level. In a tsunami message, the highest alert level will always be presented first.

4.5.1 Tsunami Watch Message

A tsunami watch message is issued by the NEAM-RTWC whenever the seismic information or/and sea-level data indicates that any area of the NEAM coast line may be impacted by a tsunami wave height greater than 0.5 m, and/or when tsunami run-up is expected to be higher than 1 m. The certainty degree of the watch depends on the data that are used to make the tsunami threat evaluation, and also on the magnitude of the earthquake. Messages
based on seismic data only will have a low degree of certainty, but the probability that a
destructive tsunami has been generated increases with its magnitude. A tsunami Watch is
the highest severity level of a tsunami alert message and it must be considered that the
tsunami waves, if generated, pose a real threat to coastal populations and may cause
destruction along the shoreline.

The initial message will be followed always by one or more additional messages related to
the same event.

Continuing observation of sea level and collection of seismic data will determine the content
of the supplement message(s) to be issued by the NEAM-RTWC. This level of alert can be
confirmed, downgraded or cancelled. If a tsunami is confirmed by sea-level observations or
other reports, then the NEAM-RTWC last message in the sequence must be an “end-of-alert”
message. Upon the receipt of a tsunami watch message, National TFPs, NTWCs and
emergency management agencies in all affected countries should evaluate the probability of
a tsunami impacting their area and carry out appropriate actions according to their
predetermined standard operating procedures (Tsunami Response Plan).

4.5.2 Tsunami Advisory Message

A tsunami advisory message is issued by the NEAM-RTWC whenever the seismic
information or/and sea-level data indicates that any area of the NEAM coast line may be
impacted a tsunami wave height from 0.2 to 0.5 m, and/or when tsunami run-up is expected
to be lower than 1 m.

The certainty degree of the advisory depends on the data that was used to make the tsunami
threat evaluation, and also on the magnitude of the earthquake. Messages based on seismic
data only will have a low degree of certainty, but the probability that a tsunami has been
generated increases with its magnitude. The tsunami advisory is the second level of severity
in a tsunami alert and in this case the effects on the coast are reduced and no extensive
destruction is expected. No evacuation is usually required. However, the tsunami waves can
cause bores, strong currents, recession of the sea and small inundation on beaches.
Resonance can cause damage on harbours and disrupt harbour operations. Adequate
actions are recommended, like averting people and boats along the coastline, take out
swimmers from the water, averting harbour authorities.

The Initial message will be followed always by one or more additional messages related to
the same event.

Continuing observation of sea level and collection of seismic data will determine the content
of the supplement message(s) to be issued by the NEAM-RTWC. The level of alert can be
confirmed, upgraded or cancelled. If a tsunami is confirmed by sea-level observations or
other reports, then the NEAM-RTWC last message in the sequence must be an “end-of-alert”
message. Upon the receipt of a tsunami advisory message, National TFPs, NTWCs and
emergency management agencies in all affected countries should evaluate the probability of
a tsunami impacting their area and carry out appropriate actions according to their
predetermined standard operating procedures (Tsunami Response Plan).

4.5.3 Tsunami Information Message

This is a message issued to advise NEAM recipients on the occurrence of a major
earthquake in the NEAM region but with an evaluation that there is no tsunami threat.

4.5.4 Tsunami Communication Test Message

This is a test message issued by the NEAM-RTWC, usually at unannounced times, to
determine delays in disseminating tsunami messages by different methods of transmission
(GTS, Internet, …), to test the operation of the warning system by requiring a response, and
to keep NEAM-RTWC operations personnel familiar with the procedures for handling tsunami
message traffic. It is recommended that communication tests should take place approximately four times per year. Results of communication tests will be provided to all other NEAM-RTWCs and the ICG/NEAMTWS to facilitate the performance monitoring of the RTWC.

4.5.5 Tsunami Exercise Messages

These are Exercise messages issued by a TWC, organised by the ICG, to initiate an exercise that will test the performance of the Regional Coordination of the NEAM-RTWCs and, if desired, it could also trigger a National Tsunami Exercise in the MB that desire so. These exercises correspond in general to the watch level in a specific sub-basin, and information for the other sub-basins. Unlike the Communication Test Messages, the Tsunami Exercise Messages must be very well planned and integrated in a Tsunami Exercise. These messages will be identical to ordinary Watch and Information messages, but they exercise status will be declared in the first statement of the message, to avoid any unnecessary confusion.

4.6 NEAM-RTWC ALERT STATUS DEFINITIONS

4.6.1 Tsunami Watch

A tsunami watch is issued by the NEAM-RTWC when a potential tsunami with significant widespread inundation is expected. Watches alert the National TWFPs, the NTWCs and the emergency management agencies that widespread, dangerous coastal flooding accompanied by powerful currents is possible and may continue for several hours after arrival of the initial wave. Watches alert emergency management officials to take action for the entire tsunami hazard zone. Appropriate actions to be taken by local officials may include the evacuation of low-lying coastal areas, and the repositioning of ships to deep waters when there is time to safely do so. Watches may be updated, adjusted geographically, downgraded, or cancelled. To provide the earliest possible alert, initial tsunami watch messages are based only on seismic information.

4.6.2 Tsunami Advisory

A tsunami advisory is issued by the NEAM-RTWC when a tsunami with a small inundation potential is expected in very specific areas. In this case the effects of the tsunami on the coast are reduced and no extensive destruction is expected. No evacuation is usually required. However, the effects of the tsunami can cause bores, strong currents, recession of the sea and small inundation on beaches or along river shores. Resonance can cause damage on harbours and disrupt harbour operations. These effects may continue for up to a few hours. Advisories alert the National TWFPs, the NTWCs and the emergency management agencies to take appropriate actions for the entire tsunami hazard zone, like averting people and boats along the coastline, take out swimmers from the water, averting harbour authorities. Advisories may be updated, adjusted geographically, upgraded, or cancelled. To provide the earliest possible alert, initial advisory messages are based only on seismic information.

4.6.3 Tsunami Information

Tsunami information is in fact a “non-alert” level and it is issued to inform that an earthquake has occurred but it has no potential to generate a tsunami. The tsunami information message will be used to prevent unnecessary evacuations as the earthquake may have been strongly felt in coastal areas.
4.6.4 End of Tsunami Alert (Watch or Advisory)

An “All Clear”, or its equivalent, is usually issued by local authorities following any type of near or actual disaster to inform the public that it is safe to re-enter evacuated areas and resume normal activities.

Following a tsunami, the NEAM-RTWC will issue a tsunami end of alert message when observations, modelling and historical records show that the disturbances due to the tsunami wave subsided. However, the NEAM-RTWC does not receive enough data to determine when the danger has passed in all coastal areas. Local conditions can cause wide variations in tsunami wave action and additional hazards such as fires, chemical spills, or downed power lines may exist following a destructive tsunami. Consequently, “All Clear” determinations must be made by local authorities and not by the NEAM-RTWC. In general, local authorities can assume the tsunami danger has passed when their area is free from damaging waves for at least 2 hours after the last destructive wave, or if no destructive waves have occurred for at least two hours after the expected tsunami arrival time. Local conditions including seiching in bays and harbours, wave resonance along continental shelves, and strong currents in channels and harbours can persist for many hours and delay the “All Clear”.

4.6.5 Tsunami Alert Cancellation (Watch or Advisory)

A tsunami alert cancellation indicates the end of the damaging tsunami threat, when no tsunami occurrence is confirmed.

4.7 NEAM-RTWC TEXT MESSAGES FORMAT AND CONTENT

The NEAM-RTWC text messages are composed of the following key elements:

4.7.1 Message Header (MH)

The Message Header has three lines. The first line indicates that this is a tsunami message, a tsunami exercise message or a tsunami communication test message.

It shows the sequential number of the message. Messages are numbered starting with 1 for each event and continue in sequence. Numbers continue to increment, even if the alert level changes from one type of message to another (e.g., from a Tsunami Advisory to a Tsunami Watch). The second line indicates the issuing office, the NEAM-XXX-RTWC (where XXX is the name of the centre). The third line indicates the date and time that the bulletin was issued.

All times used in tsunami messages are referred to UTC. It is the responsibility of National TWFPs, NTWCs and emergency management agencies to translate the time information to each country local time, if necessary.

All 3 possible message first line would be:

| TSUNAMI MESSAGE NUMBER 002 |
| TSUNAMI EXERCISE MESSAGE NUMBER 001 |
| TSUNAMI COMMUNICATION TEST MESSAGE NUMBER 001 |

Sample Message Header:

| TSUNAMI MESSAGE NUMBER 002 |
| NEAM XXX REGIONAL TSUNAMI WATCH CENTER |
| ISSUED AT 1010Z 01 NOV 2014 |
4.7.2 Message Type (MT) and Affected Area (AA)

Immediately following the Message Header there is a series of pairs of statements regarding the Message Type and the Affected Area. This association is needed because a single message has to be sent by the NEAM-RTWC to areas that have different tsunami threat levels.

The Message Type field uses a single line, with an ellipsis at each end. We suggest that, in addition to the keywords that identify the tsunami message type, we add extra keywords related to the sequence of the messages. These keywords could be: **ongoing** (for supplemental messages), **cancellation** (when the alert is cancelled) and **end of** (for the last message referring to the one tsunami event sequence)

All 10 possible message type lines would be:

```
... TSUNAMI WATCH ...
... TSUNAMI WATCH ONGOING ...
... TSUNAMI WATCH CANCELLATION ...
... END OF TSUNAMI WATCH ...
... TSUNAMI ADVISORY ...
... TSUNAMI ADVISORY ONGOING ...
... TSUNAMI ADVISORY CANCELLATION ...
... END OF TSUNAMI ADVISORY ...
... TSUNAMI INFORMATION ...
... TSUNAMI COMMUNICATION TEST ...
```

The affected area field is the list of countries (and if the type is advisory or watch, the region/department names for each country) that are subject to the level of tsunami threat implied by the previous message type line. The list of countries should be given in alphabetical order to facilitate the identification by the national recipients.

Sample of an association of different message type and affected area fields

```
... TSUNAMI WATCH ONGOING ...
THIS ALERT APPLIES TO FRANCE (FRENCH RIVIERA, LANGUEDOC...)... IRELAND ...
MOROCCO ... PORTUGAL ... SPAIN ... UNITED KINGDOM

... TSUNAMI INFORMATION ...
THIS ALERT APPLIES TO ALBANIA ... ALGERIA ... BOSNIA AND HERZEGOVINA ...
BULGARIA ... CROATIA ... CYPRUS ... EGYPT ... GEORGIA ... GREECE ... ISRAEL ...
ITALY ... LEBANON ... LIBYA ... MALTA ... MONTENEGRO ... PALESTINE ... ROMANIA ...
RUSSIA ... SLOVENIA ... SYRIA ... TUNISIA ... TURKEY ... UKRAINE
```

4.7.3 Authority Statement (AS)

Following the Message Header, the Message Type and Affected Area fields is mentioned the Authority Statement. It indicates that the NEAM-RTWC message is issued as advice only and that the condition of alert in each area is up to national or local authorities.

Sample Authority Statement

```
THIS MESSAGE IS ISSUED AS ADVICE TO GOVERNMENT AGENCIES. ONLY NATIONAL AND LOCAL GOVERNMENT AGENCIES HAVE THE AUTHORITY TO MAKE DECISIONS REGARDING THE OFFICIAL STATE OF ALERT IN THEIR AREA AND ANY ACTIONS TO BE TAKEN IN RESPONSE.
```
4.7.4 Earthquake Parameters (EP)

Following the Authority Statement comes the Earthquake Parameters. In the initial message of a tsunami alert sequence the earthquake parameters are preliminary since they are determined quickly for tsunami purposes. They may be revised following the initial message as more data are received and analysed. Small differences between these parameters and those that may be issued by other earthquake reporting agencies are normal. The magnitude reported is $M_w$ or some fast estimate of it. Time is UTC.

The location is the country and the sub-basin of the epicenter, in case of an earthquake close to a country, or a sub-basin in case of an epicenter far from the coast.

