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05. Author(s): **Sunanda M.V, T. Srinivasa Kumar, B. Ajay Kumar Ch. Patanjali Kumar, R.S. Mahendra, E. Uma Devi, M. Raghavendra, J. Padmanabham, N. Kiran Kumar, S.A. Kishore**

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11. **Abstract**

The Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS) was formed in response to the tragic tsunami on December 26th 2004, in which over 230,000 lives were lost around the Indian Ocean region. The Intergovernmental Oceanographic Commission of UNESCO (IOC-UNESCO) assembly, during its twenty-third Session (21-30 June 2005), formally established the ICG/IOTWS through Resolution IOC-XXIII-12, which meets regularly to establish and implement working plans in the Indian Ocean region. The IOTWS comprises a network of National Tsunami Warning Centres (NTWC) in each Member state receiving tsunami advisories from Regional Tsunami Advisory Service Providers (RTSP) that are establishing capabilities to issue regional tsunami bulletins for the Indian Ocean. The IOTWS will therefore operate as a "system-of-systems".

The Indian Tsunami Early Warning Centre operated by the Indian National Centre for Ocean Information Services (INCOIS) has been established with all the necessary capabilities to serve as one of the RTSPs for the Indian Ocean. During the ICG/IOTWS V Meeting at Kuala Lumpur during April, 2008, India presented its proposal for offering RTSP Services for the Indian Ocean. The capabilities of the Indian System against the RTSP Benchmarks were presented and subsequently the Indian National Tsunami Early Warning Centre started exchanging SL-1 Earthquake information with the other RTSPs. India is now fully geared up to provide SL-2 bulletins for the Indian Ocean region as part of the IOTWS.

This document provides details of the Indian RTSP services such as the observing systems, modeling, operating procedures, products, dissemination methods, etc. and is intended to serve as a user guide to the NTWCs.

12. Keywords: **Indian Tsunami Early Warning System, Standard Operating Procedure, Coastal Forecast Zones, Decision Support System, Tsunami Advisories**

13. Security classification: **Unrestricted**

Technical Report Report No. INCOIS-ASG-TR-2011-05

Regional Tsunami Advisory Services Provider (RTSP) services of Indian Tsunami Early Warning Centre

Indian National Centre for Ocean Information Services
Hyderabad

August 2011

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Regional Tsunami Advisory Services Provider (RTSP) services of Indian Tsunami Early Warning Centre

Contents

Regional Tsunami Advisory Services Provider (RTSP) services of Indian Tsunami Early Warning Centre

1. Introduction

The Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS) established by the Intergovernmental Oceanographic Commission (IOC) coordinates the implementation of an Indian Ocean wide tsunami warning system that is being established as a network of national systems. The network comprises of National Tsunami Warning Centres (NTWC) in each Member state receiving tsunami advisories from Regional Tsunami Advisory Services Providers (RTSPs) that are establishing capabilities to issue regional tsunami bulletins for the Indian Ocean. The National Tsunami Warning Centres (NTWCs) of individual countries, through bilateral agreements, will be able to choose the RTSP(s) from which they wish to access tsunami watch information from. Ultimately it is the NTWCs, operating within the legal framework of the sovereign nation in which they reside and serve, that provide warnings, watches, and advisories to their citizens, public and private agencies.

The IOTWS will therefore operate as a "system-of-systems". This will require all tsunami watch information to be interoperable, i.e. use common and agreed formats for information exchange, address service requirements, follow agreed, high-level operating Standard Operating Procedures (SOPs), share information on procedures and processes. The IOTWS implementation plan outlines the RTSP service requirements and capabilities, Concept of Operations (ConOps), SOPs, performance indicators, and implementation schedule.

The Indian Tsunami Early Warning Centre is operated by the Indian National Centre for Ocean Information Services (INCOIS) and has been established with all the necessary capabilities to serve as one of the RTSPs for the Indian Ocean. During the ICG/IOTWS - V Meeting at Kuala Lumpur during April, 2008, India presented its proposal for offering RTSP Services for the Indian Ocean. The capabilities of the Indian System against the RTSP Benchmarks were presented and subsequently the Indian National Tsunami Early Warning Centre started exchanging SL-1 Earthquake information with the other RTSPs.

India is now geared up to provide SL-2 bulletins for the Indian Ocean region as part of the IOTWS. This document provides details of the Indian RTSP service such as the observing systems, modeling, operating procedures, products, dissemination methods, etc. and is intended to serve as a user guide to the NTWCs.

2. ITEWC Components

2.1. Seismic Network

As part of the Indian Tsunami Early Warning System, a Real Time Seismic Monitoring Network (RTSMN) has been established by India Meteorological Department (IMD). The network comprises of 17 Broadband seismic field stations transmitting real time data through V-SAT communication to the Central Receiving Stations (CRSs) located at IMD at New Delhi and INCOIS, Hyderabad simultaneously for processing and interpretation. In addition to this, data from around 300 global seismic stations data received at INCOIS in near-real time, are the basis for determining preliminary earthquake epicenters and magnitudes. Most of these data are provided by IRIS Global Seismographic Network and GEOFON Extended Virtual Network. The location of current network of stations is as shown in the figure-1. For determining tsunamigenic potential of an earthquake moment magnitude, Mw, is useful. It is computed based on the long-period components of the seismic signal and is more accurate for very large earthquakes. INCOIS uses Response Hydra and Seiscomp for autolocation of earthquakes. All earthquakes of >5 M are autolocated within 5 – 10 minutes of occurrence.

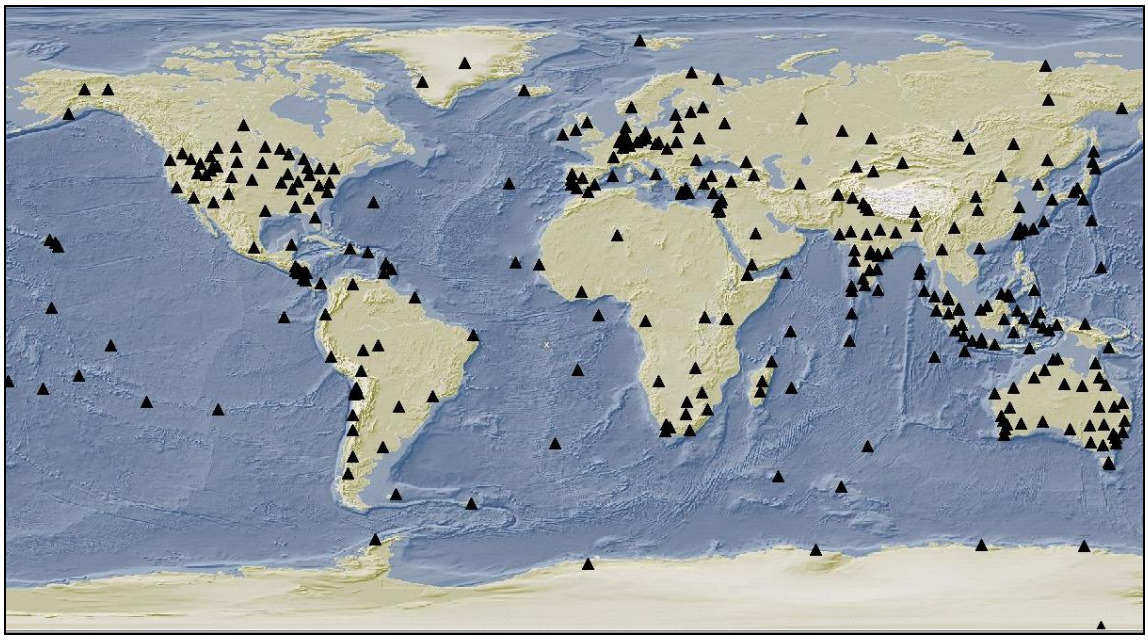

Figure 1: Real Time Seismic Monitoring Network, INDIA

2.2. Modelling

The use of numerical modeling to determine the potential run-ups and inundation from a local or distant Tsunami is recognized as useful and important tool, since data from past Tsunamis are usually insufficient to plan future disaster mitigation and management plans. Models can be initialized with potential worst case scenarios for the Tsunami sources or for the waves just offshore to determine corresponding impact on near by

coast. Models can also be initialized with smaller sources to understand the severity of the hazard for the less extreme but more frequent events. This information then forms the basis for creating Tsunami evacuation maps and procedures.

At INCOIS a finite difference code of TUNAMI N2 (Imamura, 1996) is employed to study the Tsunami. The TUNAMI N2 model basically takes the seismic deformation as input to predict the run-up heights and inundation levels at coastal regions for a given tsunamigenic earthquake. The seismic deformation for an earthquake has been computed using Smylie and Mansinha, (1971) formulation using the earthquake parameters like location, focal depth, strike, dip and rake angles, length, width and slip of the fault plane. At the time of earthquake, only location, magnitude and focal depth are available immediately. For operational quantitative tsunami forecast, there needs to be a method to quickly estimate the travel times and run up based on the above available parameters. For this purpose, all the other input parameters such as length, width and slip are calculated from the magnitude using global relations. strike angle, dip angle and slip angle are considered for worst case scenario (strike angle parallel to trench or coast, dip angle 45 deg, slip angle 90 deg).

2.2.1. Pre-run Model Scenario Database

A "scenario" is a single tsunami model simulation that is calculated from the required initial seismic deformation condition with the pre-defined input fault geometry parameters of earthquake rupture, i.e., Fault Location, Depth, Length, Width, Displacement, Strike angle, Dip angle and Slip angle. Each Scenario output contains the expected tsunami wave travel times, run-up heights and directivity maps.

The scenario database of pre-computed scenarios is generated with the objective to use available real time seismic information to provide an immediate forecast of tsunami height at the coast. The database is developed for different levels of depth (10, 20, 33, 40, 60, 80 & 100 km) and magnitudes (6.5, 7.0, 7.5, 8.0, 8.5, 9.0 & 9.5), for 975 “simulations points”, each with separation of half a degree, covering all tsunamigenic sources in the Indian Ocean. The Model Domain that has been setup for Indian Ocean covers 30 N to 40 S latitude and 30 E to 130 E longitudes with a grid spacing 0.0450 degrees approximately (5.01km). Each simulation covers the entire Indian Ocean domain with 15 hours simulation time and a time step of 5 seconds. The tsunami profiles of 15 hours for every 15 seconds are saved at coastal forecast points for each scenario. The coastal forecast points are selected at 30 m bathymetry assuming that till such depth, the computation is linear. About 1800 CFPs are selected for the tsunami domain separated by ~50 km apart covering the entire Indian Ocean rim countries. Arrival times and wave heights at these coastal forecast points for each scenario are stored in a database. Travel times and Surge heights on 30 m bathymetry are interpolated to get the values at Coast. Whenever an earthquake occurs, the closest scenario to the event is extracted from the scenario database based on magnitude and hypocenter location to identify the regions at risk.

Further as an improvement to the scenario database only Mw 7.5 is considered as the basis for 1000 unit sources covering all the tsunamigenic sources. In this database each unit source has a length of 100 km and width of 50 km that represents a rupture caused by a Mw 7.5 magnitude earthquake with a slip of 1m. During any earthquake event, the basic unit source open ocean propagation scenario is selected from the scenario database and depending on earthquake's location and magnitude these basic unit source open ocean propagation scenarios are either scaled up or down using scaling relations for any level of depth, eliminating the need for accessing huge database for matching scenario. The main advantage with this kind of approach is, for higher magnitudes such as 9.0, the rupture can be represented more realistically with multiple rupture zones of Mw 7.5, instead of a single uniform rupture zone. Further, real time observations of sea level will be used to "invert" for slip parameter. This information can be used to update the forecast.

2.2.2. Coastal Forecast Zones

To ensure interoperability between the RTSPs and NTWCs, RTSPs use a common spatial data set of specific "Coastal Forecast Zones" for providing tsunami forecasts. The NTWCs can use the information provided for each of its coastal forecast zones to formulate its own national bulletins during an event. Use of common spatial data will not only facilitate inter-RTSP performance comparisons but also enable NTWCs to realistically compare RTSP products.

INCOIS in consultation with other RTSPs such as JATWC (Australia) and INATEWS (Indonesia) generated the spatial dataset of coastal forecast zones using Geographic Information system (GIS). This spatial dataset are used for generation of public products as well as detailed NTWC products. NTWC products are issued at the highest level of spatial resolution that can be supported. For practical purposes, it was decided that every 100 Km stretch of coastline should be represented by one coastal forecast zone. Each coastal forecast zone contains quantitative information extracted from numerical model simulations that enables NTWCs to formulate appropriate national warnings.

Accordingly, each coastal forecast zone is represented by a rectangular box extending 100 km in length (along the coast) and 50 Km in width (across the coast). The box starts from a depth of 30 M bathymetry line to ensure that there are sufficient numbers of wet grids in the model simulations of different RTSPs. The results of the model simulations from within the 100 x 50 km boxes are extrapolated to the adjacent coasts.

While islands large enough have been represented in one coastal forecast zone, in case of smaller islands, a group of islands have been clubbed into one coastal forecast zone. In case of Australia, India, Sri Lanka and Indonesia, the 100 x 50 Km boxes have been re-appropriated so as to match the local administrative provinces (districts/marine threat zones/etc.).

Each box is associated with attributes as listed in Table 1 below. The name of the box is based on the major coastal settlement point taken from Google Earth, Tide Gauge Network, etc. The name of the State and Countries were given as per the global administrative boundaries.

Sl.No.	Fields	Details
1	Ex_Box_ID	Unique id (1-546) for the detailed product for exchange
2	PB_BOX_ID	Unique id (1-155) for the public product
3	PLACE_NAME	Name of the major coastal settlement
4	BOX_NAME	Named after the coastal district or coastal settlement
5	STATE_PROV	Province or State name
6	COUNTRY	Country name
7	CNTRY_CODE	Country code (GAB)
8	T1	These fields will be populated by the RTSPs during an event
9	T2	
10	T3	
11	T4	
12	max_beach	
13	max_deep	
14	depth	
15	Threat_cat	

Table 1: Attribute Table for the Common Spatial Data Set

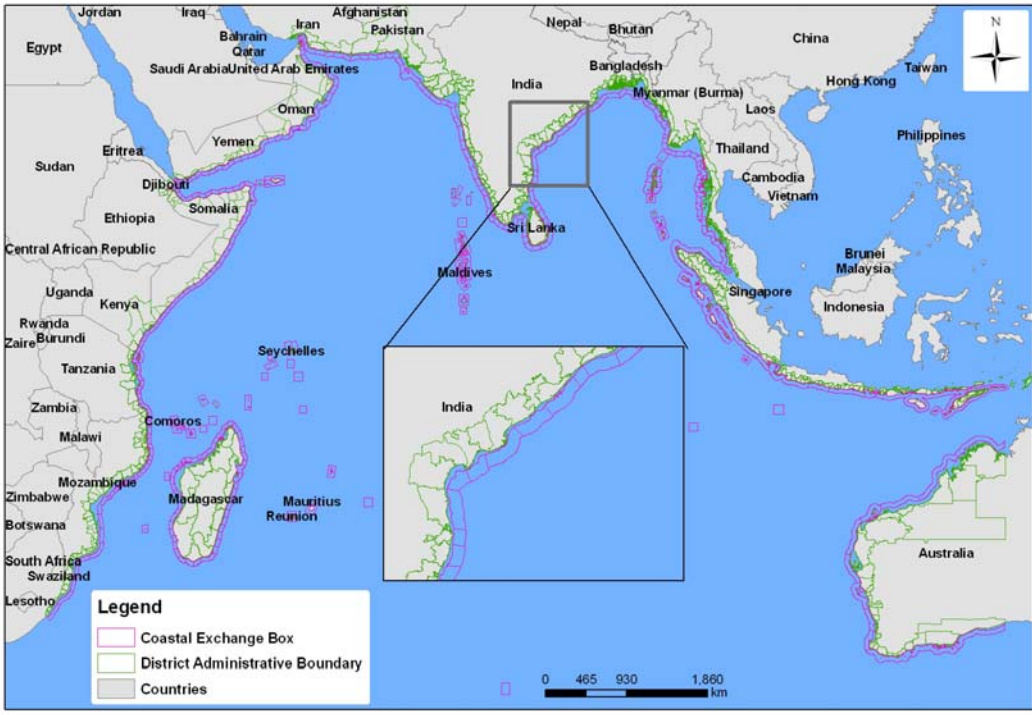

Figure 2: Map depicting the coastal boxes for NTWC Products

2.3. Sea-level Network

In order to confirm whether the earthquake has actually triggered a tsunami, it is essential to measure the change in water level as near to the fault zone with high accuracy. There are two basic types of sea level gages: coastal tide gages and open ocean buoys. Tide gages are generally located at the land-sea interface, usually in locations somewhat protected from the heavy seas that are occasionally created by storm systems. Tide gages that initially detect tsunami waves provide little advance warning at the actual location of the gage, but can provide coastal residents where the waves have not yet reached an indication that a tsunami does exist, its speed, and its approximate strength.

Open ocean tsunami buoy systems equipped with bottom pressure sensors are now a reliable technology that can provide advance warning to coastal areas that will be first impacted by a teletsunami, before the waves reach them and nearby tide gages. Since the tsunami waves will not yet be modified by local bathymetry, Open Ocean buoys often provide a better forecast of the tsunami strength than tide gages at distant locations.

The ITEWC's planned sea level network compromise of 7 tsunami buoys (5 in Bay of Bengal & 2 in North Arabian Sea) to be installed by NIOT and Tide gauge stations at 36 locations to be installed by SOI & INCOIS. The location of the BPRs and Tide Gauges is given in figure 4. Currently, 4 tsunami buoys (3 in Bay of Bengal & 1 in North Arabian Sea) and Tide Gauges at 25 locations are operational. Near-real time data is also being received from international stations. Necessary software for real-time reception, display and archiving of tide gauge data has been developed.

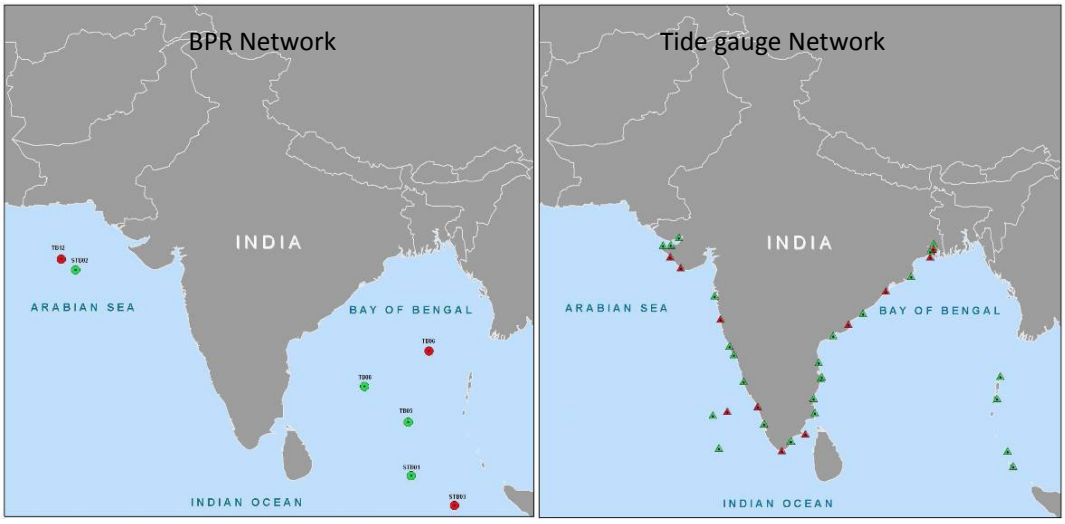

Figure 3: Tsunami Buoy Network and Indian Tide gauge

2.4. Decision Support System (DSS)

The Decision Support System is intended to (i) Monitor the online input data from individual sensors, (ii) Generate automatic alarms based on preset decision rules for one or many of the input parameters and (iii) Carry out criteria-based analysis for one or many input parameters to generate online advisories. Automated DSS software has been developed and deployed at the ITEWC that enables the operator to make quick decisions and generate advisories based on pre-defined decision rules following the SOP. Few snapshots of the DSS are given in figure-4.

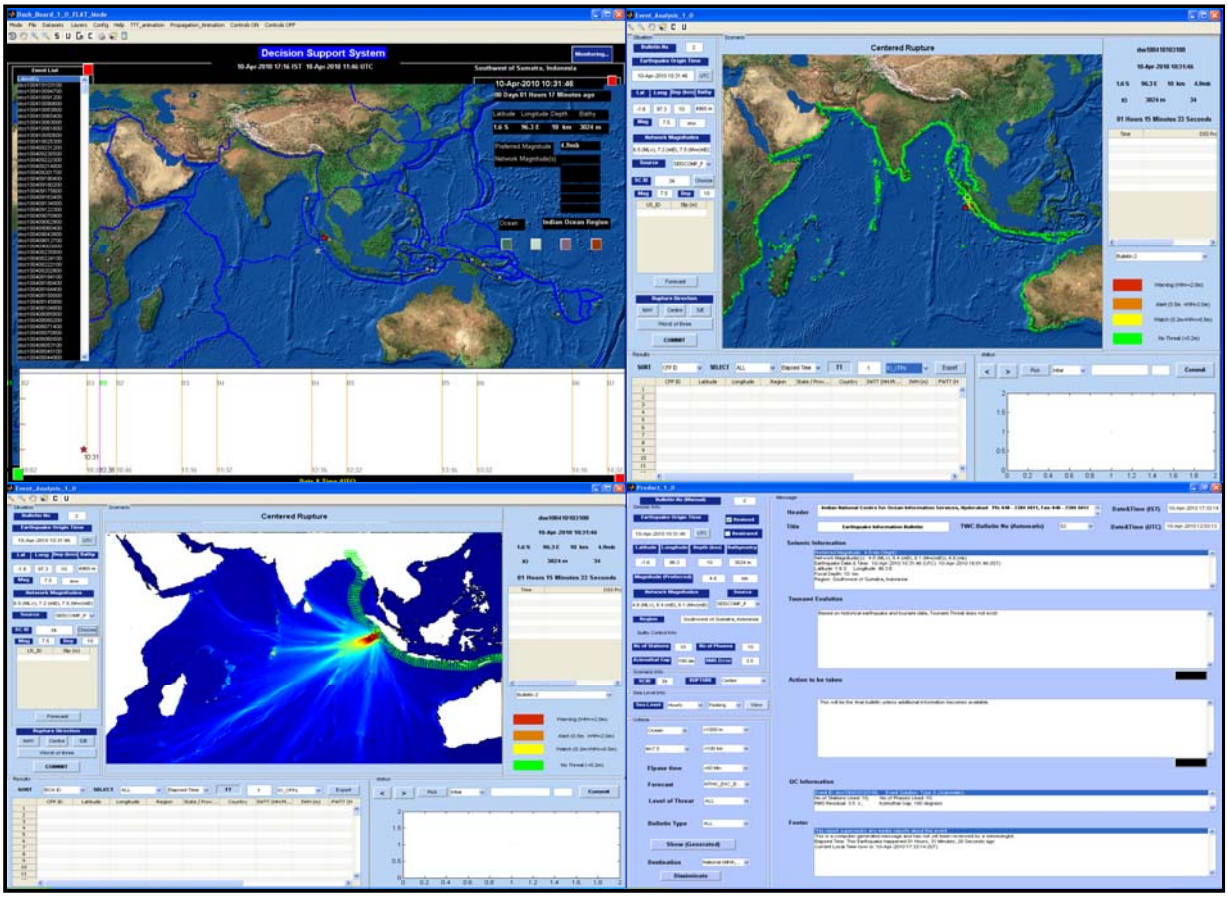

Figure 4: DSS system

2.5. Computational & Communication Facilities

A state-of-the-art data centre has been established at INCOIS with all the necessary computational and communication infrastructure that enables reception of real-time data from all the sensors, analysis of the data, generation and dissemination of warnings following a standard operating procedure. Necessary redundancies are planned to ensure fault tolerance of the entire system configuration. All hardware elements are scalable. The

entire warning centre infrastructure is hosted on highly reliable hardware designed for mission critical applications with necessary redundancies.