Sample Earthquake Parameters

<table>
<thead>
<tr>
<th>AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ORIGIN TIME - 0940Z 01 NOV 2014</td>
</tr>
<tr>
<td>COORDINATES – 35.90 NORTH 10.22 WEST</td>
</tr>
<tr>
<td>DEPTH - 30 KM</td>
</tr>
<tr>
<td>LOCATION – North-Eastern ATLANTIC, PORTUGAL</td>
</tr>
<tr>
<td>MAGNITUDE – 8.5</td>
</tr>
</tbody>
</table>

4.7.5 Tsunami Wave Measurements (TM)

When such data become available, usually after the issuing of the initial message, the NEAM-RTWC will report tsunami wave measurements from key coastal and deep ocean gauges. Each measurement includes the name of the gauge, the coordinates of the gauge, the time of the measurement, the maximum amplitude of the wave in meters observed so far, and the period of the wave cycle in minutes, if available (see Figure 1). These measurements, while generally indicative of whether a tsunami has been generated and the size of the tsunami, should only be further interpreted by experts. The character of tsunami waves in the deep ocean and at the shore is outside normal human experience and is non-intuitive. For example, a tsunami measuring only a few centimetres on a deep ocean gauge can create flooding at the shore. In addition, because new waves could be recorded, values reported for a particular gauge may change significantly from one message to the next.

When a gauge location is similar to a forecast point location (see 3.7.3 and 4.7.7), the computed arrival time and estimated level of warning and the measured arrival time and amplitude will be indicated in the same line.

Sample Tsunami Wave Measurements

<table>
<thead>
<tr>
<th>MEASUREMENTS OR REPORTS OF TSUNAMI WAVE ACTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>GAUGE LOCATION LAT LON TIME AMPL PER</td>
</tr>
<tr>
<td>-------------------------------------------------------------</td>
</tr>
<tr>
<td>PORTUGAL - LAGOS 37.06N 8.73W 1003Z 2.44M</td>
</tr>
<tr>
<td>PORTUGAL - SINES 37.97N 8.89W 1007Z 2.25M</td>
</tr>
<tr>
<td>LAT - LATITUDE (N-NORTH, S-SOUTH)</td>
</tr>
<tr>
<td>LON - LONGITUDE (E-EAST, W-WEST)</td>
</tr>
<tr>
<td>TIME - TIME OF THE MEASUREMENT (Z IS UTC TIME)</td>
</tr>
<tr>
<td>AMPL - TSUNAMI AMPLITUDE MEASURED RELATIVE TO NORMAL SEA LEVEL.</td>
</tr>
<tr>
<td>IT IS ...NOT... CREST-TO-TROUGH WAVE HEIGHT.</td>
</tr>
<tr>
<td>VALUES ARE GIVEN IN METERS (M).</td>
</tr>
<tr>
<td>PER - PERIOD OF TIME IN MINUTES (MIN) FROM ONE WAVE TO THE NEXT.</td>
</tr>
</tbody>
</table>
All bulletins contain an evaluation statement. This is a general statement of the current situation along with an assessment of the tsunami threat. It may also contain advice regarding the appropriate response actions. It will contain the information regarding the certainty of the tsunami alert message that is required by the message recipients to take appropriate actions, according to their Tsunami Response Plan. Since a single message is sent to recipients with different levels of tsunami threat, we suggest that the type of message should be included in the first line of the Evaluation Statement field. This will inform the message recipient if the following evaluation applies or not to its region. All Possible Evaluation Statements are shown below.

**Tsunami Watch Initial**

**EVALUATION OF TSUNAMI WATCH**

IT IS NOT KNOWN THAT A TSUNAMI WAS GENERATED. THIS WARNING IS BASED ONLY ON THE EARTHQUAKE EVALUATION. AN EARTHQUAKE OF THIS SIZE HAS THE POTENTIAL TO GENERATE A TSUNAMI THAT CAN STRIKE COASTLINES WITH A WAVE HEIGHT GREATER THAN 0.5M AND/OR CAUSE A TSUNAMI RUN-UP GREATER THAN 1M. AUTHORITIES SHOULD TAKE APPROPRIATE ACTION IN RESPONSE TO THIS POSSIBILITY. THIS CENTER WILL MONITOR SEA LEVEL DATA FROM GAUGES NEAR THE EARTHQUAKE TO DETERMINE IF A TSUNAMI WAS GENERATED AND ESTIMATE THE SEVERITY OF THE THREAT.

A TSUNAMI IS A SERIES OF WAVES AND THE FIRST WAVE MAY NOT BE THE LARGEST. TSUNAMI WAVE HEIGHTS CANNOT BE PREDICTED AND CAN VARY SIGNIFICANTLY ALONG A COAST DUE TO LOCAL EFFECTS. THE TIME FROM ONE TSUNAMI WAVE TO THE NEXT CAN BE FIVE MINUTES TO AN HOUR, AND THE THREAT CAN CONTINUE FOR MANY HOURS AS MULTIPLE WAVES ARRIVE.

---

**Tsunami Watch Supplement**

**EVALUATION OF TSUNAMI WATCH**

SEA LEVEL READINGS INDICATE A TSUNAMI WAS GENERATED. THIS TSUNAMI CAN STRIKE COASTLINES WITH A WAVE HEIGHT GREATER THAN 0.5M AND/OR CAUSE A TSUNAMI RUN-UP GREATER THAN 1M. THIS CENTER WILL CONTINUE TO MONITOR SEA LEVEL GAUGES NEAREST THE REGION AND REPORT IF ANY ADDITIONAL TSUNAMI WAVE ACTIVITY IS OBSERVED. AUTHORITIES SHOULD TAKE APPROPRIATE ACTION IN RESPONSE TO THIS POSSIBILITY.

A TSUNAMI IS A SERIES OF WAVES AND THE FIRST WAVE MAY NOT BE THE LARGEST. TSUNAMI WAVE HEIGHTS CANNOT BE PREDICTED AND CAN VARY SIGNIFICANTLY ALONG A COAST DUE TO LOCAL EFFECTS. THE TIME FROM ONE TSUNAMI WAVE TO THE NEXT CAN BE FIVE MINUTES TO AN HOUR, AND THE THREAT CAN CONTINUE FOR MANY HOURS AS MULTIPLE WAVES ARRIVE.

---

**End of Tsunami Watch**

**EVALUATION OF TSUNAMI WATCH**

SEA LEVEL READINGS INDICATE A TSUNAMI WAS GENERATED.
OBSERVATIONS AND MODELS INDICATE THAT NO MORE TSUNAMI WAVES ARE EXPECTED. WHEN NO MAJOR WAVES ARE OBSERVED FOR TWO HOURS AFTER THE ESTIMATED TIME OF ARRIVAL OR DAMAGING WAVES HAVE NOT OCCURRED FOR AT LEAST TWO HOURS THEN LOCAL AUTHORITIES CAN ASSUME THE THREAT IS PASSED. DANGER TO BOATS AND COASTAL STRUCTURES CAN CONTINUE FOR SEVERAL HOURS DUE TO THE CONTINUING SEA LEVEL CHANGES AND RAPID CURRENTS. AS LOCAL CONDITIONS CAN CAUSE A WIDE VARIATION IN TSUNAMI WAVE ACTION THE ALL CLEAR DETERMINATION MUST BE MADE BY LOCAL AUTHORITIES.

Tsunami Watch Cancellation

EVALUATION OF TSUNAMI WATCH
SEA LEVEL READINGS INDICATE THAT NO TSUNAMI WAS GENERATED. THE TSUNAMI ALERT IS CANCELLED. HOWEVER, EARTHQUAKES OF THIS SIZE CAN GENERATE SMALL TSUNAMIS THAT CAUSE LOCALLY CHANGES IN CURRENTS AND RESONANCE IN HARBOURS. AUTHORITIES SHOULD BE AWARE OF THIS POSSIBILITY AND TAKE APPROPRIATE ACTION.

Tsunami Advisory Initial

EVALUATION OF TSUNAMI ADVISORY
IT IS NOT KNOWN THAT A TSUNAMI WAS GENERATED. THIS WARNING IS BASED ONLY ON THE EARTHQUAKE EVALUATION. AN EARTHQUAKE OF THIS SIZE HAS THE POTENTIAL TO GENERATE A TSUNAMI THAT CAN STRIKE COASTLINES WITH A WAVE HEIGHT LESS THAN 0.5M AND/OR CAUSE A TSUNAMI RUN-UP LESS THAN 1M. AUTHORITIES SHOULD TAKE APPROPRIATE ACTION IN RESPONSE TO THIS POSSIBILITY. THIS CENTER WILL MONITOR SEA LEVEL DATA FROM GAUGES NEAR THE EARTHQUAKE TO DETERMINE IF A TSUNAMI WAS GENERATED AND ESTIMATE THE SEVERITY OF THE THREAT. A TSUNAMI IS A SERIES OF WAVES AND THE FIRST WAVE MAY NOT BE THE LARGEST. TSUNAMI WAVE HEIGHTS CANNOT BE PREDICTED AND CAN VARY SIGNIFICANTLY ALONG A COAST DUE TO LOCAL EFFECTS. THE TIME FROM ONE TSUNAMI WAVE TO THE NEXT CAN BE FIVE MINUTES TO AN HOUR, AND THE THREAT CAN CONTINUE FOR MANY HOURS AS MULTIPLE WAVES ARRIVE.

Tsunami Advisory Supplement

EVALUATION OF TSUNAMI ADVISORY
SEA LEVEL READINGS INDICATE A TSUNAMI WAS GENERATED. THIS TSUNAMI CAN STRIKE COASTLINES WITH A WAVE HEIGHT LESS THAN 0.5M AND/OR CAUSE A TSUNAMI RUN-UP LESS THAN 1M. THIS CENTER WILL CONTINUE TO MONITOR SEA LEVEL GAUGES NEAREST THE REGION AND REPORT IF ANY ADDITIONAL TSUNAMI WAVE ACTIVITY IS OBSERVED. AUTHORITIES SHOULD TAKE APPROPRIATE ACTION IN RESPONSE TO THIS POSSIBILITY. A TSUNAMI IS A SERIES OF WAVES AND THE FIRST WAVE MAY NOT BE THE LARGEST. TSUNAMI WAVE HEIGHTS CANNOT BE PREDICTED AND CAN VARY
SIGNIFICANTLY ALONG A COAST DUE TO LOCAL EFFECTS. THE TIME FROM ONE
TSUNAMI WAVE TO THE NEXT CAN BE FIVE MINUTES TO AN HOUR, AND THE
THREAT CAN CONTINUE FOR MANY HOURS AS MULTIPLE WAVES ARRIVE.

End of Tsunami Advisory

EVALUATION OF TSUNAMI ADVISORY
SEA LEVEL READINGS INDICATE A TSUNAMI WAS GENERATED.
OBSERVATIONS AND MODELS INDICATE THAT NO MORE TSUNAMI WAVES ARE
EXPECTED.
WHEN NO MAJOR WAVES ARE OBSERVED FOR TWO HOURS AFTER THE
ESTIMATED TIME OF ARRIVAL OR DAMAGING WAVES HAVE NOT OCCURRED FOR
AT LEAST TWO HOURS THEN LOCAL AUTHORITIES CAN ASSUME THE THREAT IS
PASSED. DANGER TO BOATS AND COASTAL STRUCTURES CAN CONTINUE FOR
SEVERAL HOURS DUE TO THE CONTINUING SEA LEVEL CHANGES AND RAPID
CURRENTS. AS LOCAL CONDITIONS CAN CAUSE A WIDE VARIATION IN TSUNAMI
WAVE ACTION THE ALL CLEAR DETERMINATION MUST BE MADE BY LOCAL
AUTHORITIES.

Tsunami Advisory Cancellation

EVALUATION OF TSUNAMI ADVISORY
SEA LEVEL READINGS INDICATE THAT NO TSUNAMI WAS GENERATED.
The TSUNAMI ALERT IS CANCELLED.
HOWEVER, EARTHQUAKES OF THIS SIZE CAN GENERATE SMALL TSUNAMIS THAT
CAUSE LOCALLY CHANGES IN CURRENTS AND RESONANCE IN HARBOURS.
AUTHORITIES SHOULD BE AWARE OF THIS POSSIBILITY AND TAKE APPROPRIATE
ACTION.

Tsunami Information

EVALUATION OF TSUNAMI INFORMATION
BASED ON HISTORICAL EARTHQUAKE AND TSUNAMI MODELLING THERE IS NO
THREAT THAT A TSUNAMI HAS BEEN GENERATED THAT CAN CAUSE DAMAGE OR
MAJOR EFFECT IN THE REGION. THIS MESSAGE IS FOR INFORMATION ONLY.