2.6. Manpower

The functions at the Tsunami Early Warning Centre are varied and require the expertise of multi-disciplinary group of scientists to perform 24 x 7 functions for routine monitoring, bulletin generation and dissemination, maintenance, etc. In addition, there is a large component of Research and Development to improve the system. The Tsunami Early Warning Centre currently has 14 Scientific / Technical Personnel working on a full time basis and 8 personnel contributing on a part-time / on-call basis. This team comprises of Geophysicists, Oceanographers, Marine Scientists, Electronics Engineers, Communication Engineers, Computer Engineers, Spatial Information Technologists, etc. The centre operates on a round-the-clock basis with three shifts of 8 hours in a day. The centre is always manned by a shift in-charge, preferably a geo-physicist, who is assisted by two scientific personnel. In addition a senior geo-physicist is designated as scientist-on-call to be available at the warning centre within 15 minutes of any major earthquake. One scientist each is made functionally responsible to oversee different subsystems such as seismic, tide gauges, BPRs, modeling, computational facilities, communication facilities, application software, R&D, capacity building, etc. who will act as the single-point contact for that subsystem and will ensure effective operation and maintenance. All the personnel report to the warning centre in-charge who is the overall in-charge of the operations of the tsunami warning system and reports to Director, INCOIS.

3. RTSP Service:

3.1. Coverage:

Indian Ocean rim countries

3.2. Service level:

The ITEWC will provide SL-2 products as part of its RTSP operations to the IOTWS Member states. Further it will provide SL-3 products to countries with which it has specific bilateral arrangements.

3.3. Types of Products:

The ITEWC RTSP services comprise two types of products, as defined in the document "Definition of RTSP Advisory Services" dated December 2, 2009 that is annexed to the Report of Intersessional Meeting of ICG/IOTWS Working Group 5 on: "A System of Interoperable Advisory and Warning Centres". A brief summary is given below:

3.3.1. Exchange (NTWC) Products: These products, released only to NTWCs, consist of detailed tsunami forecast information that needs expert interpretation. Every coastal

forecast zone in the spatial data is provided with attributes such as max_beach, max_deep, depth, travel times (T1, T2, T3, T4) and threat category. These products, which could facilitate advance actions by nodal agencies, are shared through password protected websites and other secure means requested by the NTWCs.

3.3.2. Public Products: These products, released publicly, consist of Type-I (earthquake information), tsunami-genesis potential and an NTWC warning summary. Observations of positive wave amplitude and time (UTC) at tide gauge stations are also included in the bulletins. BPRs will be listed as having observed a tsunami, but no numerical height values will be provided.

3.4. Operational Procedures & Types of Bulletins

RTSP services for an earthquake event commence whenever earthquakes are recorded with magnitudes ≥ 6.5 within Indian Ocean and magnitudes > 8.0 outside Indian Ocean. Duty officers respond immediately and begin their analysis of the event. The analysis includes automatic and interactive processes for determining the earthquake's epicenter, depth, and origin time, as well as its magnitude.

3.4.1. Notification Messages:

The ITEWC issues brief Notification Messages alerting the recipients as and when a bulletin is issued. The notification messages contain earthquake parameters as well as web links to the detailed Bulletins. An example of the Notification message is given below:

```
---------------------------------------------------------------------
TSUNAMI BULLETIN NOTIFICATION MESSAGE NUMBER 1
INDIAN TSUNAMI EARLY WARNING CENTRE (ITEWC)
issued at 0604 UTC Wednesday 15 June 2011
---------------------------------------------------------------------

TO:   INDIAN OCEAN NATIONAL TSUNAMI WARNING CENTRES (NTWCs)
FROM: RTSP-INDIA

NOTIFICATION:
RTSP INDIA has just issued TSUNAMI BULLETIN NUMBER 1

(Earthquake Bulletin) for the Indian Ocean, based on the following
earthquake event:

Magnitude:   9.0 Mwp
Depth:       10km
Date:        15 Jun 2011
Origin Time: 1130 IST
Latitude:    7.20N
Longitude:   92.90E
Location:    Nicobar Islands, India

To view the bulletin go to the RTSP INDIA website at:

http://www.incois.gov.in/Incois/tsunami/eqevents.jsp

Note: This is a restricted-access website containing technical data for
administrators only. It is not for general public access
```

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General public information for this event is available from:

Indian Tsunami Early Warning Centre (ITEWC)
Indian National Centre for Ocean Information Services (INCOIS)
Hyderabad, India
Phone:  91-40-23895011
Fax:    91-40-23895012
Email:  tsunami@incois.gov.in
Web:    www.incois.gov.in

END OF NOTIFICATION MESSAGE
```

3.4.2. Bulletin Types:

For Indian Ocean earthquakes, ITEWC issues **Bulletin-1** that contains preliminary earthquake information & a qualitative statement on its tsunamigenic potential based on the following criteria:

Magnitude (Mw)	Product Type
$6.5 \geq M \leq 7.5$	Possibility of local tsunamis that can be destructive along the coast located within 100 KM of the earthquake epicenter
$7.6 \geq M \leq 7.8$	Possibility of Regional tsunamis that can be destructive along the coast located within 1000 KM of the earthquake epicenter.
$M \geq 7.9$	Possibility of Ocean-Wide tsunamis that can be destructive along the entire Indian Ocean coastline.

Table 2: Criteria for Tsunamigenic potential based on preliminary earthquake parameters

Based on preliminary earthquake parameters, the nearest matching scenario from pre-run model scenario database is selected and the **Bulletin-2** is issued with **THREAT** information. The agreed THREAT threshold for considering a country under threat is when the predicted positive wave amplitude is ≥ 0.5 metre at any location in that country. If pre-run model scenario indicates Estimated Wave Amplitude < 0.5 m then Bulletin-2 is issued with **NO THREAT** information. However, the monitoring of sea-level observations continues.

As and when the revised earthquake parameters become available (before the availability of sea-level data), then a supplementary to the Bulletin-2 (**Bulletin-2 Supplementary-xx**) is issued with revised THREAT information based on updated parameters.

If a THREAT is issued or if there is otherwise the possibility that a tsunami may has been generated, ITEWC monitors the sea level gauges such as open ocean BPRs and coastal tideguages near to the epicenter.

If the readings from sea level gauges confirm generation of tsunami, ITEWC issues **Bulletin-3** with THREAT information from model scenario as well as **observed water levels.** As and when subsequent real-time observations become available or after 60 mins from the time of previous bulletin issuance, **Bulletin-3 Supplementary-xx** is issued. Bulletin-3 Supplementary-xx messages also contain Threat Passed information for individual Zones (120 minutes after the last exceedance of 0.5 M threat threshold for that zone)

The **Final bulletin** is issued when there are no significant water level changes from multiple sea level gauges or 120 mins after the last exceedance of 0.5 M threat threshold at last Indian Ocean member state.

However, as local conditions would cause a wide variation in tsunami wave action the ALL CLEAR determination is made by local authorities.

The following table defines the bulletin types issued by the ITEWC & the timelines

Bulletin type	**Information**	**Time of issue (Earthquake Origin time as T_0) mins**
Bulletin-1	Preliminary EQ Parameters and LAND / NO THREAT Information based on EQ Location, Magnitude & Depth.	$T_0 + 10$
	Preliminary EQ Parameters and Qualitative Tsunamigenic potential based on EQ Location, Magnitude & Depth	
Bulletin-2	Preliminary EQ Parameters and NO THREAT Information from Model Scenarios	$T_0 + 15$
	Preliminary EQ Parameters and Quantitative Tsunami Threat Information from Model Scenarios	
Bulletin-2 Supplementary - xx	Revised EQ Parameters and Quantitative Tsunami Threat Information from Model Scenarios - If revised EQ Parameters are available much before the real-time water level observations are reported	as and when revised earthquake parameters are available
Bulletin-3	Revised EQ Parameters and Quantitative Tsunami Threat Information from Model Scenarios and Real-time water level observations indicating Tsunami Generation	as and when the first real-time water level observation is available

Bulletin-3 Supplementary – xx	Revised EQ Parameters and Quantitative Tsunami Threat Information from Model Scenarios and Real-time water level observations indicating Tsunami Generation THREAT PASSED information for individual Zones	Hourly update / as and when the subsequent real-time water level observations are available
Final Bulletin	Issued when water levels from multiple gauges confirm that no significant tsunami was generated.	
	120 mins after the last exceedance of 0.5 M threat threshold at last Indian Ocean member state	

The DSS flow chart followed by ITEWC for its RTSP operations is as follows:

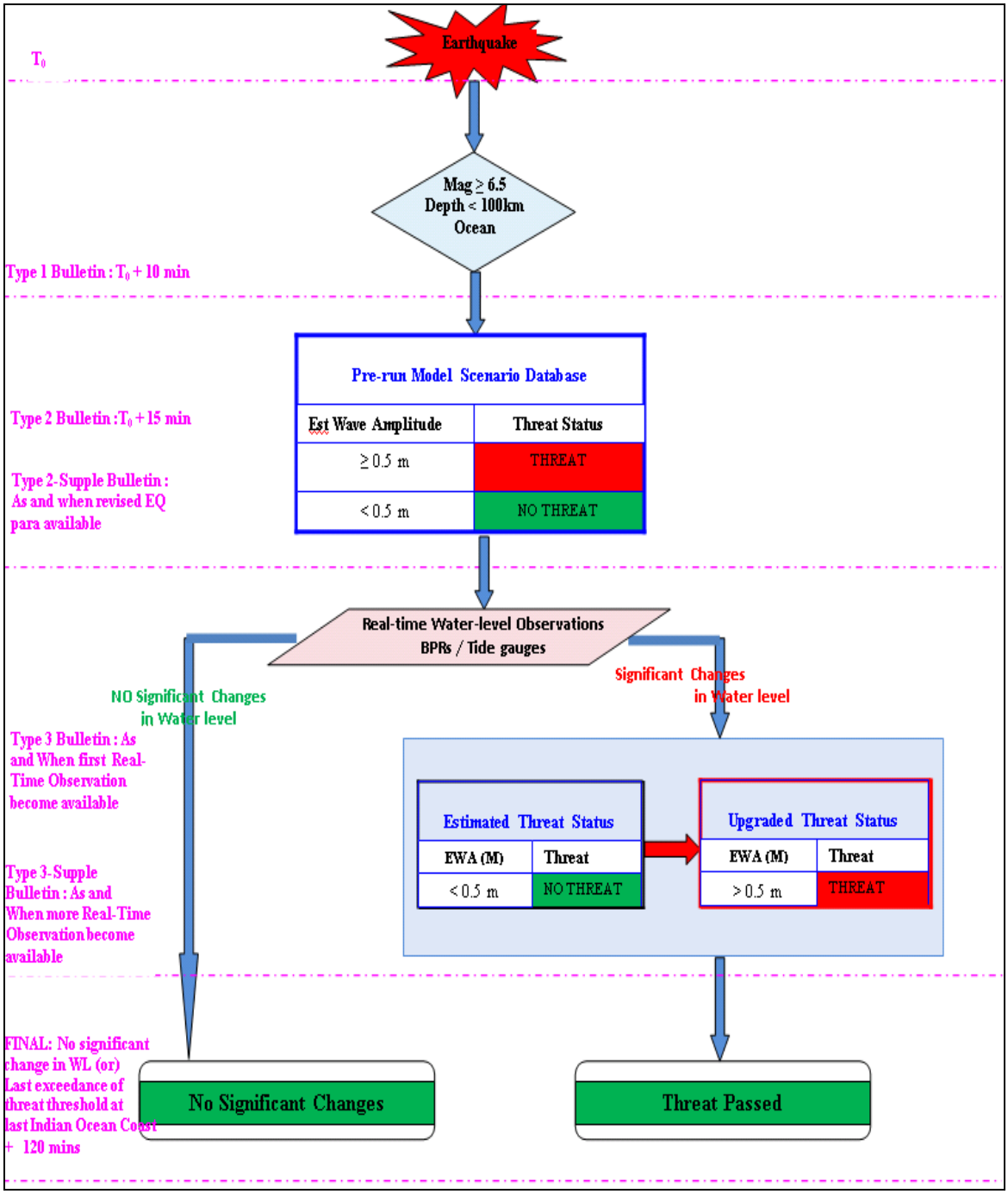

Figure 5: RTSP SOP

4. Bulletin Content

The different sections in an RTSP Exchange bulletin are detailed below

4.1.1. Product Header

Product Header has four lines. The first line represents issuing authority followed by earthquake origin time in UTC, bulletin number and type of the bulletin. The second line indicates tsunami bulletin number which is sequential, third line is issuing authority and fourth line indicates date and time in UTC that the bulletin was issued.

Sample Header:

RTSP-INDIA-20110527-1130-001 (TYPE - I)

TSUNAMI BULLETIN NUMBER 1

REGIONAL TSUNAMI ADVISORY SERVICE PROVIDER - RTSP INDIA (ITEWC)

issued at: 1133 UTC Friday 27 May 2011

4.1.2. Earthquake Parameters

Earthquake parameters are listed under "Earthquake Information". These are preliminary parameters determined from very early data available from seismic data for tsunami purposes. They may get revised following the initial bulletin as and when more stations data becomes available.

Sample Earthquake Parameters

EARTHQUAKE INFORMATION

RTSP INDIA detected an earthquake with the following preliminary information:

Magnitude:	9.0 M (Great)
Depth:	10 km
Date:	27 May 2011
Origin Time:	1130 IST
Latitude:	7.2 N
Longitude:	92.9 E
Location:	Nicobar Islands

4.1.3. Tsunami Evaluation Statement

Based on preliminary earthquake parameters, the first bulletin contains the information on tsunamigenic potential of the earthquake (local / regional / ocean-wide) according to range of the

magnitude. If pre-run model results indicate a THREAT, the evaluation message indicates currently investigation is underway in second bulletin. Meanwhile if any sea level gauge indicates any significant change in water level that is listed from third bulletin onwards.

Sample Tsunami Evaluation Statement -1

There is no confirmation of tsunami triggering so far. An investigation is currently underway to determine if a tsunami has been triggered by this earthquake. However, Earthquakes of this magnitude sometimes generate Regional tsunamis that can be destructive along the coast located within 1000 KM of the earthquake epicenter. Authorities in the region of the epicenter should be aware of this possibility.

Sample Tsunami Evaluation Statement - 2

There is no confirmation of tsunami triggering so far. An investigation is currently underway to determine if a tsunami has been triggered by this earthquake. This centre will monitor sea level gauges near to epicentre and report if any tsunami activity is observed.

Earthquakes of this magnitude sometimes generate tsunamis. Based on preliminary earthquake information and pre-run model scenarios, the following zones are under THREAT.

Times shown are the expected times in UTC for the arrival of tsunami waves exceeding 50cm amplitude at the coast. The maximum predicted tsunami amplitude is also listed for each zone.

District/ Region Name	State/ Territory	Country	T2 (mins)	max_beach (Metres)	Threat Category
BANTEN Pandeglang P.Panaitan	BANTEN	INDONESIA	13	0.51	Threat

Sample Tsunami Evaluation Statement - 3

Real-time measurements of wave activity indicated that no significant tsunami was generated. When no major waves have occurred at least for two hours after the estimated arrival time then local authorities can assume that the threat is passed. As local conditions can cause a wide variation in tsunami wave action the ALL CLEAR decision /all clear determination must be made by local authorities.

4.1.4. Advice

Following the headline is the Authority Statement. It indicates that the bulletin is issued as an advice only and that the condition of the alert and determination of action based on threat status is up to national or local authorities.

Sample Advice:

This Bulletin is being issued as an advice. Only national/state/local authorities and disaster management offices have the authority to make decisions regarding the official threat status in their coastal area and any action to be taken in response.

4.1.5. Other Center's Action information

Following the advice information a statement regarding products that may be issued by other tsunami warning centres such as JMA / PTWC / JATWC / InaTEWS is indicated.

Sample statement regarding Other Center's Actions
JMA/PTWC/JATWC/INATEWS/Other Centres may issue additional information regarding this event. In case of conflicting information, the more conservative information should be used for safety.

4.1.6. Product Schedule

At the end of the bulletin is a statement regarding future bulletins. THREAT bulletins are issued at an hourly schedule or as and when realtime water level observations become available. The FINAL bulletin is issued only when no significant water level changes are confirmed from the readings of multiple sea level gauges or else after 120 mins after the last exceedance of 0.5 M threat threshold at last Indian Ocean member state which was under THREAT.

Sample Product Schedule Statement
The next bulletin will be issued within the next one-hour or as and when the observations become available.

Sample bulletin formats are given as ANNEXURE -1.

5. Bulletin Formats

- Notification Messages are issued in text format
- Bulletins are issued in both text and html formats.
- Graphics are made available in jpg or png format on the website