Tsunami Communication Test

FROM – NEAM – REGIONAL TSUNAMI WATCH CENTER
TO - DESIGNATED 24-HOUR TSUNAMI WARNING FOCAL POINTS OF THE
NEAM REGION FOR THE FOLLOWING COUNTRIES:
ALBANIA ... ALGERIA ... BOSNIA AND HERZEGOVINA ... BULGARIA ... CROATIA ...
CYPRUS ... EGYPT ... FRANCE ... GEORGIA ... GREECE ... IRELAND ... ISRAEL ...
ITALY ... LEBANON ... LIBYA ... MALTA ... MONTENEGRO ... MOROCCO ... PALESTINE ...
PORTUGAL ... ROMANIA ... RUSSIA ... SLOVENIA ... SPAIN ... SYRIA ... TUNISIA ...
TURKEY ... UKRAINE ... UNITED KINGDOM
SUBJECT – NEAM-RTWC TSUNAMI COMMUNICATION TEST
THIS IS A TEST TO VERIFY COMMUNICATION LINKS AND DETERMINE
TRANSMISSION TIMES INVOLVED IN THE DISSEMINATION OF OPERATIONAL
TSUNAMI MESSAGES FROM THE NEAM- REGIONAL TSUNAMI WATCH CENTER TO DESIGNATED 24-HOUR TSUNAMI WARNING FOCAL POINTS OF THE NEAM TSUNAMI WARNING SYSTEM.
RECIPIENTS ARE REQUESTED TO PLEASE RESPOND BACK TO THE NEAM-RTWC WITH THE FOLLOWING INFORMATION.
1 - NAME OF OFFICE THAT RECEIVED THIS TEST MESSAGE
2 - METHOD OR METHODS BY WHICH THE TEST MESSAGE WAS RECEIVED
3 - TIME OF RECEIPT OF THIS TEST MESSAGE BY EACH METHOD
PLEASE RESPOND VIA ONE OF THE FOLLOWING MEANS
EMAIL – NEAM-RTWC@IOC-TSUNAMI.ORG
TELEFAX - 99-999-999-9999
THANK YOU FOR YOUR PARTICIPATION IN THIS COMMUNICATION TEST.

4.7.7 Estimated Arrival Times (ETA)

The estimated tsunami arrival times (ETA) are computed using a simple approximation of the tsunami propagation, as discussed in paragraph 4.4.2. They should be used with caution by the national and regional emergency management agencies. All times mentioned are in UTC and it will be the task of the message recipients to convert to local time if required. ETA will be provided only to the forecast points that have been agreed between the NEAM-RTWC and the National TWFP or NTWC. The localities will be ordered by ETA. If more than one level of threat has to be included in the same tsunami message, the forecast points in Watch will appear before the localities in Advisory, irrespective of their ETA. Two sets of ETA will be presented in the message, differentiates by the keywords Watch or Advisory.

When a country is in a Watch or Advisory status only, the ETAs for its forecast points that meet the criteria will be listed in the tsunami alert messages issued by the RTWCs.

To be easy to read, the list of forecast points will be listed country by country, starting with the first country impacted and continuing with the next impacted.

Sample Estimated Arrival Times for localities in Watch

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>FORECAST POINT</th>
<th>COORDINATES</th>
<th>ARRIVAL TIME</th>
<th>LEVEL (ADVISORY, WATCH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PORTUGAL - VILA DO BISPO</td>
<td>37.04N 8.89W</td>
<td>0955Z 01 NOV</td>
<td>ADVISORY</td>
<td></td>
</tr>
<tr>
<td>PORTUGAL - VILAMOURA</td>
<td>37.07N 8.12W</td>
<td>1009Z 01 NOV</td>
<td>ADVISORY</td>
<td></td>
</tr>
<tr>
<td>SPAIN - LA BARROSA</td>
<td>36.37N 6.18W</td>
<td>1006Z 01 NOV</td>
<td>ADVISORY</td>
<td></td>
</tr>
<tr>
<td>SPAIN - TORRE DEL PUERCO</td>
<td>36.34N 6.16W</td>
<td>1010Z 01 NOV</td>
<td>ADVISORY</td>
<td></td>
</tr>
<tr>
<td>MOROCCO - ASILAH</td>
<td>35.42N 6.07W</td>
<td>1007Z 01 NOV</td>
<td>ADVISORY</td>
<td></td>
</tr>
<tr>
<td>MOROCCO - EL BEHARA</td>
<td>34.68N 6.40W</td>
<td>1023Z 01 NOV</td>
<td>ADVISORY</td>
<td></td>
</tr>
<tr>
<td>FRANCE - CAPBRETON</td>
<td>43.64N 1.45W</td>
<td>1009Z 01 NOV</td>
<td>ADVISORY</td>
<td></td>
</tr>
<tr>
<td>FRANCE - LACANAU</td>
<td>44.98N 1.20W</td>
<td>1010Z 01 NOV</td>
<td>ADVISORY</td>
<td></td>
</tr>
<tr>
<td>IRELAND - SCHULL</td>
<td>51.53N 9.55W</td>
<td>1317Z 01 NOV</td>
<td>ADVISORY</td>
<td></td>
</tr>
</tbody>
</table>
4.7.8 Message Schedule (MS)

Near the end of the message appears a statement regarding future messages related to the same tsunami event. Supplemental messages will be issued according to new data and updated evaluation made at the NEAM-RTWC. This field will apply both to Watch and Advisory levels of alert.

Samples of Schedule Statements

SUPPLEMENT MESSAGES WILL BE ISSUED AS SOON AS NEW DATA AND EVALUATION ALLOWS. THE TSUNAMI ALERT WILL REMAIN IN EFFECT UNTIL AN END OF ALERT IS BROADCAST.

THIS WILL BE THE FINAL MESSAGE ISSUED FOR THIS EVENT UNLESS ADDITIONAL INFORMATION BECOMES AVAILABLE.

4.7.9 Table of Message Content

The following table shows which of these elements normally appear in each type of a NEAM-RTWC message.

<table>
<thead>
<tr>
<th>Message Type</th>
<th>Sequence</th>
<th>MH</th>
<th>MT+AA</th>
<th>AS</th>
<th>EP</th>
<th>TM</th>
<th>ES</th>
<th>ETA</th>
<th>MS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tsunami Watch</td>
<td>Initial</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Supplement</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>O</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>End of</td>
<td>Y</td>
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Y = yes, N = no, O = optional
MH - Message Header; MT+AA - Message Type and Affected Area; AS - Authority Statement; EP - Earthquake Parameters; TM - Tsunami Wave Measurements; ES - Evaluation Statement; ETA - Estimated Arrival Times; MS - Message Schedule.

The column MT+AA has 3 different contents:
  - Tsunami Information and Tsunami Communication Test: 1 message title and 1 affected area (all countries)
  - Tsunami advisory: 2 messages title ((2,3) tsunami advisory and tsunami information) and each corresponding affected area
- Tsunami Watch: 3 messages title ((1,2,3) tsunami watch, tsunami advisory and tsunami information) and each corresponding affected area

4.10 SAMPLE TSUNAMI MESSAGES

Tsunami Watch Initial – Type 1

<table>
<thead>
<tr>
<th>TSUNAMI MESSAGE NUMBER 001</th>
<th>NEAM REGIONAL TSUNAMI WATCH CENTER</th>
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<tr>
<td>ISSUED AT 0947Z 01 NOV 2014</td>
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... TSUNAMI WATCH...
THIS ALERT APPLIES TO FRANCE ... IRELAND ... MOROCCO ... PORTUGAL ... SPAIN ... UNITED KINGDOM

... TSUNAMI INFORMATION ...
THIS INFORMATION APPLIES TO ALBANIA ... ALGERIA ... BOSNIA AND HERZEGOVINA ... BULGARIA ... CROATIA ... CYPRUS ... EGYPT ... GEORGIA ... GREECE ... ISRAEL ... ITALY ... LEBANON ... LIBYA ... MALTA ... MONTENEGRO ... PALESTINE ... ROMANIA ... RUSSIA ... SLOVENIA ... SYRIA ... TUNISIA ... TURKEY ... UKRAINE

THIS MESSAGE IS ISSUED AS ADVICE TO GOVERNMENT AGENCIES. ONLY NATIONAL AND LOCAL GOVERNMENT AGENCIES HAVE THE AUTHORITY TO MAKE DECISIONS REGARDING THE OFFICIAL STATE OF ALERT IN THEIR AREA AND ANY ACTIONS TO BE TAKEN IN RESPONSE.

AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS
ORIGIN TIME - 0940Z 01 NOV 2014
COORDINATES – 35.90 NORTH 10.22 WEST
DEPTH - 30 KM
LOCATION – SW CAPE SAN VINCENT, PORTUGAL
MAGNITUDE – 8.5

EVALUATION OF TSUNAMI WATCH
IT IS NOT KNOWN THAT A TSUNAMI WAS GENERATED. THIS WARNING IS BASED ONLY ON THE EARTHQUAKE EVALUATION.
AN EARTHQUAKE OF THIS SIZE HAS THE POTENTIAL TO GENERATE A TSUNAMI THAT CAN STRIKE COASTLINES WITH A WAVE HEIGHT GREATER THAN 0.5M AND/OR CAUSE A TSUNAMI RUN-UP GREATER THAN 1M.
AUTHORITIES SHOULD TAKE APPROPRIATE ACTION IN RESPONSE TO THIS POSSIBILITY. THIS CENTER WILL MONITOR SEA LEVEL DATA FROM GAUGES NEAR THE EARTHQUAKE TO DETERMINE IF A TSUNAMI WAS GENERATED AND ESTIMATE THE SEVERITY OF THE THREAT.
A TSUNAMI IS A SERIES OF WAVES AND THE FIRST WAVE MAY NOT BE THE LARGEST. TSUNAMI WAVE HEIGHTS CANNOT BE PREDICTED AND CAN VARY SIGNIFICANTLY ALONG A COAST DUE TO LOCAL EFFECTS. THE TIME FROM ONE TSUNAMI WAVE TO THE NEXT CAN BE FIVE MINUTES TO AN HOUR, AND THE THREAT CAN CONTINUE FOR MANY HOURS AS MULTIPLE WAVES ARRIVE.

EVALUATION OF TSUNAMI INFORMATION
BASED ON HISTORICAL EARTHQUAKE AND TSUNAMI MODELLING THERE IS NO THREAT THAT A TSUNAMI HAS BEEN GENERATED THAT CAN CAUSE DAMAGE OR MAJOR EFFECT IN THE REGION. THIS MESSAGE IS FOR INFORMATION ONLY.
ESTIMATED INITIAL TSUNAMI WAVE ARRIVAL TIMES AT FORECAST POINTS WITHIN THE WATCH AREA ARE GIVEN BELOW. ACTUAL ARRIVAL TIMES MAY DIFFER AND THE INITIAL WAVE MAY NOT BE THE LARGEST. A TSUNAMI IS A SERIES OF WAVES AND THE TIME BETWEEN SUCCESSIVE WAVES CAN BE FIVE MINUTES TO ONE HOUR.
LOCATION, FORECAST POINT COORDINATES, ARRIVAL TIME, ALERT LEVEL (ADVISORY, WATCH)

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<th>Location</th>
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<th>Arrival Time</th>
<th>Alert Level</th>
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<tr>
<td>SPAIN - TORRE DEL PUERCO</td>
<td>36.34N 6.16W</td>
<td>1010Z</td>
<td>WATCH</td>
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<tr>
<td>MOROCCO - ASILAH</td>
<td>35.42N 6.07W</td>
<td>1007Z</td>
<td>WATCH</td>
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<tr>
<td>MOROCCO - EL BEHARA</td>
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<tr>
<td>FRANCE - CAPBRETON</td>
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<td>IRELAND - TOP CROSS</td>
<td>51.83N 10.17W</td>
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<tr>
<td>UNITED KINGDOM - MULLION</td>
<td>50.02N 5.26W</td>
<td>1424Z</td>
<td>WATCH</td>
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</table>

SUPPLEMENT MESSAGES WILL BE ISSUED AS SOON AS NEW DATA AND EVALUATION ALLOWS. THE TSUNAMI ALERT WILL REMAIN IN EFFECT UNTIL AN END OF ALERT IS BROADCAST.

---

**Tsunami Watch Supplement Type 1**

**TSUNAMI MESSAGE NUMBER 002**
NEAM REGIONAL TSUNAMI WATCH CENTER
ISSUED AT 10107Z 01 NOV 2014

... TSUNAMI WATCH ONGOING ...
THIS ALERT APPLIES TO FRANCE ... IRELAND ... MOROCCO ... PORTUGAL ... SPAIN ... UNITED KINGDOM

THIS MESSAGE IS ISSUED AS ADVICE TO GOVERNMENT AGENCIES. ONLY NATIONAL AND LOCAL GOVERNMENT AGENCIES HAVE THE AUTHORITY TO MAKE DECISIONS REGARDING THE OFFICIAL STATE OF ALERT IN THEIR AREA AND ANY ACTIONS TO BE TAKEN IN RESPONSE.

AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS
ORIGIN TIME - 0940Z 01 NOV 2014
COORDINATES – 35.90 NORTH 10.22 WEST
DEPTH - 30 KM
LOCATION – SW CAPE SAN VINCENT, PORTUGAL
MAGNITUDE – 8.5

EVALUATION OF TSUNAMI WATCH
SEA LEVEL READINGS INDICATE A TSUNAMI WAS GENERATED.
THIS TSUNAMI CAN STRIKE COASTLINES WITH A WAVE HEIGHT GREATER THAN 0.5M AND/OR CAUSE A TSUNAMI RUN-UP GREATER THAN 1M. THIS CENTER WILL CONTINUE TO MONITOR SEA LEVEL GAUGES NEAREST THE
REGION AND REPORT IF ANY ADDITIONAL TSUNAMI WAVE ACTIVITY IS OBSERVED. AUTHORITIES SHOULD TAKE APPROPRIATE ACTION IN RESPONSE TO THIS POSSIBILITY.
A TSUNAMI IS A SERIES OF WAVES AND THE FIRST WAVE MAY NOT BE THE LARGEST. TSUNAMI WAVE HEIGHTS CANNOT BE PREDICTED AND CAN VARY SIGNIFICANTLY ALONG A COAST DUE TO LOCAL EFFECTS. THE TIME FROM ONE TSUNAMI WAVE TO THE NEXT CAN BE FIVE MINUTES TO AN HOUR, AND THE THREAT CAN CONTINUE FOR MANY HOURS AS MULTIPLE WAVES ARRIVE.

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<td>50.02N 5.26W</td>
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</table>

SUPPLEMENT MESSAGES WILL BE ISSUED AS SOON AS NEW DATA AND EVALUATION ALLOWS. THE TSUNAMI ALERT WILL REMAIN IN EFFECT UNTIL AN END OF ALERT IS BROADCAST.

End of Tsunami Watch Type 1

TSUNAMI MESSAGE NUMBER 003
NEAM REGIONAL TSUNAMI WATCH CENTER
ISSUED AT 1625Z 01 NOV 2014

... END OF TSUNAMI WATCH ...
THIS ALERT APPLIES TO FRANCE ... IRELAND ... MOROCCO ... PORTUGAL ... SPAIN ... UNITED KINGDOM

THIS MESSAGE IS ISSUED AS ADVICE TO GOVERNMENT AGENCIES. ONLY NATIONAL AND LOCAL GOVERNMENT AGENCIES HAVE THE AUTHORITY TO MAKE DECISIONS REGARDING THE OFFICIAL STATE OF ALERT IN THEIR AREA AND ANY ACTIONS TO BE TAKEN IN RESPONSE.

AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS
ORIGIN TIME - 0940Z 01 NOV 2014
COORDINATES – 35.90 NORTH 10.22 WEST
DEPTH - 30 KM
LOCATION – SW CAPE SAN VINCENT, PORTUGAL
MAGNITUDE – 8.5

EVALUATION OF TSUNAMI WATCH
SEA LEVEL READINGS INDICATE A TSUNAMI WAS GENERATED.
OBSERVATIONS AND MODELS INDICATE THAT NO MORE TSUNAMI WAVES ARE EXPECTED.

WHEN NO MAJOR WAVES ARE OBSERVED FOR TWO HOURS AFTER THE ESTIMATED TIME OF ARRIVAL OR DAMAGING WAVES HAVE NOT OCCURRED FOR AT LEAST TWO HOURS THEN LOCAL AUTHORITIES CAN ASSUME THE THREAT IS PASSED. DANGER TO BOATS AND COASTAL STRUCTURES CAN CONTINUE FOR SEVERAL HOURS DUE TO THE CONTINUING SEA LEVEL CHANGES AND RAPID CURRENTS. AS LOCAL CONDITIONS CAN CAUSE A WIDE VARIATION IN TSUNAMI WAVE ACTION THE ALL CLEAR DETERMINATION MUST BE MADE BY LOCAL AUTHORITIES.

THIS WILL BE THE FINAL MESSAGE ISSUED FOR THIS EVENT UNLESS ADDITIONAL INFORMATION BECOMES AVAILABLE.

---

Tsunami Watch Cancellation Type 1

TSUNAMI MESSAGE NUMBER 002
NEAM REGIONAL TSUNAMI WATCH CENTER
ISSUED AT 1020Z 01 NOV 2014

... TSUNAMI WATCH CANCELLATION ...
THIS ALERT APPLIES TO FRANCE ... IRELAND ... MOROCCO ... PORTUGAL ... SPAIN ...
UNITED KINGDOM

THIS MESSAGE IS ISSUED AS ADVICE TO GOVERNMENT AGENCIES. ONLY NATIONAL AND LOCAL GOVERNMENT AGENCIES HAVE THE AUTHORITY TO MAKE DECISIONS REGARDING THE OFFICIAL STATE OF ALERT IN THEIR AREA AND ANY ACTIONS TO BE TAKEN IN RESPONSE.

AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS
ORIGIN TIME - 0940Z 01 NOV 2014
COORDINATES – 35.90 NORTH 10.22 WEST
DEPTH - 30 KM
LOCATION – SW CAPE SAN VINCENT, PORTUGAL
MAGNITUDE – 8.5

EVALUATION OF TSUNAMI WATCH
SEA LEVEL READINGS INDICATE THAT NO TSUNAMI WAS GENERATED.
THE TSUNAMI ALERT IS CANCELLED.
HOWEVER, EARTHQUAKES OF THIS SIZE CAN GENERATE SMALL TSUNAMIS THAT CAUSE LOCALLY CHANGES IN CURRENTS AND RESONANCE IN HARBOURS. AUTHORITIES SHOULD BE AWARE OF THIS POSSIBILITY AND TAKE APPROPRIATE ACTION.

THIS WILL BE THE FINAL MESSAGE ISSUED FOR THIS EVENT UNLESS ADDITIONAL INFORMATION BECOMES AVAILABLE.
Tsunami Watch Initial – Type 2

TSUNAMI MESSAGE NUMBER 001
NEAM REGIONAL TSUNAMI WATCH CENTER
ISSUED AT 0947Z 01 NOV 2014

... TSUNAMI WATCH...
THIS ALERT APPLIES TO MOROCCO ... PORTUGAL ... SPAIN

... TSUNAMI ADVISORY...
THIS ALERT APPLIES TO FRANCE ... IRELAND ... UNITED KINGDOM

... TSUNAMI INFORMATION ...
THIS INFORMATION APPLIES TO ALBANIA ... ALGERIA ... BOSNIA AND HERZEGOVINA ... BULGARIA ... CROATIA ... CYPRUS ... EGYPT ... GEORGIA ... GREECE ... ISRAEL ... ITALY ... LEBANON ... LIBYA ... MALTA ... MONTENEGRO ... PALESTINE ... ROMANIA ... RUSSIA ... SLOVENIA ... SYRIA ... TUNISIA ... TURKEY ... UKRAINE

THIS MESSAGE IS ISSUED AS ADVICE TO GOVERNMENT AGENCIES. ONLY NATIONAL AND LOCAL GOVERNMENT AGENCIES HAVE THE AUTHORITY TO MAKE DECISIONS REGARDING THE OFFICIAL STATE OF ALERT IN THEIR AREA AND ANY ACTIONS TO BE TAKEN IN RESPONSE.

AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS
ORIGIN TIME - 0940Z 01 NOV 2014
COORDINATES – 35.90 NORTH 10.22 WEST
DEPTH - 30 KM
LOCATION – SW CAPE SAN VINCENT, PORTUGAL
MAGNITUDE – 7.7

EVALUATION OF TSUNAMI WATCH
IT IS NOT KNOWN THAT A TSUNAMI WAS GENERATED. THIS WARNING IS BASED ONLY ON THE EARTHQUAKE EVALUATION.
AN EARTHQUAKE OF THIS SIZE HAS THE POTENTIAL TO GENERATE A TSUNAMI THAT CAN STRIKE COASTLINES WITH A WAVE HEIGHT GREATER THAN 0.5M AND/OR CAUSE A TSUNAMI RUN-UP GREATER THAN 1M.
AUTHORITIES SHOULD TAKE APPROPRIATE ACTION IN RESPONSE TO THIS POSSIBILITY. THIS CENTER WILL MONITOR SEA LEVEL DATA FROM GAUGES NEAR THE EARTHQUAKE TO DETERMINE IF A TSUNAMI WAS GENERATED AND ESTIMATE THE SEVERITY OF THE THREAT.
A TSUNAMI IS A SERIES OF WAVES AND THE FIRST WAVE MAY NOT BE THE LARGEST. TSUNAMI WAVE HEIGHTS CANNOT BE PREDICTED AND CAN VARY SIGNIFICANTLY ALONG A COAST DUE TO LOCAL EFFECTS. THE TIME FROM ONE TSUNAMI WAVE TO THE NEXT CAN BE FIVE MINUTES TO AN HOUR, AND THE THREAT CAN CONTINUE FOR MANY HOURS AS MULTIPLE WAVES ARRIVE.

EVALUATION OF TSUNAMI ADVISORY
IT IS NOT KNOWN THAT A TSUNAMI WAS GENERATED. THIS WARNING IS BASED ONLY ON THE EARTHQUAKE EVALUATION.
AN EARTHQUAKE OF THIS SIZE HAS THE POTENTIAL TO GENERATE A TSUNAMI THAT CAN STRIKE COASTLINES WITH A WAVE HEIGHT LESS THAN 0.5M AND/OR

3 Note by F. Schindelé. Italics in the message text indicate repetitions that we should try to avoid.
CAUSE A TSUNAMI RUN-UP LESS THAN 1M, AT MORE THAN 1000 KM FAR FROM THE EPICENTER.

AUTHORITIES SHOULD TAKE APPROPRIATE ACTION IN RESPONSE TO THIS POSSIBILITY. THIS CENTER WILL MONITOR SEA LEVEL DATA FROM GAUGES NEAR THE EARTHQUAKE TO DETERMINE IF A TSUNAMI WAS GENERATED AND ESTIMATE THE SEVERITY OF THE THREAT.

A TSUNAMI IS A SERIES OF WAVES AND THE FIRST WAVE MAY NOT BE THE LARGEST. TSUNAMI WAVE HEIGHTS CANNOT BE PREDICTED AND CAN VARY SIGNIFICANTLY ALONG A COAST DUE TO LOCAL EFFECTS. THE TIME FROM ONE TSUNAMI WAVE TO THE NEXT CAN BE FIVE MINUTES TO AN HOUR, AND THE THREAT CAN CONTINUE FOR MANY HOURS AS MULTIPLE WAVES ARRIVE.

EVALUATION OF TSUNAMI INFORMATION
BASED ON HISTORICAL EARTHQUAKE AND TSUNAMI MODELLING THERE IS NO THREAT THAT A TSUNAMI HAS BEEN GENERATED THAT CAN CAUSE DAMAGE OR MAJOR EFFECT IN THE REGION. THIS MESSAGE IS FOR INFORMATION ONLY.

ESTIMATED INITIAL TSUNAMI WAVE ARRIVAL TIMES AT FORECAST POINTS WITHIN THE WATCH AREA ARE GIVEN BELOW. ACTUAL ARRIVAL TIMES MAY DIFFER AND THE INITIAL WAVE MAY NOT BE THE LARGEST. A TSUNAMI IS A SERIES OF WAVES AND THE TIME BETWEEN SUCCESSIVE WAVES CAN BE FIVE MINUTES TO ONE HOUR.