- Spatial data is made available in dbf format through the ftp site

6. Dissemination Methods

- Notification messages are sent to NTWCs through email, Fax, SMS & GTS, as and when an RTSP bulletin is issued.
- RTSP bulletins are disseminated to NTWPs through email, Fax and password-protected websites.
- Graphic products such as Directivity maps, Travel Time maps and Threat status maps are made available to NTWCs on password-protected websites
- Spatial data will be exchanged through password protected ftp site

7. Contact Details for the ITEWC

- 24 x 7 Monitoring Room Contact No. : **+ 91 40 23895011**
- 24 x 7 Monitoring Room Fax No. : **+91 40 23895012**
- Email id : **tsunami@incois.gov.in**
- Website Address: **http://www. incois.gov.in; http://www.tsunami.incois.gov.in**
- **Warning centre in-charge:**

  Dr. T. Srinivasa Kumar
  In-charge, National Tsunami Early Warning System (NTEWS)
  Head, Advisory Services and Satellite Oceanography Group (ASG)
  Indian National Centre for Ocean Information Services (INCOIS)
  "Ocean Valley", PB No. 21,
  IDA Jeedimetla P.O.,
  Hyderabad - 500 055
  Andhra Pradesh, INDIA
  Tel: +91 40 2389 5006 / 2388 6006
  Fax: +91 40 2389 5001
  Email: srinivas@incois.gov.in

- **Director, INCOIS:**

  Dr. Satheesh C. Shenoi
  Director
  Indian National Centre for Ocean Information Services (INCOIS),
  "Ocean Valley", P.B No.21,
  IDA Jeedimetla P.O
  Hyderabad 500 055, Andhra Pradesh, INDIA
  Tel: +91 40 23895000
  Fax: +91 40 23895001
  Email: director@incois.gov.in

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9. Glossary of Tsunami Terms

Local tsunamis are those with destructive effects generally limited to within 100 km of their source. Destructive local tsunamis with runups tens of meters above normal sea level are possible.

Regional tsunamis are those with destructive effects generally limited to within 1000 km of their source. This is because either because the energy released was not sufficient to generate a destructive ocean-wide tsunami, or because the source was within a confined sea.

Ocean-wide tsunamis are much less frequent, but still occur a few times each century, mostly in the Pacific. Such tsunamis can have disastrous consequences because their source area is large, initial wave heights are great, and even distant coastal areas are subject to destructive impacts.

Tsunami Arrival Time: Time when the tsunami appears on the record. (PTWS/NWPTAC/WCATWC)

Time of the Measurement: Time when the centre measured tsunami amplitude showed in its bulletin. (PTWS/NWPTAC/WCATWC)

Period: Period of time in minutes from one crest to the next. (PTWS/IOTWS)

Amplitude: For the PTWC and WC/ATWC tsunami amplitude is measured relative to normal sea level. On the other hand, the NWPTAC reports amplitude in 0.1 meter unit by measuring half of trough to crest height. (PTWS/CARIBE-EWS/IOTWS)

Tsunami Height: Amplitude from predicted tide level to the crest of the maximum wave. (PTWS/CARIBE-EWS/IOTWS)

Double Amplitude: Wave amplitude from a trough to crest or a crest to trough. (PTWS/WCATWC)

Initial Estimated Arrival Times: Computed from the epicenter of the earthquake to each forecast point using the physics principle that a wave will travel from point A to point B over whatever path in the ocean gets it there the fastest. (PTWS/NWPTAC/WCATWC/CARIBE-EWS/IOTWS)

Warning area: Near beach or surrounding low-lying area (PTWS/CARIBE-EWS/IOTWS)

Earthquake magnitude: The magnitude used by PTWC is the moment magnitude, Mw. It is more accurate for large earthquakes than the more common Richter magnitude. The moment magnitude determined by PTWC for initial products is Mwp, based on the first arriving seismic P waves. Subsequent estimates of Mw may be made by methods based on later arriving seismic waves. (PTWS/CARIBE-EWS/IOTWS)

Depth: Focal depth of the earthquake. Seismogically, earthquakes occurring at a depth of 100km or more considered not to generate tsunami regardless of its magnitude. (PTWS/ CARIBE-EWS/IOTWS)

Location: Latitude and longitude of the earthquake. Tsunami is not generated by earthquakes occurring in inland areas. However, possibilities are not excluded if its epicenter is located very close to the sea. (PTWS/CARIBE-EWS/IOTWS)

THREAT/NO THREAT: A country is considered under THREAT when a predicted positive wave amplitude ≥ 0.5 metre at any location in that country. Otherwise, the country is under NO THREAT. (Proposed IOTWS Service)

Coastal Forecast Zones: To ensure interoperability between the RTSPs and NTWCs, it was decided that all the RTSPs will use a common spatial data set of specific "coastal forecast zones" for providing tsunami advisories. Every **coastal forecast zone** in the spatial data shall be provided with attributes such as max_beach, max_deep, depth, threat category, travel times (T1, T2, T3, T4). (Proposed IOTWS Service)

Max_beach: Maximum positive wave amplitude at the shore-line (Proposed IOTWS Service)

Max_deep: Maximum positive wave amplitude in deep water in each coastal zone (Proposed IOTWS Service)

T1: Time of arrival of the minimum detectable positive amplitude wave (Proposed IOTWS Service)

T2: First exceedance of the threat threshold (Proposed IOTWS Service)

T3: Time of arrival of max_beach (Proposed IOTWS Service)

T4: Time when the last exceedance of the Threat Threshold is forecast (Proposed IOTWS Service)

ICG Intergovernmental Coordination Group

PTWS Pacific Tsunami Warning and Mitigation System (formerly ITSU)

IOTWS Intergovernmental Coordination Group for the Indian Ocean Tsunami

Warning and Mitigation System

JMA Japan Meteorological Agency

GTS Global Telecommunication System

NTWC National Tsunami Warning Center

NTWFP National Tsunami Warning Focal Point

RTSP Regional Tsunami Warning Provider

TOWS-WG Working Group on Tsunamis and Other Hazards Related to Sea-Level

Warning and Mitigation Systems

TWFP Tsunami Warning Focal Point

TWS Tsunami Warning System

ANNEXURE – I

Sample Bulletins

Bulletin 01: Preliminary EQ Parameters and NO THREAT Information based on EQ Location, Magnitude & Depth - within T + 10 Min

This is a trial service. This information requires expert interpretation and is intended as guidance for NTWCs only and NOT for public use

RTSP-INDIA-20110615-0600-001 (TYPE - I)

TSUNAMI BULLETIN NUMBER 1

REGIONAL TSUNAMI ADVISORY SERVICE PROVIDER RTSP INDIA (ITEWC)

issued at: 0606 UTC Wednesday 15 June 2011

... EARTHQUAKE INFORMATION BULLETIN ...

1. EARTHQUAKE INFORMATION

RTSP INDIA detected an earthquake with the following preliminary information:

Magnitude: 9.0 M

Depth: 10 km

Date: 15 Jun 2011

Origin Time: 06 00 UTC

Latitude: 7.2 N

Longitude: 92.9 E

Location: Nicobars Islands, India

2. EVALUATION

Based on historical data and pre-run model scenarios, this earthquake will not generate a tsunami.

3. ADVICE

This Bulletin is being issued as an advice. Only national/state/local authorities and disaster management offices have the authority to make decisions regarding the official threat status in their coastal area and any action to be taken in response.

4. UPDATES

This will be final bulletin unless additional information regarding this event becomes available.

Other RTSPs may issue additional information at:

RTSP AUSTRALIA: http://www.bom.gov.au/tsunami/rtwp_new/

RTSP INDONESIA: http://www.inatews.bmkg.gov.id

In case of conflicting information from RTSPs or the IAS (PTWC, JMA), the more conservative information should be used for safety.

5. CONTACT INFORMATION

Indian Tsunami Early Warning Centre (ITEWC)

Indian National Centre for Ocean Information Services (INCOIS)

Address:"Ocean Valley", P.B No.21,IDA Jeedimetla P.O,

Hyderabad - 500 055, India.

Tel: 91-40-23895011

Fax: 91-40-23895012

Email: tsunami@incois.gov.in

Website: www.incois.gov.in

END OF BULLETIN

Bulletin 01: Preliminary EQ Information with Qualitative Tsunami Threat Information

RTSP-INDIA-20110615-0600-001 (TYPE - I)

TSUNAMI BULLETIN NUMBER 1

REGIONAL TSUNAMI ADVISORY SERVICE PROVIDER RTSP INDIA (ITEWC)

issued at: 0606 UTC Wednesday 15 June 2011

... EARTHQUAKE INFORMATION BULLETIN ...

1. EARTHQUAKE INFORMATION

RTSP INDIA detected an earthquake with the following preliminary information:

Magnitude:	9.0 M
Depth:	10 km
Date:	15 Jun 2011
Origin Time:	06 00 UTC
Latitude:	7.2 N
Longitude:	92.9 E
Location:	Nicobars Islands, India

2. EVALUATION

6.5 ≥ M ≤ 7.0

Earthquakes of this size sometimes have small potential to generate local tsunamis that can be destructive along the coast located within 100 KM of the earthquake epicenter. Authorities in the region of the epicenter should be aware of this possibility. However, so far there is no confirmation about the triggering of a tsunami. An investigation is under way to determine if a tsunami has been triggered. RTSP INDIA will monitor sea level gauges near epicenter and report if any tsunami wave activity has occured.

7.1 ≥ M ≤ 7.5

Earthquakes of this size sometimes have potential to generate local tsunamis that can be destructive along the coast located within 100 KM of the earthquake epicenter. Authorities in the region of the epicenter should be aware of this possibility. However, so far there is no confirmation about the triggering of a tsunami. An investigation is under way to determine if a tsunami has been triggered. RTSP INDIA will monitor sea level gauges near epicenter and report if any tsunami wave activity has occured.

7.6 ≥ M ≤ 7.8

Earthquakes of this size sometimes have potential to generate Regional tsunamis that can be destructive along the coast located within 1000 KM of the earthquake epicenter. Authorities in the region of the epicenter should be aware of this possibility. However, so far there is no confirmation about the triggering of a tsunami. An investigation is under way to determine if a tsunami has been triggered. RTSP INDIA will monitor sea level gauges near epicenter and report if any tsunami wave activity has occured.