LOCATION, FORECAST POINT COORDINATES, ARRIVAL TIME, ALERT LEVEL (ADVISORY, WATCH)
-------------------------------- ------------ ------------
PORTUGAL - VILA DO BISPO 37.04N 8.89W 0955Z 01 NOV WATCH
PORTUGAL - VILAMOURA 37.07N 8.12W 1009Z 01 NOV WATCH
SPAIN - LA BARROSA 36.37N 6.18W 1006Z 01 NOV WATCH
SPAIN - TORRE DEL PUERCO 36.34N 6.16W 1010Z 01 NOV WATCH
MOROCCO - ASILAH 35.42N 6.07W 1007Z 01 NOV WATCH
MOROCCO - EL BEHARA 34.68N 6.40W 1023Z 01 NOV WATCH
FRANCE - CAPBRETON 43.64N 1.45W 1243Z 01 NOV ADVISORY
FRANCE - LACANAU 44.98N 1.20W 1254Z 01 NOV ADVISORY
IRELAND - SCHULL 51.53N 9.55W 1317Z 01 NOV ADVISORY
IRELAND - TOP CROSS 51.83N 10.17W 1324Z 01 NOV ADVISORY
UNITED KINGDOM - FALMOUTH 50.14N 5.07W 1417Z 01 NOV ADVISORY
UNITED KINGDOM - MULLION 50.02N 5.26W 1424Z 01 NOV ADVISORY

SUPPLEMENT MESSAGES WILL BE ISSUED AS SOON AS NEW DATA AND EVALUATION ALLOWS. THE TSUNAMI ALERT WILL REMAIN IN EFFECT UNTIL AN END OF ALERT IS BROADCAST.

Tsunami Watch Supplement Type 2

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... TSUNAMI WATCH ONGOING ...
THIS ALERT APPLIES TO MOROCCO ... PORTUGAL ... SPAIN

---

4 Note by F. Schindelé. Italics in the message text indicate repetitions that we should try to avoid.
... TSUNAMI ADVISORY ONGOING...
THIS ALERT APPLIES TO FRANCE ... IRELAND ... UNITED KINGDOM

THIS MESSAGE IS ISSUED AS ADVICE TO GOVERNMENT AGENCIES. ONLY NATIONAL AND LOCAL GOVERNMENT AGENCIES HAVE THE AUTHORITY TO MAKE DECISIONS REGARDING THE OFFICIAL STATE OF ALERT IN THEIR AREA AND ANY ACTIONS TO BE TAKEN IN RESPONSE.

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ORIGIN TIME - 0940Z 01 NOV 2014
COORDINATES – 35.90 NORTH 10.22 WEST
DEPTH - 30 KM
LOCATION – SW CAPE SAN VINCENT, PORTUGAL
MAGNITUDE – 7.7

EVALUATION OF TSUNAMI WATCH
SEA LEVEL READINGS INDICATE A TSUNAMI WAS GENERATED.
THIS TSUNAMI CAN STRIKE COASTLINES WITH A WAVE HEIGHT GREATER THAN 0.5M AND/OR CAUSE A TSUNAMI RUN-UP GREATER THAN 1M. THIS CENTER WILL CONTINUE TO MONITOR SEA LEVEL GAUGES NEAREST THE REGION AND REPORT IF ANY ADDITIONAL TSUNAMI WAVE ACTIVITY IS OBSERVED. AUTHORITIES SHOULD TAKE APPROPRIATE ACTION IN RESPONSE TO THIS POSSIBILITY.
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EVALUATION OF TSUNAMI ADVISORY
SEA LEVEL READINGS INDICATE A TSUNAMI WAS GENERATED.
OBSERVATIONS AND MODELS INDICATE THAT NO MORE TSUNAMI WAVES ARE EXPECTED.
THIS TSUNAMI CAN STRIKE COASTLINES WITH A WAVE HEIGHT LESS THAN 0.5M AND/OR CAUSE A TSUNAMI RUN-UP LESS THAN 1M., AT MORE THAN 1000 KM FAR FROM THE EPICENTER
AUTHORITIES SHOULD TAKE APPROPRIATE ACTION IN RESPONSE TO THIS POSSIBILITY.
A TSUNAMI IS A SERIES OF WAVES AND THE FIRST WAVE MAY NOT BE THE LARGEST. TSUNAMI WAVE HEIGHTS CANNOT BE PREDICTED AND CAN VARY SIGNIFICANTLY ALONG A COAST DUE TO LOCAL EFFECTS. THE TIME FROM ONE TSUNAMI WAVE TO THE NEXT CAN BE FIVE MINUTES TO AN HOUR, AND THE THREAT CAN CONTINUE FOR MANY HOURS AS MULTIPLE WAVES ARRIVE.

ESTIMATED INITIAL TSUNAMI WAVE ARRIVAL TIMES AT FORECAST POINTS WITHIN THE WATCH AREA ARE GIVEN BELOW. ACTUAL ARRIVAL TIMES MAY DIFFER AND THE INITIAL WAVE MAY NOT BE THE LARGEST. A TSUNAMI IS A SERIES OF WAVES AND THE TIME BETWEEN SUCCESSIVE WAVES CAN BE FIVE MINUTES TO ONE HOUR.
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(ADVISORY, WATCH)

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PORTUGAL - VILA DO BISPO  37.04N 8.89W 0955Z 01 NOV WATCH
PORTUGAL - VILAMOURA 37.07N 8.12W 1009Z 01 NOV WATCH
SPAIN - LA BARROSA 36.37N 6.18W 1006Z 01 NOV WATCH
SPAIN - TORRE DEL PUERCO 36.34N 6.16W 1010Z 01 NOV WATCH
MOROCCO - ASILAH 35.42N 6.07W 1007Z 01 NOV WATCH

MOROCCO - EL BEHARA 34.68N 6.40W 1023Z 01 NOV W
FRANCE - CAPBRETON 43.64N 1.45W 1243Z 01 NOV ADVISORY
FRANCE - LACANAU 44.98N 1.20W 1254Z 01 NOV ADVISORY
IRELAND - SCHULL 51.53N 9.55W 1317Z 01 NOV ADVISORY
IRELAND - TOP CROSS 51.83N 10.17W 1324Z 01 NOV ADVISORY
UNITED KINGDOM - FALMOUTH 50.14N 5.07W 1417Z 01 NOV ADVISORY
UNITED KINGDOM - MULLION 50.02N 5.26W 1424Z 01 NOV ADVISORY

SUPPLEMENT MESSAGES WILL BE ISSUED AS SOON AS NEW DATA AND
EVALUATION ALLOWS. THE TSUNAMI ALERT WILL REMAIN IN EFFECT UNTIL AN END
OF ALERT IS BROADCAST.

End of Tsunami Watch Type 2

TSUNAMI MESSAGE NUMBER 003
NEAM REGIONAL TSUNAMI WATCH CENTER
ISSUED AT 1625Z 01 NOV 2014

... END OF TSUNAMI WATCH ...
THIS ALERT APPLIES TO MOROCCO ... PORTUGAL ... SPAIN

... END OF TSUNAMI ADVISORY ...
THIS ALERT APPLIES TO FRANCE ... IRELAND ...UNITED KINGDOM

THIS MESSAGE IS ISSUED AS ADVICE TO GOVERNMENT AGENCIES. ONLY
NATIONAL AND LOCAL GOVERNMENT AGENCIES HAVE THE AUTHORITY TO MAKE
DECISIONS REGARDING THE OFFICIAL STATE OF ALERT IN THEIR AREA AND ANY
ACTIONS TO BE TAKEN IN RESPONSE.

AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS
ORIGIN TIME - 0940Z 01 NOV 2014
COORDINATES – 35.90 NORTH 10.22 WEST
DEPTH - 30 KM
LOCATION – SW CAPE SAN VINCENT, PORTUGAL
MAGNITUDE – 7.7

EVALUATION OF TSUNAMI WATCH
SEA LEVEL READINGS INDICATE A TSUNAMI WAS GENERATED.
OBSERVATIONS AND MODELS INDICATE THAT NO MORE TSUNAMI WAVES ARE
EXPECTED.

EVALUATION OF TSUNAMI ADVISORY
SEA LEVEL READINGS INDICATE A TSUNAMI WAS GENERATED.
OBSERVATIONS AND MODELS INDICATE THAT NO MORE TSUNAMI WAVES ARE
EXPECTED.

5 Note by F. Schindelé. Italics in the message text indicate repetitions that we should try to avoid.
A tsunami is a series of waves and the first wave may not be the largest. Tsunami wave heights cannot be predicted and can vary significantly along a coast due to local effects. The time from one tsunami wave to the next can be five minutes to an hour, and the threat can continue for many hours as multiple waves arrive.

When no major waves are observed for two hours after the estimated time of arrival or damaging waves have not occurred for at least two hours then local authorities can assume the threat is passed. Danger to boats and coastal structures can continue for several hours due to the continuing sea level changes and rapid currents. As local conditions can cause a wide variation in tsunami wave action the all clear determination must be made by local authorities.

This will be the final message issued for this event unless additional information becomes available.

Tsunami Watch Cancellation Type 2

TSUNAMI MESSAGE NUMBER 002
NEAM REGIONAL TSUNAMI WATCH CENTER
ISSUED AT 1020Z 01 NOV 2014

... TSUNAMI WATCH CANCELLATION ...
THIS ALERT APPLIES TO MOROCCO ... PORTUGAL ... SPAIN

... TSUNAMI ADVISORY CANCELLATION ...
THIS ALERT APPLIES TO FRANCE ... IRELAND ... UNITED KINGDOM

This message is issued as advice to government agencies. Only national and local government agencies have the authority to make decisions regarding the official state of alert in their area and any actions to be taken in response.

An earthquake has occurred with these preliminary parameters
Origin Time - 0940Z 01 NOV 2014
Coordinates – 35.90 North 10.22 West
Depth - 30 km
Location – SW Cape San Vincent, Portugal
Magnitude – 7.7

Evaluation of tsunami watch and advisory
Sea level readings indicate that no tsunami was generated. The tsunami alert is cancelled. However, earthquakes of this size can generate small tsunamis that cause locally changes in currents and resonance in harbours.
AUTHORITIES SHOULD BE AWARE OF THIS POSSIBILITY AND TAKE APPROPRIATE ACTION.

THIS WILL BE THE FINAL MESSAGE ISSUED FOR THIS EVENT UNLESS ADDITIONAL INFORMATION BECOMES AVAILABLE.

Tsunami Advisory Initial

TSUNAMI MESSAGE NUMBER 001
NEAM REGIONAL TSUNAMI WATCH CENTER
ISSUED AT 0947Z 01 NOV 2014

... TSUNAMI ADVISORY...
THIS ALERT APPLIES TO IRELAND ... MOROCCO ... PORTUGAL ... SPAIN ...

... TSUNAMI INFORMATION ...
THIS INFORMATION APPLIES TO ALBANIA ... ALGERIA ... BOSNIA AND HERZEGOVINA ... BULGARIA ... CROATIA ... CYPRUS ... EGYPT ... FRANCE ... GEORGIA ... GREECE ... ISRAEL ... ITALY ... IRELAND ... LEBANON ... LIBYA ... MALTA ... MONTENEGRO ... PALESTINE ... ROMANIA ... RUSSIA ... SLOVENIA ... SYRIA ... TUNISIA ... TURKEY ... UKRAINE ... UNITED KINGDOM

THIS MESSAGE IS ISSUED AS ADVICE TO GOVERNMENT AGENCIES. ONLY NATIONAL AND LOCAL GOVERNMENT AGENCIES HAVE THE AUTHORITY TO MAKE DECISIONS REGARDING THE OFFICIAL STATE OF ALERT IN THEIR AREA AND ANY ACTIONS TO BE TAKEN IN RESPONSE.

AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS
ORIGIN TIME - 0940Z 01 NOV 2014
COORDINATES – 35.90 NORTH 10.22 WEST
DEPTH - 30 KM
LOCATION – SW CAPE SAN VINCENT, PORTUGAL
MAGNITUDE – 7.2

EVALUATION OF TSUNAMI ADVISORY
IT IS NOT KNOWN THAT A TSUNAMI WAS GENERATED. THIS WARNING IS BASED ONLY ON THE EARTHQUAKE EVALUATION.
AN EARTHQUAKE OF THIS SIZE HAS THE POTENTIAL TO GENERATE A TSUNAMI THAT CAN STRIKE COASTLINES WITH A WAVE HEIGHT LESS THAN 0.5M AND/OR CAUSE A TSUNAMI RUN-UP LESS THAN 1M.
AUTHORITIES SHOULD TAKE APPROPRIATE ACTION IN RESPONSE TO THIS POSSIBILITY. THIS CENTER WILL MONITOR SEA LEVEL DATA FROM GAUGES NEAR THE EARTHQUAKE TO DETERMINE IF A TSUNAMI WAS GENERATED AND ESTIMATE THE SEVERITY OF THE THREAT.
A TSUNAMI IS A SERIES OF WAVES AND THE FIRST WAVE MAY NOT BE THE LARGEST. TSUNAMI WAVE HEIGHTS CANNOT BE PREDICTED AND CAN VARY SIGNIFICANTLY ALONG A COAST DUE TO LOCAL EFFECTS. THE TIME FROM ONE TSUNAMI WAVE TO THE NEXT CAN BE FIVE MINUTES TO AN HOUR, AND THE THREAT CAN CONTINUE FOR MANY HOURS AS MULTIPLE WAVES ARRIVE.