M ≥ 7.9

Earthquakes of this size sometimes have potential to generate Ocean-wide tsunamis that can be destructive along the entire coastline of Indian ocean. Authorities in the region should be aware of this possibility. However, so far there is no confirmation about the triggering of a tsunami. An investigation is under way to determine if a tsunami has been triggered. RTSP INDIA will monitor sea level gauges near epicenter and report if any tsunami wave activity has occured.

3. ADVICE

This Bulletin is being issued as an advice. Only national/state/local authorities and disaster management offices have the authority to make decisions regarding the official threat status in their coastal area and any action to be taken in response.

4. UPDATES

Additional bulletins will be issued by ITEWC INCOIS for this event as more information becomes available.

Other RTSPs may issue additional information at:

RTSP AUSTRALIA: http://www.bom.gov.au/tsunami/rtwp_new/

RTSP INDONESIA: http://www.inatews.bmkg.gov.id

In case of confilicting information from RTSPs or the IAS (PTWC, JMA), the more conservative information should be used for saftey.

5. CONTACT INFORMATION

Indian Tsunami Early Warning Centre (ITEWC)

Indian National Centre for Ocean Information Services (INCOIS)

Address:"Ocean Valley", P.B No.21,IDA Jeedimetla P.O,

Hyderabad - 500 055, India.

Tel: 91-40-23895011

Fax: 91-40-23895012

Email: tsunami@incois.gov.in

Website: www.incois.gov.in

END OF BULLETIN

Bulletin 02: Preliminary EQ Information with NO THREAT Information from Modeled Scenarios – T + 15

RTSP-INDIA-20110615-0600-002 (TYPE - II)

TSUNAMI BULLETIN NUMBER 2

REGIONAL TSUNAMI ADVISORY SERVICE PROVIDER RTSP INDIA (ITEWC)

issued at: 0611 UTC Wednesday 15 June 2011

1. EARTHQUAKE INFORMATION (Revised)

ITEWC INCOIS detected an earthquake with the following preliminary information:

Magnitude:	7.4 (Major)
Depth:	10 km
Date:	27 May 2011
Origin Time:	1130 IST
Latitude:	7.2 N
Longitude:	92.9 E
Location:	Nicobar Islands

2. EVALUATION

Based on historical data and pre-run model scenarios, this earthquake will not generate a tsunami.

This Bulletin is being issued as an advice. Only national/state/local authorities and disaster management offices have the authority to make decisions regarding the official threat status in their coastal area and any action to be taken in response.

4. UPDATES

This will be final bulletin unless additional information regarding this event becomes available.

5. CONTACT INFORMATION

Indian Tsunami Early Warning Centre (ITEWC)

Indian National Centre for Ocean Information Services (INCOIS)

Address:"Ocean Valley", P.B No.21,IDA Jeedimetla P.O,

Hyderabad - 500 055, India.

Tel: 91-40-23895011

Fax: 91-40-23895012

Email: tsunami@incois.gov.in

Website: www.incois.gov.in

END OF BULLETIN

Bulletin 02: Preliminary EQ Information with Quantitative Tsunami Threat Information from Modeled Scenarios – T + 15

RTSP-INDIA-20110615-0600-002 (TYPE - II)

TSUNAMI BULLETIN NUMBER 2

REGIONAL TSUNAMI ADVISORY SERVICE PROVIDER RTSP INDIA (ITEWC)

issued at: 0611 UTC Wednesday 15 June 2011

... POTENTIAL TSUNAMI THREAT IN THE INDIAN OCEAN ...

1. EARTHQUAKE INFORMATION (Revised)

RTSP INDIA issuing earthquake with the following preliminary parameters:

Magnitude: 8.8 (Great)

Depth: 10 km

Date: 15 Jun 2011

Origin Time: 0600 UTC

Latitude: 7.2 N

Longitude: 92.9 E

Location: Nicobars Islands, India

2. EVALUATION

Earthquakes of this size sometimes have potential to generate tsunamis. However, so far there is no confirmation about the triggering of a tsunami.

An investigation is under way to determine if a tsunami has been triggered. This RTSP will monitor sea level gauges and report if any tsunami wave activity has occurred. Based on pre-run model scenarios, the zones listed below are POTENTIALLY UNDER THREAT.

3. TSUNAMI THREAT FOR THE INDIAN OCEAN

The list below shows the forecast arrival time of the first wave estimated to exceed 0.5m amplitude at the beach in each zone, and the amplitude of the maximum beach wave predicted for the zone. Zones where the estimated wave amplitudes are less than 0.5m at the beach are not shown.

The list is grouped by country (alphabetic order) and ordered according to the earliest estimated times of arrival at the beach.

Please be aware that actual wave arrival times may differ from those below, 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.

The threat is deemed to have passed two hours after the forecast time for last exceedance of the 0.5m threat threshold for a zone. As local conditions can cause a wide variation in tsunami wave action, CANCELLATION of national warnings and ALL CLEAR determination must be made by national/state/local authorities.

AUSTRALIA

COCOS ISLAND (AU)	0834Z 15 Jun 2011	1.1m
NORTHWEST CAPE TO CARNARVON	1114Z 15 Jun 2011	2.2m

BANGLADESH

KHULNA	0846Z 15 Jun 2011	1.8m
COXS BAZAR	0853Z 15 Jun 2011	3.4m

4. ADVICE

This bulletin is being issued as advice. Only national/state/local authorities and disaster management officers have the authority to make decisions regarding the official threat and warning status in their coastal areas and any action to be taken in response.

5. UPDATES

Additional bulletins will be issued by RTSP INDIA for this event as more information becomes available.

Other RTSPs may issue additional information at:

RTSP AUSTRALIA: http://www.bom.gov.au/tsunami/rtwp_new/

RTSP INDONESIA: http://www.inatews.bmkg.gov.id

In case of confilicting information from RTSPs or the IAS (PTWC, JMA), the more conservative information should be used for saftey.

6. CONTACT INFORMATION

Indian Tsunami Early Warning Centre (ITEWC)

Indian National Centre for Ocean Information Services (INCOIS)

Address:"Ocean Valley", P.B No.21,IDA Jeedimetla P.O,

Hyderabad - 500 055, India.

Tel: 91-40-23895011

Fax: 91-40-23895012

Email: tsunami@incois.gov.in

Website: www.incois.gov.in

END OF TEST BULLETIN

Bulletin 02 Supplementary XX: Revised EQ Information with Revised Quantitative Tsunami Threat Information from Modeled Scenarios - If revised EQ information is available much before the real-time water level observations are available - as and when revised earthquake parameters are available

RTSP-INDIA-20110615-0600-003 (TYPE – II Supplementary 01)

TSUNAMI BULLETIN NUMBER 3

REGIONAL TSUNAMI ADVISORY SERVICE PROVIDER RTSP INDIA (ITEWC)

issued at: 0611 UTC Wednesday 15 June 2011

... POTENTIAL TSUNAMI THREAT IN THE INDIAN OCEAN ...

1. EARTHQUAKE INFORMATION (Revised)

RTSP INDIA issuing earthquake with the following preliminary parameters:

Magnitude: 9.0 (Great)

Depth: 10 km

Date: 15 Jun 2011

Origin Time: 0600 UTC

Latitude: 7.2 N

Longitude: 92.9 E

Location: Nicobars Islands, India

2. EVALUATION

Earthquakes of this size sometimes have potential to generate tsunamis. However, so far there is no confirmation about the triggering of a tsunami.

An investigation is under way to determine if a tsunami has been triggered. This RTSP will monitor sea level gauges and report if any tsunami wave activity has occurred. Based on pre-run model scenarios, the zones listed below are POTENTIALLY UNDER THREAT.

3. TSUNAMI THREAT FOR THE INDIAN OCEAN

The list below shows the forecast arrival time of the first wave estimated to exceed 0.5m amplitude at the beach in each zone, and the amplitude of the maximum beach wave predicted for the zone. Zones where the estimated wave amplitudes are less than 0.5m at the beach are not shown.

The list is grouped by country (alphabetic order) and ordered according to the earliest estimated times of arrival at the beach.

Please be aware that actual wave arrival times may differ from those below, 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.

The threat is deemed to have passed two hours after the forecast time for last exceedance of the 0.5m threat threshold for a zone. As local conditions can cause a wide variation in tsunami wave action, CANCELLATION of national warnings and ALL CLEAR determination must be made by national/state/local authorities.

AUSTRALIA

COCOS ISLAND (AU)	0834Z 15 Jun 2011	1.1m
NORTHWEST CAPE TO CARNARVON	1114Z 15 Jun 2011	2.2m

BANGLADESH

KHULNA	0846Z 15 Jun 2011	1.8m
COXS BAZAR	0853Z 15 Jun 2011	3.4m

4. ADVICE

This bulletin is being issued as advice. Only national/state/local authorities and disaster management officers have the authority to make decisions regarding the official threat and warning status in their coastal areas and any action to be taken in response.

5. UPDATES

Additional bulletins will be issued by RTSP INDIA for this event as more information becomes available.

Other RTSPs may issue additional information at:

RTSP AUSTRALIA: http://www.bom.gov.au/tsunami/rtwp_new/

RTSP INDONESIA: http://www.inatews.bmkg.gov.id

In case of conflicting information from RTSPs or the IAS (PTWC, JMA), the more conservative information should be used for safety.

6. CONTACT INFORMATION

Indian Tsunami Early Warning Centre (ITEWC)

Indian National Centre for Ocean Information Services (INCOIS)

Address:"Ocean Valley", P.B No.21,IDA Jeedimetla P.O,

Hyderabad - 500 055, India.

Tel: 91-40-23895011

Fax: 91-40-23895012

Email: tsunami@incois.gov.in

Website: www.incois.gov.in

END OF TEST BULLETIN

Bulletin 03: includes real-time water level observations and threat status - As and when the first real-time water level observation is available

RTSP-INDIA-20110615-0600-004 (TYPE - III)