EVALUATION OF TSUNAMI INFORMATION
BASED ON HISTORICAL EARTHQUAKE AND TSUNAMI MODELLING THERE IS NO THREAT THAT A TSUNAMI HAS BEEN GENERATED THAT CAN CAUSE DAMAGE OR MAJOR EFFECT IN THE REGION. THIS MESSAGE IS FOR INFORMATION ONLY.
ESTIMATED INITIAL TSUNAMI WAVE ARRIVAL TIMES AT FORECAST POINTS WITHIN THE WATCH AREA ARE GIVEN BELOW. ACTUAL ARRIVAL TIMES MAY DIFFER AND THE INITIAL WAVE MAY NOT BE THE LARGEST. A TSUNAMI IS A SERIES OF WAVES AND THE TIME BETWEEN SUCCESSIVE WAVES CAN BE FIVE MINUTES TO ONE HOUR.

LOCATION, FORECAST POINT COORDINATES, ARRIVAL TIME, ALERT LEVEL (ADVISORY, WATCH)

<table>
<thead>
<tr>
<th>Location</th>
<th>Coordinates</th>
<th>Arrival Time</th>
<th>Alert Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>PORTUGAL - VILA DO BISPO</td>
<td>37.04N 8.89W</td>
<td>0955Z</td>
<td>01 NOV ADVISORY</td>
</tr>
<tr>
<td>PORTUGAL - VILAMOURA</td>
<td>37.07N 8.12W</td>
<td>1009Z</td>
<td>01 NOV ADVISORY</td>
</tr>
<tr>
<td>SPAIN - LA BARROSA</td>
<td>36.37N 6.18W</td>
<td>1006Z</td>
<td>01 NOV ADVISORY</td>
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<tr>
<td>SPAIN - TORRE DEL PUERCO</td>
<td>36.34N 6.16W</td>
<td>1010Z</td>
<td>01 NOV ADVISORY</td>
</tr>
<tr>
<td>MOROCCO - ASILAH</td>
<td>35.42N 6.07W</td>
<td>1007Z</td>
<td>01 NOV ADVISORY</td>
</tr>
<tr>
<td>MOROCCO - EL BEHARA</td>
<td>34.68N 6.40W</td>
<td>1023Z</td>
<td>01 NOV ADVISORY</td>
</tr>
<tr>
<td>FRANCE - CAPBRETON</td>
<td>43.64N 1.45W</td>
<td>1243Z</td>
<td>01 NOV ADVISORY</td>
</tr>
<tr>
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<tr>
<td>IRELAND - SCHULL</td>
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</tr>
<tr>
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<td>51.83N 10.17W</td>
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<td>01 NOV ADVISORY</td>
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<tr>
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<td>50.14N 5.07W</td>
<td>1417Z</td>
<td>01 NOV ADVISORY</td>
</tr>
<tr>
<td>UNITED KINGDOM - MULLION</td>
<td>50.02N 5.26W</td>
<td>1424Z</td>
<td>01 NOV ADVISORY</td>
</tr>
</tbody>
</table>

SUPPLEMENT MESSAGES WILL BE ISSUED AS SOON AS NEW DATA AND EVALUATION ALLOWS. THE TSUNAMI ALERT WILL REMAIN IN EFFECT UNTIL AN END OF ALERT IS BROADCAST.

TSunami Advisory Supplement

TSUNAMI MESSAGE NUMBER 002
NEAM REGIONAL TSUNAMI WATCH CENTER
ISSUED AT 10107Z 01 NOV 2014

... TSUNAMI ADVISORY ONGOING ...
THIS ALERT APPLIES TO FRANCE ... IRELAND ... MOROCCO ... PORTUGAL ... SPAIN ...
... UNITED KINGDOM

THIS MESSAGE IS ISSUED AS ADVICE TO GOVERNMENT AGENCIES. ONLY NATIONAL AND LOCAL GOVERNMENT AGENCIES HAVE THE AUTHORITY TO MAKE DECISIONS REGARDING THE OFFICIAL STATE OF ALERT IN THEIR AREA AND ANY ACTIONS TO BE TAKEN IN RESPONSE.

AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS
ORIGIN TIME - 0940Z 01 NOV 2014
COORDINATES – 35.90 NORTH 10.22 WEST
DEPTH - 30 KM
LOCATION – SW CAPE SAN VINCENT, PORTUGAL
MAGNITUDE – 7.2

EVALUATION OF TSUNAMI ADVISORY
SEA LEVEL READINGS INDICATE A TSUNAMI WAS GENERATED.
THIS TSUNAMI CAN STRIKE COASTLINES WITH A WAVE HEIGHT LESS THAN 0.5M
AND/OR CAUSE A TSUNAMI RUN-UP LESS THAN 1M. THIS CENTER WILL CONTINUE TO MONITOR SEA LEVEL GAUGES NEAREST THE
REGION AND REPORT IF ANY ADDITIONAL TSUNAMI WAVE ACTIVITY IS OBSERVED. AUTHORITIES SHOULD TAKE APPROPRIATE ACTION IN RESPONSE TO THIS POSSIBILITY. A TSUNAMI IS A SERIES OF WAVES AND THE FIRST WAVE MAY NOT BE THE LARGEST. TSUNAMI WAVE HEIGHTS CANNOT BE PREDICTED AND CAN VARY SIGNIFICANTLY ALONG A COAST DUE TO LOCAL EFFECTS. THE TIME FROM ONE TSUNAMI WAVE TO THE NEXT CAN BE FIVE MINUTES TO AN HOUR, AND THE THREAT CAN CONTINUE FOR MANY HOURS AS MULTIPLE WAVES ARRIVE.

ESTIMATED INITIAL TSUNAMI WAVE ARRIVAL TIMES AT FORECAST POINTS WITHIN THE WATCH AREA ARE GIVEN BELOW. ACTUAL ARRIVAL TIMES MAY DIFFER AND THE INITIAL WAVE MAY NOT BE THE LARGEST. A TSUNAMI IS A SERIES OF WAVES AND THE TIME BETWEEN SUCCESSIVE WAVES CAN BE FIVE MINUTES TO ONE HOUR.

LOCATION, FORECAST POINT COORDINATES, ARRIVAL TIME, ALERT LEVEL
(ADVISORY, WATCH)
-------------------------------- ------------ ------------
PORTUGAL - VILA DO BISPO  37.04N 8.89W 0955Z 01 NOV ADVISORY
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UNITED KINGDOM - MULLION 50.02N 5.26W 1424Z 01 NOV ADVISORY

SUPPLEMENT MESSAGES WILL BE ISSUED AS SOON AS NEW DATA AND EVALUATION ALLOWS. THE TSUNAMI ALERT WILL REMAIN IN EFFECT UNTIL AN END OF ALERT IS BROADCAST.

End of Tsunami Advisory

TSUNAMI MESSAGE NUMBER 003
NEAM REGIONAL TSUNAMI WATCH CENTER
ISSUED AT 1625Z 01 NOV 2014

... END OF TSUNAMI WATCH ...
THIS ALERT APPLIES TO FRANCE … IRELAND … MOROCCO … PORTUGAL … SPAIN … UNITED KINGDOM

THIS MESSAGE IS ISSUED AS ADVICE TO GOVERNMENT AGENCIES. ONLY NATIONAL AND LOCAL GOVERNMENT AGENCIES HAVE THE AUTHORITY TO MAKE DECISIONS REGARDING THE OFFICIAL STATE OF ALERT IN THEIR AREA AND ANY ACTIONS TO BE TAKEN IN RESPONSE.

AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS ORIGIN TIME - 0940Z 01 NOV 2014
COORDINATES – 35.90 NORTH 10.22 WEST
DEPTH - 30 KM
LOCATION – SW CAPE SAN VINCENT, PORTUGAL
MAGNITUDE – 7.2

EVALUATION OF TSUNAMI ADVISORY
SEA LEVEL READINGS INDICATE A TSUNAMI WAS GENERATED.
OBSERVATIONS AND MODELS INDICATE THAT NO MORE TSUNAMI WAVES ARE EXPECTED.
WHEN NO MAJOR WAVES ARE OBSERVED FOR TWO HOURS AFTER THE ESTIMATED TIME OF ARRIVAL OR DAMAGING WAVES HAVE NOT OCCURRED FOR AT LEAST TWO HOURS THEN LOCAL AUTHORITIES CAN ASSUME THE THREAT IS PASSED. DANGER TO BOATS AND COASTAL STRUCTURES CAN CONTINUE FOR SEVERAL HOURS DUE TO THE CONTINUING SEA LEVEL CHANGES AND RAPID CURRENTS. AS LOCAL CONDITIONS CAN CAUSE A WIDE VARIATION IN TSUNAMI WAVE ACTION THE ALL CLEAR DETERMINATION MUST BE MADE BY LOCAL AUTHORITIES.

THIS WILL BE THE FINAL MESSAGE ISSUED FOR THIS EVENT UNLESS ADDITIONAL INFORMATION BECOMES AVAILABLE.

<table>
<thead>
<tr>
<th>Tsunami Advisory Cancellation</th>
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</thead>
<tbody>
<tr>
<td>TSUNAMI MESSAGE NUMBER 002</td>
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<tr>
<td>NEAM REGIONAL TSUNAMI WATCH CENTER</td>
</tr>
<tr>
<td>ISSUED AT 1020Z 01 NOV 2014</td>
</tr>
</tbody>
</table>

... TSUNAMI ADVISORY CANCELLATION ...
THIS ALERT APPLIES TO FRANCE ... IRELAND ... MOROCCO ... PORTUGAL ... SPAIN ... UNITED KINGDOM

THIS MESSAGE IS ISSUED AS ADVICE TO GOVERNMENT AGENCIES. ONLY NATIONAL AND LOCAL GOVERNMENT AGENCIES HAVE THE AUTHORITY TO MAKE DECISIONS REGARDING THE OFFICIAL STATE OF ALERT IN THEIR AREA AND ANY ACTIONS TO BE TAKEN IN RESPONSE.

AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS
ORIGIN TIME - 0940Z 01 NOV 2014
COORDINATES – 35.90 NORTH 10.22 WEST
DEPTH - 30 KM
LOCATION – SW CAPE SAN VINCENT, PORTUGAL
MAGNITUDE – 7.2

EVALUATION OF TSUNAMI WATCH
SEA LEVEL READINGS INDICATE THAT NO TSUNAMI WAS GENERATED.
THE TSUNAMI ALERT IS CANCELLED.
HOWEVER, EARTHQUAKES OF THIS SIZE CAN GENERATE SMALL TSUNAMIS THAT CAUSE LOCALLY CHANGES IN CURRENTS AND RESONANCE IN HARBOURS.
AUTHORITIES SHOULD BE AWARE OF THIS POSSIBILITY AND TAKE APPROPRIATE ACTION.

THIS WILL BE THE FINAL MESSAGE ISSUED FOR THIS EVENT UNLESS ADDITIONAL INFORMATION BECOMES AVAILABLE.
Tsunami Information

TSUNAMI MESSAGE NUMBER 001
NEAM REGIONAL TSUNAMI WATCH CENTER
ISSUED AT 0947 01 NOV 2014

... TSUNAMI INFORMATION ...
THIS ALERT APPLIES TO ALBANIA ... ALGERIA ... BOSNIA AND HERZEGOVINA ...
BULGARIA ... CROATIA ... CYPRUS ... EGYPT ... FRANCE ... GEORGIA ... GREECE ...
IRELAND ... ISRAEL ... ITALY ... LEBANON ... LIBYA ... MALTA ... MONTENEGRO ...
MOROCCO ... PALESTINE ... PORTUGAL ... ROMANIA ... RUSSIA ... SLOVENIA ...
SPAIN ... SYRIA ... TUNISIA ... TURKEY ... UKRAINE ... UNITED KINGDOM

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NATIONAL AND LOCAL GOVERNMENT AGENCIES HAVE THE AUTHORITY TO MAKE
DECISIONS REGARDING THE OFFICIAL STATE OF ALERT IN THEIR AREA AND ANY
ACTIONS TO BE TAKEN IN RESPONSE.

AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS
ORIGIN TIME - 0940Z 01 NOV 2014
COORDINATES – 35.90 NORTH 10.22 WEST
DEPTH - 30 KM
LOCATION – SW CAPE SAN VINCENT, PORTUGAL
MAGNITUDE – 6.7

EVALUATION OF TSUNAMI INFORMATION
BASED ON HISTORICAL EARTHQUAKE AND TSUNAMI MODELLING THERE IS NO
THREAT THAT A TSUNAMI HAS BEEN GENERATED THAT CAN CAUSE DAMAGE OR
MAJOR EFFECT IN THE REGION. THIS MESSAGE IS FOR INFORMATION ONLY.

THIS WILL BE THE FINAL MESSAGE ISSUED FOR THIS EVENT UNLESS ADDITIONAL
INFORMATION BECOMES AVAILABLE.

Tsunami Communication Test

TSUNAMI COMMUNICATION TEST MESSAGE NUMBER 001
NEAM REGIONAL TSUNAMI WATCH CENTER
ISSUED AT 2315Z 25 DEC 2011

... TSUNAMI COMMUNICATION TEST ...
THIS TEST APPLIES TO ALBANIA ... ALGERIA ... BOSNIA AND HERZEGOVINA ...
BULGARIA ... CROATIA ... CYPRUS ... EGYPT ... FRANCE ... GEORGIA ... GREECE ...
IRELAND ... ISRAEL ... ITALY ... LEBANON ... LIBYA ... MALTA ... MONTENEGRO ...
MOROCCO ... PALESTINE ... PORTUGAL ... ROMANIA ... RUSSIA ... SLOVENIA ...
SPAIN ... SYRIA ... TUNISIA ... TURKEY ... UKRAINE ... UNITED KINGDOM

FROM – NEAM – REGIONAL TSUNAMI WATCH CENTER
TO - DESIGNATED 24-HOUR TSUNAMI WARNING FOCAL POINTS OF THE
NEAM REGION
SUBJECT – NEAM-RTWC TSUNAMI COMMUNICATION TEST
THIS IS A TEST TO VERIFY COMMUNICATION LINKS AND DETERMINE
TRANSMISSION TIMES INVOLVED IN THE DISSEMINATION OF OPERATIONAL
TSUNAMI MESSAGES FROM THE NEAM- REGIONAL TSUNAMI WATCH CENTER
TO DESIGNATED 24-HOUR TSUNAMI WARNING FOCAL POINTS OF THE NEAM TSUNAMI WARNING SYSTEM.
RECIPIENTS ARE REQUESTED TO PLEASE RESPOND BACK TO THE NEAM-RTWC WITH THE FOLLOWING INFORMATION.
1 - NAME OF OFFICE THAT RECEIVED THIS TEST MESSAGE
2 - METHOD OR METHODS BY WHICH THE TEST MESSAGE WAS RECEIVED
3 - TIME OF RECEIPT OF THIS TEST MESSAGE BY EACH METHOD
PLEASE RESPOND VIA ONE OF THE FOLLOWING MEANS
EMAIL – NEAM-RTWC@IOC-TSUNAMI.ORG
TELEFAX - 99-999-999-9999
THANK YOU FOR YOUR PARTICIPATION IN THIS COMMUNICATION TEST.

THIS WILL BE THE FINAL MESSAGE ISSUED FOR THIS EVENT UNLESS ADDITIONAL INFORMATION BECOMES AVAILABLE.
ANNEX I: ICG/NEAMTWS ORGANIZATIONAL STRUCTURE AND GOVERNANCE

The ICG/NEAMTWS was established in 2005 through IOC Resolution XXIII-13. It consists of a Chair and two Vice-chairs, a Secretariat (provided by the IOC) and four Working Groups, each led by two Co-chairs. These working groups address essential thematic issues for the tsunami warning system in the region, namely hazard and risk assessment including numerical modeling (WG1); a seismic monitoring network (WG2), a sea level monitoring network with coastal and offshore stations (WG3); and advisory, mitigation and public awareness (WG4). In addition, three Task Teams (TT) address the regional tsunami warning system architecture, communication test and tsunami exercises, and the multi-hazard approach to coastal inundation.

The ICG has met seven times since 2005 (about once per year) in different European countries:

- ICG/NEAMTWS-I: Rome, Italy, 21–22 November 2005
- ICG/NEAMTWS-II: Nice, France, 22–24 May 2006
- ICG/NEAMTWS-III: Bonn, Germany, 7–9 February 2007
- ICG/NEAMTWS-IV: Lisbon, Portugal, 21–23 November 2007
- ICG/NEAMTWS-V: Athens, Greece, 3–5 November 2008
- ICG/NEAMTWS-VI: Istanbul, Turkey, 11-13 November 2009

The working groups have organized additional intersessional meetings to monitor the progress of their work and activities.
INTERGOVERNMENTAL COORDINATION GROUP FOR THE TSUNAMI EARLY WARNING AND MITIGATION SYSTEM IN THE NORTH-EASTERN ATLANTIC, THE MEDITERRANEAN AND CONNECTED SEAS

The Intergovernmental Oceanographic Commission,

Following the guidance of the World Conference on Disaster Reduction held in Kobe, Hyogo, Japan, 18-22 January 2005, and of the Hyogo Framework for Action 2005-2015 adopted by that World Conference,

Considering the 26 December 2004 event in the Indian Ocean that showed the devastating power of the tsunami and that its disastrous consequences could have been reduced if a tsunami early warning system had been in place,

Being aware that tsunamis pose threats in all ocean basins of the world, and that the protection of the coastal populations and mitigation of tsunami effects is a high-priority,

Recognizing that the north-eastern Atlantic, the Mediterranean and connected seas are regions with identified potential for catastrophic tsunamis and with a long known history of tsunami events,

Noting that:

(i) no effective regional tsunami early warning system is in place in the north-eastern Atlantic, in the Mediterranean and connected sea, and that the effects of a large tsunami in the area would be more disastrous than in the case of historical events, given the huge increase in coastal development and use in modern times,

(ii) these areas include countries with different levels of resources and development and that assistance to disaster-prone developing countries to set up national strategies and plans of actions and programmes for disaster risk reduction is one of the identified priorities of the Hyogo Framework,

(iii) a project for building up a European monitoring and alert system on tsunamis covering the European waters in the Atlantic, Mediterranean and connected seas is under consideration by the European Commission,

Decides:

(i) to establish an Intergovernmental Coordination Group for a Tsunami Early Warning System in the North-eastern Atlantic and the Mediterranean and Connected Sea (ICG/NEAMTWS) with the Terms of Reference annexed to this Resolution, and that such a Tsunami Warning and Mitigation System be developed within the global framework of IOC;

(ii) that the IOC shall provide the Secretariat of the ICG/NEAMTWS;

Invites Member States and other international and regional organizations to provide voluntary contributions to the IOC Trust Fund in order to assist the IOC in the effective provision of secretariat services for the ICG/NEAMTWS;
Instructs the IOC Executive Secretary to initiate consultations with the European Commission on cooperation and mobilization of support for the establishment of the ICG/NEAMTWS;

Welcomes and accepts the offer of Italy to host the first meeting of the ICG/NEAMTWS in Rome before the end of 2005.

Identified funding: US$ 30,000 from extra-budgetary resources to be identified.

Annex to Resolution XXIII-14

Terms of Reference for the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North-eastern Atlantic, the Mediterranean and Connected Seas

The ICG will be established as an intergovernmental subsidiary body of the IOC and will report to, and seek guidance from, the IOC Assembly.

Objectives:
1. To coordinate the activities of the ICG/NEAMTWS;
2. To organize and facilitate, as appropriate, the exchange of seismic, geodetic, sea-level and other data in or near real-time and information required for interoperability of the ICG/NEAMTWS;
3. To promote the sharing of experience and expertise related to tsunami warning and mitigation for the north-eastern Atlantic, the Mediterranean and connected seas;
4. To promote tsunami research;
5. To promote the establishment and further development of national tsunami warning and mitigation capacities in accordance with standard protocols and methods;
6. To develop, adopt and monitor implementation of work plans of the ICG/NEAMTWS, and to identify required resources;
7. To promote implementation of relevant capacity-building;
8. To liaise and coordinate with other tsunami warning systems;
9. To liaise with other relevant organizations, programmes and projects;
10. To promote the implementation of the ICG/NEAMTWS within a multi-hazard framework;
11. To develop a comprehensive programme of capacity-building on tsunami protection for the north-eastern Atlantic, the Mediterranean and connected seas, including the Black Sea;
12. To keep under constant scrutiny the status of the system and how it satisfies the needs.

The Secretariat for the ICG/NEAMTWS shall:
1. Support meetings of the Intergovernmental Coordination Group;
2. Facilitate the liaison among the various national contact points and national tsunami warning centres;
3. Maintain a current list of operational national contact points and facilities and make it available on request to all Member States;
4. Organize the liaison of the ICG/NEAMTWS with the PTWC and with other tsunami warning centres to facilitate best practices in tsunami warning;
5. Initiate and support, in consultation with ITIC, training activities and enhance and enrich warning in the north-eastern Atlantic and the Mediterranean and connected seas.

Membership:
- Member States of the IOC bordering the north-eastern Atlantic and those bordering and within the Mediterranean Sea and connected seas.
- Observers from other IOC Member States.
- Invited observers from other organizations (including NGO’s), programmes and projects in accordance with the IOC rules and procedures.
TERMS OF REFERENCE OF THE WORKING GROUPS AND THE TASK TEAM

Working Group 1 - Hazard Assessment and Modelling

The working group will be responsible for providing information and propose standards for modelling techniques in support of tsunami early warning, sea level related hazard, and coastal inundation. It proposes, facilitates, and supports efforts to homogenize model output and recommends best practices in the production of hazard maps for planning purposes of coastal communities. It interacts with other working groups to provide expertise in utilization of data for forecasting purposes and in adequate interpretation and utilization of modelling results.

Adopted by ICG/NEAMTWS-I; modified by ICG/NEAMTWS-VI

Working Group 2 - Seismic and Geophysical Measurements

The working group will be responsible for defining, based on existing organizations and functions, a transnational seismic network as part of early warning tsunami detection instruments in seismically active coastal areas and providing recommendations on the according data processing and analysis.

Adopted by ICG/NEAMTWS-I; modified by ICG/NEAMTWS-II

Working Group 3 - Sea Level Data Collection and Exchange, Including Offshore Tsunami Detection and Instruments

The working group will be responsible for defining, based on existing organizations and functions, a transnational sea level and marine network that can be integrated in an early warning tsunami detection system, as well as for providing recommendations on the data processing and analysis.

Adopted by ICG/NEAMTWS-I; modified by ICG/NEAMTWS-II

Working Group 4 - Public Awareness, Preparedness and Mitigation

The Working Group will advise on the assessment of vulnerability and risk to communities in respect of tsunami events; on procedures for enhancing awareness of, and preparedness for, tsunami impacts including evacuation planning and education; on the receipt and interpretation of tsunami alert messages received from Regional Tsunami Watch Centres by Tsunami Warning Focal Points and National Tsunami Warning Centres for issuance of warnings to threatened communities; and on the options in an Integrated Coastal Area Management (ICAM) context for the mitigation of risk to communities in respect of tsunami impacts.

Adopted by ICG/NEAMTWS-I; modified by ICG/NEAMTWS-II and VI
Task Team on the Regional Tsunami Warning System Architecture

Mandate

Taking account of the NEAMTWS implementation plan, the Interim Operational Users Guide and the Development Plan, the outcomes of working groups and task teams, and of the previous decisions made by the ICG and the work carried out formerly, the Task Team shall:

1. Continue to refine architecture, tools and cooperation for RTWCs, as elements of the technical end-to-end operational structure of the NEAMTWS;
2. Maintain and update the Development Plan and Operational Users guide for the NEAMTWS network

Modus operandi

The Task Team will mainly work by correspondence, but hold a first meeting at the beginning of 2011 and a final one, in preparation for the next ICG meeting. Other meetings will be held as needed.