TSUNAMI BULLETIN NUMBER 4

REGIONAL TSUNAMI ADVISORY SERVICE PROVIDER RTSP INDIA (ITEWC)

issued at: 0632 UTC Wednesday 15 June 2011

... CONFIRMED TSUNAMI THREAT IN THE INDIAN OCEAN ...

1. EARTHQUAKE INFORMATION (Revised)

RTSP INDIA issuing earthquake with the following preliminary parameters:

Magnitude: 9.0 M (Great)

Depth: 10 km

Date: 15 Jun 2011

Origin Time: 0600 UTC

Latitude: 7.2 N

Longitude: 92.9 E

Location: Nicobar Islands, India

2. EVALUATION

Sea level observations have confirmed that a TSUNAMI WAS GENERATED.

Maximum wave amplitudes observed so far:

CampbellBay(India)	6.9	93.7	0605Z 15 Jun 2011	12.5m
Nancowry(India)	8.0	93.5	0618Z 15 Jun 2011	2.5m

Based on pre-run model scenarios, the zones listed below are POTENTIALLY UNDER THREAT.

3. TSUNAMI THREAT FOR THE INDIAN OCEAN

The list below shows the forecast arrival time of the first wave estimated to exceed 0.5m amplitude at the beach in each zone, and the amplitude of the maximum beach wave predicted for the zone. Zones where the estimated wave amplitudes are less than 0.5m at the beach are not shown.

The list is grouped by country (alphabetic order) and ordered according to the earliest estimated times of arrival at the beach.

Please be aware that actual wave arrival times may differ from those below, 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.

The threat is deemed to have passed two hours after the forecast time for last exceedance of the 0.5m threat threshold for a zone. As local conditions can cause a wide variation in tsunami wave action, CANCELLATION of national warnings and ALL CLEAR determination must be made by national/state/local authorities.

AUSTRALIA

COCOS ISLAND (AU)	0834Z 15 Jun 2011	1.1m
NORTHWEST CAPE TO CARNARVON	1114Z 15 Jun 2011	2.2m

BANGLADESH

KHULNA	0846Z 15 Jun 2011	1.8m

COXS BAZAR 0853Z 15 Jun 2011 3.4m

4. ADVICE

This bulletin is being issued as advice. Only national/state/local authorities and disaster management officers have the authority to make decisions regarding the official threat and warning status in their coastal areas and any action to be taken in response.

5. UPDATES

Additional bulletins will be issued by RTSP INDIA for this event as more information becomes available.

Other RTSPs may issue additional information at:

RTSP AUSTRALIA: http://www.bom.gov.au/tsunami/rtwp_new/

RTSP INDONESIA: http://www.inatews.bmkg.gov.id

In case of conflicting information from RTSPs or the IAS (PTWC, JMA), the more conservative information should be used for safety.

6. CONTACT INFORMATION

Indian Tsunami Early Warning Centre (ITEWC)

Indian National Centre for Ocean Information Services (INCOIS)

Address:"Ocean Valley", P.B No.21,IDA Jeedimetla P.O,

Hyderabad - 500 055, India.

Tel: 91-40-23895011

Fax: 91-40-23895012

Email: tsunami@incois.gov.in

Website: www.incois.gov.in

END OF TEST BULLETIN

Bulletin 03 Supplementary XX: includes real-time water level observations and updated threat status - Hourly update / as and when the subsequent real-time water level observations are available

RTSP-INDIA-20110615-0600-005 (TYPE – III Supplementary 05)

TSUNAMI BULLETIN NUMBER 5

REGIONAL TSUNAMI ADVISORY SERVICE PROVIDER RTSP INDIA (ITEWC)

issued at: 0632 UTC Wednesday 15 June 2011

... CONFIRMED TSUNAMI THREAT IN THE INDIAN OCEAN ...

1. EARTHQUAKE INFORMATION (Revised)

RTSP INDIA issuing earthquake with the following preliminary parameters:

Magnitude: 9.0 M (Great)

Depth: 10 km

Date: 15 Jun 2011

Origin Time: 0600 UTC

Latitude: 7.2 N

Longitude: 92.9 E

Location: Nicobar Islands, India

2. EVALUATION

Sea level observations have confirmed that a TSUNAMI WAS GENERATED.

Maximum wave amplitudes observed so far:

CampbellBay(India)	6.9	93.7	0605Z 15 Jun 2011	12.5m
Nancowry(India)	8.0	93.5	0618Z 15 Jun 2011	2.5m
Kamorta(India)	8.1	93.5	0619Z 15 Jun 2011	14.7m
Sabang (Indonesia)	5.8	95.3	0627Z 15 Jun 2011	8.5m

Based on pre-run model scenarios, the zones listed below are POTENTIALLY UNDER THREAT.

3. TSUNAMI THREAT FOR THE INDIAN OCEAN

The list below shows the forecast arrival time of the first wave estimated to exceed 0.5m amplitude at the beach in each zone, and the amplitude of the maximum beach wave predicted for the zone. Zones where the estimated wave amplitudes are less than 0.5m at the beach are not shown.

The list is grouped by country (alphabetic order) and ordered according to the earliest estimated times of arrival at the beach.

Please be aware that actual wave arrival times may differ from those below, 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.

The threat is deemed to have passed two hours after the forecast time for last exceedance of the 0.5m threat threshold for a zone. As local conditions can cause a wide variation in tsunami wave action, CANCELLATION of national warnings and ALL CLEAR determination must be made by national/state/local authorities.

AUSTRALIA

COCOS ISLAND (AU)	0834Z 15 Jun 2011	1.1m
NORTHWEST CAPE TO CARNARVON	1114Z 15 Jun 2011	2.2m

BANGLADESH

KHULNA	0846Z 15 Jun 2011	1.8m
COXS BAZAR	0853Z 15 Jun 2011	3.4m

4. ADVICE

This bulletin is being issued as advice. Only national/state/local authorities and disaster management officers have the authority to make decisions regarding the official threat and warning status in their coastal areas and any action to be taken in response.

5. UPDATES

Additional bulletins will be issued by RTSP INDIA for this event as more information becomes available.

Other RTSPs may issue additional information at:

RTSP AUSTRALIA: http://www.bom.gov.au/tsunami/rtwp_new/

RTSP INDONESIA: http://www.inatews.bmkg.gov.id

In case of conflicting information from RTSPs or the IAS (PTWC, JMA), the more conservative information should be used for safety.

6. CONTACT INFORMATION

Indian Tsunami Early Warning Centre (ITEWC)

Indian National Centre for Ocean Information Services (INCOIS)

Address:"Ocean Valley", P.B No.21,IDA Jeedimetla P.O,

Hyderabad - 500 055, India.

Tel: 91-40-23895011

Fax: 91-40-23895012

Email: tsunami@incois.gov.in

Website: www.incois.gov.in

END OF TEST BULLETIN

FINAL BULLETIN: Issued when water levels from multiple gauges confirm that no significant tsunami was generated

RTSP-INDIA-20110615-0600-003 (TYPE - IV)

TSUNAMI BULLETIN NUMBER 3

REGIONAL TSUNAMI ADVISORY SERVICE PROVIDER RTSP INDIA (ITEWC)

issued at: 0632 UTC Wednesday 15 June 2011

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1. EARTHQUAKE INFORMATION (Revised)

RTSP INDIA issuing earthquake with the following preliminary parameters:

Magnitude: 9.0 M (Great)

Depth: 10 km

Date: 15 Jun 2011

Origin Time: 0600 UTC

Latitude: 7.2 N

Longitude: 92.9 E

Location: Nicobar Islands, India

2. EVALUATION

Real-time measurements of wave activity indicated that no significant tsunami was generated. When no major waves have occurred at least for two hours after the estimated arrival time then local authorities can assume that the threat is passed. As local conditions can cause a wide variation in tsunami wave action the ALL CLEAR decision /all clear determination must be made by local authorities.

3. ADVICE

This bulletin is being issued as advice. Only national/state/local authorities and disaster management officers have the authority to make decisions regarding the official threat and warning status in their coastal areas and any action to be taken in response

4. UPDATES

Additional bulletins will be issued by RTSP INDIA for this event as more information becomes available.

Other RTSPs may issue additional information at:

RTSP AUSTRALIA: http://www.bom.gov.au/tsunami/rtwp_new/

RTSP INDONESIA: http://www.inatews.bmkg.gov.id

In case of conflicting information from RTSPs or the IAS (PTWC, JMA), the more conservative information should be used for safety.

5. CONTACT INFORMATION

Indian Tsunami Early Warning Centre (ITEWC)

Indian National Centre for Ocean Information Services (INCOIS)

Address:"Ocean Valley", P.B No.21,IDA Jeedimetla P.O,

Hyderabad - 500 055, India.

Tel: 91-40-23895011

Fax: 91-40-23895012

Email: tsunami@incois.gov.in

Website: www.incois.gov.in

END OF TEST BULLETIN

FINAL BULLETIN: After 120 minutes after threat passed the last IO threat zone

RTSP-INDIA-20110615-0600-009 (TYPE - IV)

TSUNAMI BULLETIN NUMBER 9

REGIONAL TSUNAMI ADVISORY SERVICE PROVIDER - RTSP INDIA (ITEWC)

issued at: 0001 UTC Thursday 16 June 2011

... FINAL TSUNAMI BULLETIN FOR THE INDIAN OCEAN ...

1. EARTHQUAKE INFORMATION (Revised)

RTSP INDIA issuing earthquake with the following preliminary parameters:

Magnitude: 9.0 M (Great)

Depth: 10 km

Date: 15 Jun 2011

Origin Time: 0600 UTC

Latitude: 7.2 N

Longitude: 92.9 E

Location: Nicobar Islands, India

2. EVALUATION

Data from sea-level gauges confirmed that a tsunami was generated.

The expected period of significant tsunami waves is now over for all threatened Indian Ocean countries, based on RTSP INDIA modelling.

Because local conditions can cause a wide variation in tsunami wave action, CANCELLATION of national warnings and ALL CLEAR determination must be made by national/state/local authorities. Please be aware that dangerous currents can continue for several hours after the main tsunami waves have passed.

3. ADVICE

This bulletin is being issued as advice. Only national/state/local authorities and disaster management officers have the authority to make decisions regarding the official threat and warning status in their coastal areas and any action to be taken in response.

4. UPDATES

No further bulletins will be issued by RTSP INDIA for this event unless additional information becomes available.

Other RTSPs may issue additional information at:

RTSP AUSTRALIA: http://www.bom.gov.au/tsunami/rtwp_new/