Membership

- The ICG officers and the chairpersons of the ICG working groups
- Representatives of potential RTWCs
- Experts designated by Member States having interest in participating in the system
- Representatives of relevant organizations working in the NEAMTWS region

The Task Team will have two co-chairs nominated by the Officers of the ICG/NEAMTWS.

Adopted by ICG/NEAMTWS-IV; modified by ICG/NEAMTWS-V, VI and VII

Task Team on the Communication Test and Tsunami Exercises

Mandate

As part of the preparations phase for the NEAMTWS the Task Team on Communication Test and Tsunami Exercises will:

1. Refine procedures for testing the communication of tsunami alert messages between National Tsunami Warning Centres and Tsunami Warning Focal Points, including speed and availability within NEAMTWS region
2. Conduct a Workshop ahead of the enlarged Communication Test to inform about the procedures and discuss the practical means of the Tsunami Exercise in 2012. Participants: NTWC, TWFPs, TNCs, Civil Protection authorities, IT experts, representatives of relevant organizations working in the NEAMTWS region
3. Prepare and conduct the test and organise its assessment
4. Contribute to reviewing and proposing amendments to the relevant parts of the Operational Users Guide in the light of experience with the tests
5. Based on experience gained, set-up procedures for the first NEAM Tsunami exercise to be conducted in 2012
6. Report to ICG/NEAMTWS-VIII

Modus operandi

The Task Team will mainly work by correspondence, but hold a first meeting at the beginning of 2011 and a final one, in preparation for the next ICG meeting. Other meetings will be held as needed.
The offer of JRC to host the workshop is acknowledged.

Membership

- The ICG officers
- Chairs or co-chairs of existing NEAMTWS Task Teams and Working Groups
- Representatives of potential RTWCs
- Experts designated by Member States having interest in participating in the system (NTWC, TWFP, TNC, Civil Protection authorities)
- Representatives of relevant organizations working in the NEAMTWS region

The Task Team Co-chairs will be nominated by the Officers of the ICG/NEAMTWS.

Adopted by ICG/NEAMTWS-VI; modified by ICG/NEAMTWS-VII

Task Team on the Multi-hazard Approach to Coastal Inundation

Mandate

Taking account of encouragement by EC-XLIII and TOWS to develop a multi-hazard (MH) approach to tsunami warning systems, where appropriate, the Task Team shall:

1. Identify, in collaboration with relevant bodies, existing national sea-level related warning and mitigation systems in the NEAM region;

2. Explore ways of linking or integrating national tsunami warning functions and existing or planned multi-hazard systems, using the experience gained across NEAM and other ICGs

3. Consider how multi-hazard systems could include prevention, awareness and mitigation aspects of NEAMTWS

4. Explore linkages with existing frameworks for coastal inundation mapping such as, but not restricted to, the EU Floods Directive and the Integrated Coastal Zone Management Protocol of the Barcelona Convention

5. Make specific proposals to ICG/NEAMTWS-VIII for implementation of NEAMTWS functions in a MH framework

Modus operandi

The Task Team will mainly work by correspondence, but hold a first meeting in the beginning of 2011 in Paris and a final one, in preparation for the next ICG meeting
Membership

- The ICG officers and the chairpersons of Working Groups 3 and 4
- Representatives of NTWCs
- Experts designated by member states having interest in participating in the system, including particularly representatives of civil protection authorities
- Representatives of relevant organizations working in the NEAMTWS region

The Task Team will have one chair nominated by the Officers of the NEAMTWS ICG.

Adopted by ICG/NEAMTWS-VII
ANNEX II: TWFP AND TNC FORMS

UNESCO IOC
7/24 TSUNAMI WARNING FOCAL POINT (TWFP) FORM

Note that more than one contact point may be designated using a new Form for each

Name of Country ___________________________________________________

Place in Country ___________________________________________________
*Only if this Contact Point is not for the entire country's coast. For example, a remote island.

Do you agree to share your TWFP information with other TWFP contacts?
Yes ____ No ____

1. Tsunami Warning Focal Point for receiving Tsunami Bulletins

The Tsunami Warning Focal Point (TWFP) is a 7x24 contact person, or other official point of contact or address designated by a government, available at the national level for rapidly receiving and issuing tsunami event information (such as warnings). The Tsunami Warning Focal Point either is the emergency authority (civil defense or other designated agency responsible for public safety), or has the responsibility of notifying the emergency authority of the event characteristics (earthquake and/or tsunami), in accordance with national standard operating procedures. The Tsunami Warning Focal Point receives international tsunami warnings from the NEAMTWS or other regional warning centers. The TWFP contact information requires 7x24 telephone, facsimile, or e-mail information. The TWFP may be contacted for clarification concerning the designated communication method, or in an emergency if all designated communication methods fail.

Agency name________________________________________________________

Contact Person in Agency or Officer in Charge:

Name:  ________________________________________________________
Position: ________________________________________________________
Telephone Number: __________________________________________________
Fax:  ________________________________________________________
Cellular Telephone Number: ____________________________________________
E-mail Address: __________________________________________________
Postal Address: ___________________________________________________
_________________________________________________________________

2. Designated Communication Method Information (operational on 7/24 basis).

Please specify GTS (WMO-Global Telecommunication System), AFTN (Aeronautical Fixed Telecommunications Network), Fax, or E-mail in a priority order. Note that bulletins from JMA are not available by AFTN. Please recognize that Fax and E-mail alone are not the timeliest
and should not be used as the primary means. Also include with the international 4-letter GTS IOC Technical Series No. 87 Operational Users Guide for PTWS Page 14.

Location Indicators used in the abbreviated headings, the 8-letter AFTN Address Indicator, the Fax number, or the E-mail address, respectively. For GTS Location Indicators see http://www.wmo.int/web/www/ouis/Operational Information/VolumeC1/VolC1.html. The AFTN Address Indicators are found in ICAO (International Civil Aviation Organization) Documents 7910 and 8585, and consist of a 4-letter location indicator and 4-letter type-of-operations indicator. In general, the GTS and AFTN dedicated, private communication methods guarantee timely receipt of bulletins within several minutes, whereas Facsimile and E-mail may incur delays of tens of minutes during peak usage times. Note that while all dissemination methods designated below will be made simultaneously by the issuing centers, but bulletins may reach their destinations at different times depending on the communication method.

Primary: ____________________________________________________________
Alternate 1: __________________________________________________________
Alternate 2: __________________________________________________________
Alternate 3: __________________________________________________________
Alternate 4: __________________________________________________________
Alternate 5: __________________________________________________________

Please specify telephone number for voice communication, in a priority order. In general, due to language barriers, the operational warning centers do not use voice communication as the primary means of warning dissemination, but as a backup or for confirmation when urgently needed of message receipt through the above means.

Primary: ____________________________________________________________
Alternate 1: __________________________________________________________
Alternate 2: __________________________________________________________
Alternate 3: __________________________________________________________

3. Comments:
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

Date:___________________ Submitted by:∗ ______________________________________________________________________

∗ UNESCO and/or IOC Member States shall forward this form through one of the following channels: (a) Minister of Foreign Affairs, (b) Head of UNESCO National Commission, (c) Permanent Delegate to UNESCO, (d) Head of the specified national coordinating body for liaison with the IOC ("IOC Focal Point"); case in which UNESCO/IOC shall request validation through either the Permanent Delegate to UNESCO, the Head of the UNESCO National Commission or the Minister of Foreign Affairs. Please forward this forms to the IOC Executive Secretary, Mr Patricio Bernal at p.bernal@unesco.org, copied to Mr Peter Koltermann at p.koltermann@unesco.org, Mr Ulrich Wolf at u.wolf@unesco.org and Ms Collins at f.collins@unesco.org.
UNESCO IOC
TSUNAMI NATIONAL CONTACT (TNC) FORM

Note that more than one contact point may be designated using a new Form for each

Name of Country _____________________________________________________

Tsunami National Contact
The person designated by a Member State to an Intergovernmental Coordination Group (ICG) to represent his/her country in the coordination of international tsunami warning and mitigation activities. The person is part of the main stakeholders of the national tsunami warning and mitigation system. The person may be the Tsunami Warning Focal Point, from the national disaster management organization, from a technical or scientific institution, or from another agency with tsunami warning and mitigation responsibilities.

Agency name ________________________________________________________

Contact Person in Agency or Officer in Charge:
Name:  ________________________________________________________
Position: ________________________________________________________
Telephone Number: __________________________________________________
Fax: ______________________________________________________________
Cellular Telephone Number: ____________________________________________
E-mail Address: __________________________________________________
Postal Address: __________________________________________________
___________________________________________________________________
Comments: ________________________________________________________
___________________________________________________________________

Date:___________________ Submitted by:6 _______________________________

6 UNESCO and/or IOC Member States shall forward this form through one of the following channels: (a) Minister of Foreign Affairs, (b) Head of UNESCO National Commission, (c) Permanent Delegate to UNESCO, (d) Head of the specified national coordinating body for liaison with the IOC (“IOC Focal Point”), case in which UNESCO/IOC shall request validation through either the Permanent Delegate to UNESCO, the Head of the UNESCO National Commission or the Minister of Foreign Affairs. Please forward this forms to the IOC Executive Secretary, Ms Wendy Watson-Wright at w.watson-wright@unesco.org, copied to Mr Bernardo Aliaga at b.aliaga@unesco.org, Mr Stefano Belfiore at s.belfiore@unesco.org, and Ms Collins at f.collins@unesco.org.
ANNEX III: SUBMITTED TSUNAMI FORECAST POINTS

Croatia

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<th>Location</th>
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<td>Zirje</td>
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## United Kingdom

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## ANNEX IV: LIST OF ACRONYMS

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<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>AA</td>
<td>Affected Area (messaging)</td>
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<tr>
<td>AS</td>
<td>Authority Statement (messaging)</td>
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<td>CARIBE-EWS</td>
<td>Tsunami and other Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions</td>
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<tr>
<td>CEA</td>
<td>Commissariat à l’Energie Atomique</td>
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<td>DPC</td>
<td>Dipartimento della Protezione Civile</td>
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<tr>
<td>EP</td>
<td>Earthquake Parameters (messaging)</td>
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<tr>
<td>ES</td>
<td>Evaluation Statement (messaging)</td>
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<td>ETA</td>
<td>Estimated Arrival Times (messaging)</td>
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<td>Global Climate Observing System</td>
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<td>GFZ</td>
<td>Geoforschungszentrum Potsdam</td>
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<tr>
<td>GOOS</td>
<td>Global Ocean Observing System</td>
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<tr>
<td>GTS</td>
<td>WMO Global Telecommunication System</td>
</tr>
<tr>
<td>ICG</td>
<td>Intergovernmental Coordination Group</td>
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<tr>
<td>IM</td>
<td>Instituto de Meteorologia</td>
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<tr>
<td>IOC</td>
<td>Intergovernmental Oceanographic Commission of UNESCO</td>
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<tr>
<td>IOTWS</td>
<td>Indian Ocean Tsunami Early Warning and Mitigation System</td>
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<tr>
<td>JMA</td>
<td>Japan Meteorological Agency</td>
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<tr>
<td>KOERI</td>
<td>Kandilli Observatory and Earthquake Research Institute</td>
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<td>MH</td>
<td>Message Header (messaging)</td>
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<td>MS</td>
<td>Message Schedule (messaging)</td>
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<td>MT</td>
<td>Message Type (messaging)</td>
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<td>NEAMTWS</td>
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<td>National Observatory of Athens</td>
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<td>NTWC</td>
<td>National Tsunami Warning Centre</td>
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<td>PTWS</td>
<td>Pacific Tsunami Warning Center</td>
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<td>RTWC</td>
<td>Regional Tsunami Watch Centre</td>
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<td>SOP</td>
<td>Standard operating procedures</td>
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<td>TNC</td>
<td>Tsunami National Contact</td>
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<td>Working Group on Tsunamis and Other Hazards related to Sea Level Warning and Mitigation Systems</td>
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<td>TSU</td>
<td>IOC Tsunami Co-ordination Unit</td>
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<td>TWFP</td>
<td>Tsunami Warning Focal Point</td>
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<td>TWM</td>
<td>Tsunami Wave Measurements (messaging)</td>
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<td>TWS</td>
<td>Tsunami warning system</td>
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<tr>
<td>UNEP</td>
<td>United Nations Environment Programme</td>
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UNFCCC  United Nations Framework Convention on Climate Change
WG     Working group