RTSP INDONESIA: http://www.inatews.bmkg.gov.id

In case of conflicting information from RTSPs or the IAS (PTWC, JMA), the more conservative information should be used for safety.

5. CONTACT INFORMATION

Indian Tsunami Early Warning Centre (ITEWC)

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Address:"Ocean Valley", P.B No.21,IDA Jeedimetla P.O,

Hyderabad - 500 055, India.

Tel: 91-40-23895011

Fax: 91-40-23895012

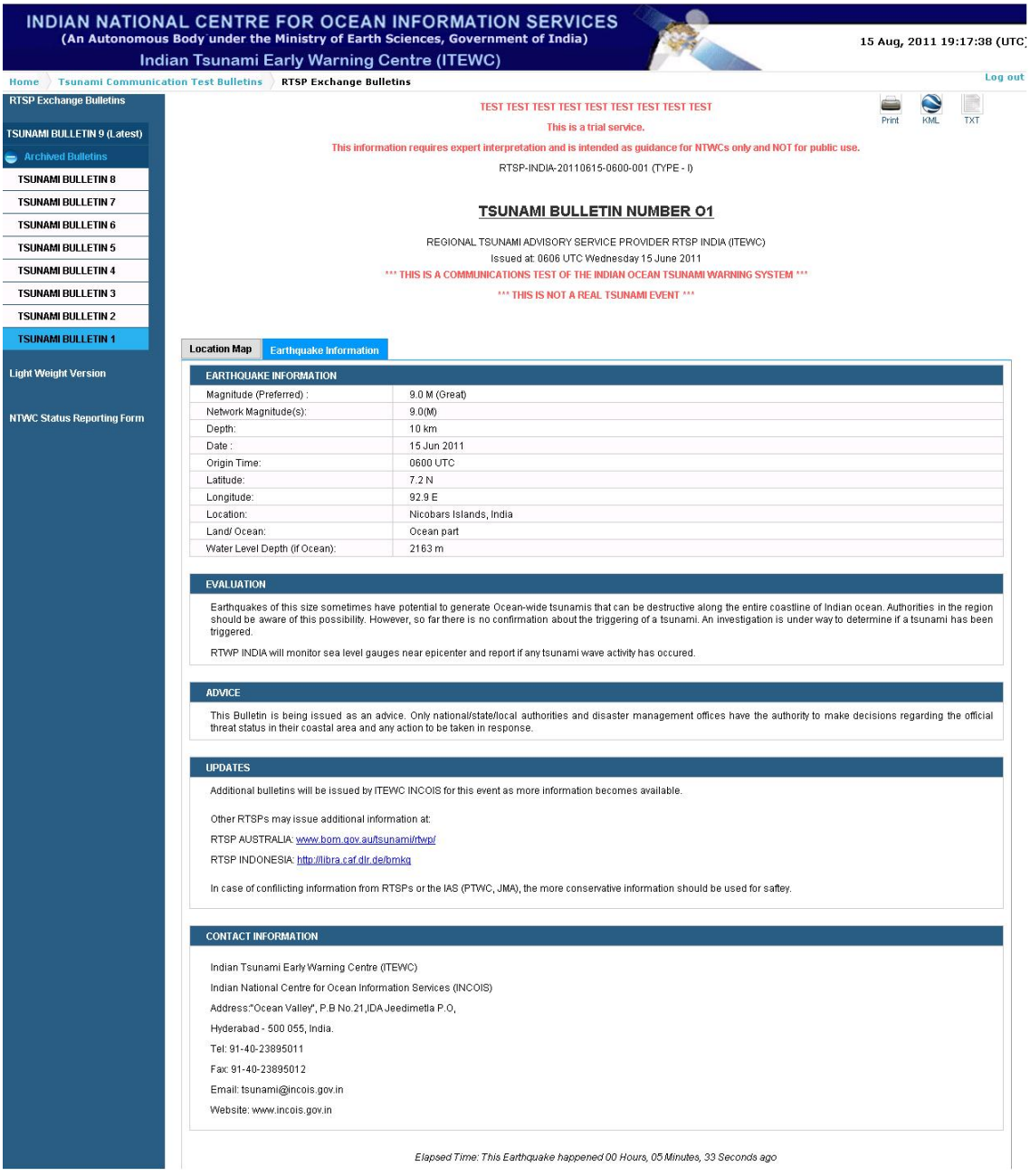
Email: tsunami@incois.gov.in

Website: www.incois.gov.in

END OF TEST BULLETIN

Sample HTML Bulletins

Bulletin-1 with Preliminary Earthquake Parameters and Map



INDIAN NATIONAL CENTRE FOR OCEAN INFORMATION SERVICES
(An Autonomous Body under the Ministry of Earth Sciences, Government of India)
Indian Tsunami Early Warning Centre (ITEWC)

15 Aug, 2011 19:17:38 (UTC)

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This is a trial service.

This information requires expert interpretation and is intended as guidance for NTWCs only and NOT for public use.

RTSP-INDIA-20110615-0600-001 (TYPE - I)

TSUNAMI BULLETIN NUMBER 01

REGIONAL TSUNAMI ADVISORY SERVICE PROVIDER RTSP INDIA (ITEWC)
Issued at: 0606 UTC Wednesday 15 June 2011

*** THIS IS A COMMUNICATIONS TEST OF THE INDIAN OCEAN TSUNAMI WARNING SYSTEM ***

*** THIS IS NOT A REAL TSUNAMI EVENT ***

Location Map | Earthquake Information

EARTHQUAKE INFORMATION

Magnitude (Preferred) :	9.0 M (Great)
Network Magnitude(s):	9.0(M)
Depth:	10 km
Date :	15 Jun 2011
Origin Time:	0600 UTC
Latitude:	7.2 N
Longitude:	92.9 E
Location:	Nicobars Islands, India
Land/ Ocean:	Ocean part
Water Level Depth (if Ocean):	2163 m

EVALUATION

Earthquakes of this size sometimes have potential to generate Ocean-wide tsunamis that can be destructive along the entire coastline of Indian ocean. Authorities in the region should be aware of this possibility. However, so far there is no confirmation about the triggering of a tsunami. An investigation is under way to determine if a tsunami has been triggered.

RTWP INDIA will monitor sea level gauges near epicenter and report if any tsunami wave activity has occured.

ADVICE

This Bulletin is being issued as an advice. Only national/state/local authorities and disaster management offices have the authority to make decisions regarding the official threat status in their coastal area and any action to be taken in response.

UPDATES

Additional bulletins will be issued by ITEWC INCOIS for this event as more information becomes available.

Other RTSPs may issue additional information at:

RTSP AUSTRALIA: www.bom.gov.au/tsunami/rtwp/

RTSP INDONESIA: http://libra.caf.dlr.de/bmkg

In case of confilicting information from RTSPs or the IAS (PTWC, JMA), the more conservative information should be used for saftey.

CONTACT INFORMATION

Indian Tsunami Early Warning Centre (ITEWC)
Indian National Centre for Ocean Information Services (INCOIS)
Address:"Ocean Valley", P.B No.21,IDA Jeedimetla P.O,
Hyderabad - 500 055, India.
Tel: 91-40-23895011
Fax: 91-40-23895012
Email: tsunami@incois.gov.in
Website: www.incois.gov.in

Elapsed Time: This Earthquake happened 00 Hours, 05 Minutes, 33 Seconds ago

INDIAN NATIONAL CENTRE FOR OCEAN INFORMATION SERVICES
(An Autonomous Body under the Ministry of Earth Sciences, Government of India)
Indian Tsunami Early Warning Centre (ITEWC)

15 Aug, 2011 19:20:28 (UTC)

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This is a trial service.

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RTSP-INDIA-20110615-0600-001 (TYPE - I)

TSUNAMI BULLETIN NUMBER 01

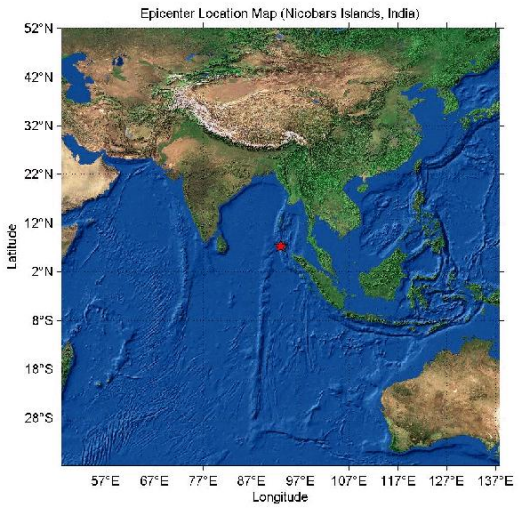
REGIONAL TSUNAMI ADVISORY SERVICE PROVIDER RTSP INDIA (ITEWC)

Issued at: 0606 UTC Wednesday 15 June 2011

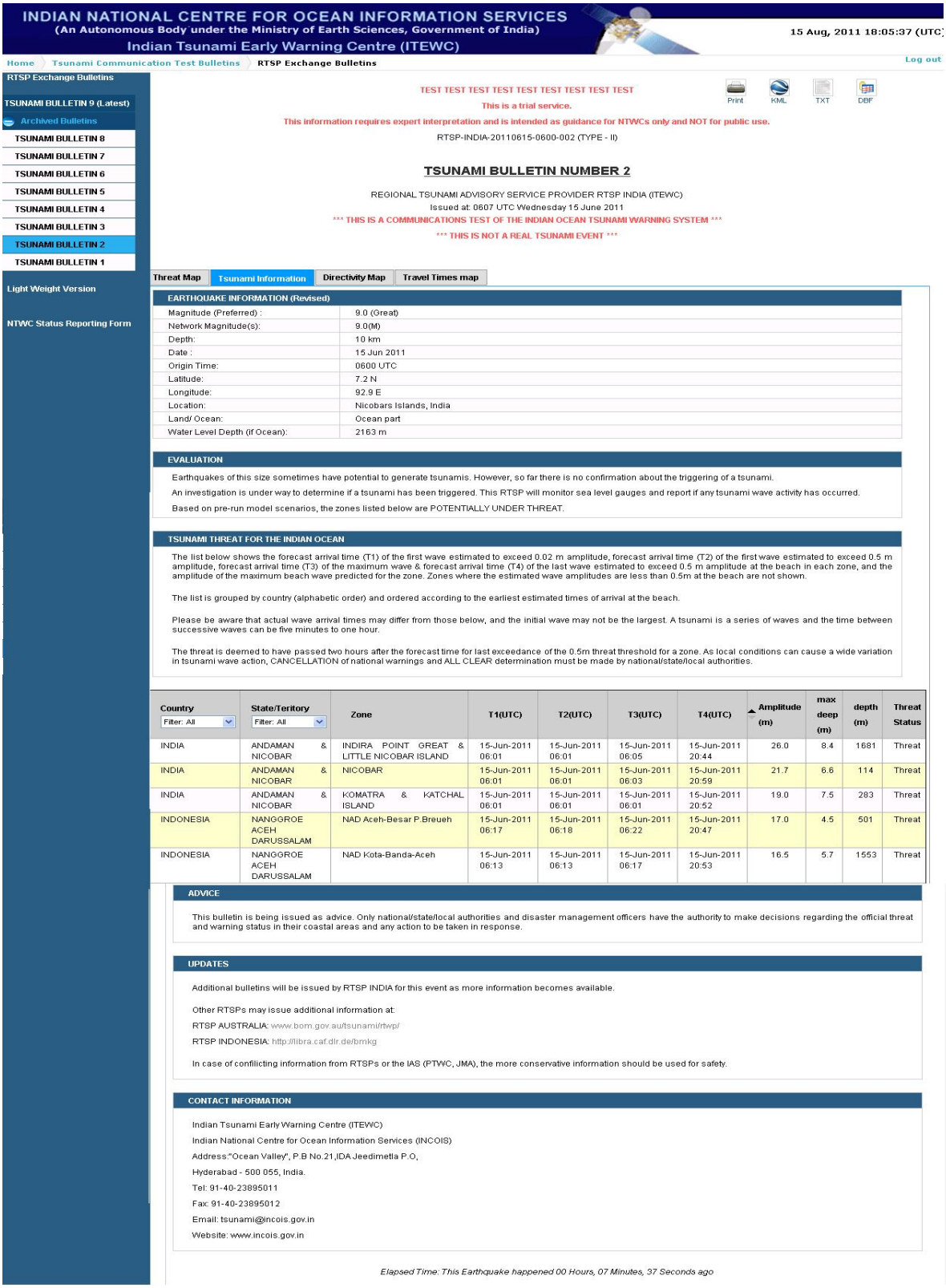
*** THIS IS A COMMUNICATIONS TEST OF THE INDIAN OCEAN TSUNAMI WARNING SYSTEM ***

*** THIS IS NOT A REAL TSUNAMI EVENT ***

Location Map | Earthquake Information



Bulletin-2 with THREAT information based on Model Scenario Results



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RTSP-INDIA-20110615-0600-002 (TYPE - II)

TSUNAMI BULLETIN NUMBER 2

REGIONAL TSUNAMI ADVISORY SERVICE PROVIDER RTSP INDIA (ITEWC)
Issued at: 0607 UTC Wednesday 15 June 2011
*** THIS IS A COMMUNICATIONS TEST OF THE INDIAN OCEAN TSUNAMI WARNING SYSTEM ***
*** THIS IS NOT A REAL TSUNAMI EVENT ***

Threat Map | Tsunami Information | Directivity Map | Travel Times map

EARTHQUAKE INFORMATION (Revised)

Magnitude (Preferred) :	9.0 (Great)
Network Magnitude(s):	9.0(M)
Depth:	10 km
Date :	15 Jun 2011
Origin Time:	0600 UTC
Latitude:	7.2 N
Longitude:	92.9 E
Location:	Nicobars Islands, India
Land/ Ocean:	Ocean part
Water Level Depth (if Ocean):	2163 m

EVALUATION

Earthquakes of this size sometimes have potential to generate tsunamis. However, so far there is no confirmation about the triggering of a tsunami.

An investigation is under way to determine if a tsunami has been triggered. This RTSP will monitor sea level gauges and report if any tsunami wave activity has occurred.

Based on pre-run model scenarios, the zones listed below are POTENTIALLY UNDER THREAT.

TSUNAMI THREAT FOR THE INDIAN OCEAN

The list below shows the forecast arrival time (T1) of the first wave estimated to exceed 0.02 m amplitude, forecast arrival time (T2) of the first wave estimated to exceed 0.5 m amplitude, forecast arrival time (T3) of the maximum wave & forecast arrival time (T4) of the last wave estimated to exceed 0.5 m amplitude at the beach in each zone, and the amplitude of the maximum beach wave predicted for the zone. Zones where the estimated wave amplitudes are less than 0.5m at the beach are not shown.

The list is grouped by country (alphabetic order) and ordered according to the earliest estimated times of arrival at the beach.

Please be aware that actual wave arrival times may differ from those below, 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.

The threat is deemed to have passed two hours after the forecast time for last exceedance of the 0.5m threat threshold for a zone. As local conditions can cause a wide variation in tsunami wave action, CANCELLATION of national warnings and ALL CLEAR determination must be made by national/state/local authorities.

Country (Filter: All)	State/Teritory (Filter: All)	Zone	T1(UTC)	T2(UTC)	T3(UTC)	T4(UTC)	Amplitude (m)	max deep (m)	depth (m)	Threat Status
INDIA	ANDAMAN & NICOBAR	INDIRA POINT GREAT & LITTLE NICOBAR ISLAND	15-Jun-2011 06:01	15-Jun-2011 06:01	15-Jun-2011 06:05	15-Jun-2011 20:44	26.0	8.4	1681	Threat
INDIA	ANDAMAN & NICOBAR	NICOBAR	15-Jun-2011 06:01	15-Jun-2011 06:01	15-Jun-2011 06:03	15-Jun-2011 20:59	21.7	6.6	114	Threat
INDIA	ANDAMAN & NICOBAR	KOMATRA & KATCHAL ISLAND	15-Jun-2011 06:01	15-Jun-2011 06:01	15-Jun-2011 06:01	15-Jun-2011 20:52	19.0	7.5	283	Threat
INDONESIA	NANGGROE ACEH DARUSSALAM	NAD Aceh-Besar P.Breueh	15-Jun-2011 06:17	15-Jun-2011 06:18	15-Jun-2011 06:22	15-Jun-2011 20:47	17.0	4.5	501	Threat
INDONESIA	NANGGROE ACEH DARUSSALAM	NAD Kota-Banda-Aceh	15-Jun-2011 06:13	15-Jun-2011 06:13	15-Jun-2011 06:17	15-Jun-2011 20:53	16.5	5.7	1553	Threat

ADVICE

This bulletin is being issued as advice. Only national/state/local authorities and disaster management officers have the authority to make decisions regarding the official threat and warning status in their coastal areas and any action to be taken in response.

UPDATES

Additional bulletins will be issued by RTSP INDIA for this event as more information becomes available.

Other RTSPs may issue additional information at:

RTSP AUSTRALIA: www.bom.gov.au/tsunami/rtwp/

RTSP INDONESIA: http://libra.caf.dlr.de/bmkg

In case of conflilicting information from RTSPs or the IAS (PTWC, JMA), the more conservative information should be used for safety.

CONTACT INFORMATION

Indian Tsunami Early Warning Centre (ITEWC)
Indian National Centre for Ocean Information Services (INCOIS)
Address:"Ocean Valley", P.B No.21,IDA Jeedimetla P.O,
Hyderabad - 500 055, India.
Tel: 91-40-23895011
Fax: 91-40-23895012
Email: tsunami@incois.gov.in
Website: www.incois.gov.in

Elapsed Time: This Earthquake happened 00 Hours, 07 Minutes, 37 Seconds ago

INDIAN NATIONAL CENTRE FOR OCEAN INFORMATION SERVICES
(An Autonomous Body under the Ministry of Earth Sciences, Government of India)
Indian Tsunami Early Warning Centre (ITEWC)

15 Aug, 2011 18:29:45 (UTC)

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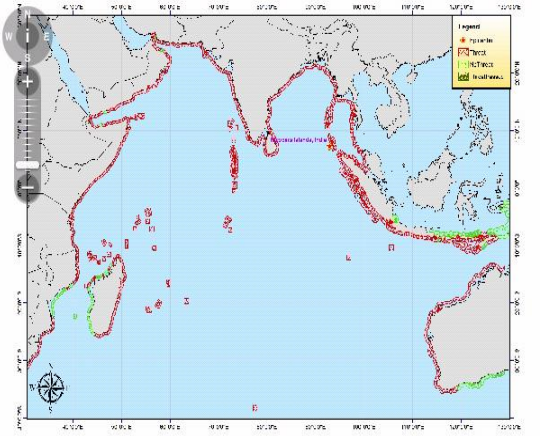
RTSP-INDIA-20110615-0600-002 (TYPE - II)

TSUNAMI BULLETIN NUMBER 2

REGIONAL TSUNAMI ADVISORY SERVICE PROVIDER RTSP INDIA (ITEWC)
Issued at: 0607 UTC Wednesday 15 June 2011
*** THIS IS A COMMUNICATIONS TEST OF THE INDIAN OCEAN TSUNAMI WARNING SYSTEM ***
*** THIS IS NOT A REAL TSUNAMI EVENT ***

Threat Map | Tsunami Information | Directivity Map | Travel Times map



Bulletin-3 Realtime Water level Observations and THREAT information

INDIAN NATIONAL CENTRE FOR OCEAN INFORMATION SERVICES
(An Autonomous Body under the Ministry of Earth Sciences, Government of India)
Indian Tsunami Early Warning Centre (ITEWC)

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This is a trial service.
This information requires expert interpretation and is intended as guidance for NTWCs only and NOT for public use.

RTSP-INDIA-20110615-0600-003 (TYPE - III)

TSUNAMI BULLETIN NUMBER 3

REGIONAL TSUNAMI ADVISORY SERVICE PROVIDER RTSP INDIA (ITEWC)
Issued at: 0629 UTC Wednesday 15 June 2011
*** THIS IS A COMMUNICATIONS TEST OF THE INDIAN OCEAN TSUNAMI WARNING SYSTEM ***
*** THIS IS NOT A REAL TSUNAMI EVENT ***

Threat Map | Tsunami Information | Directivity Map | Travel Times map

EARTHQUAKE INFORMATION (Revised)

Magnitude (Preferred) :	9.0 M (Great)
Network Magnitude(s):	9.0(M)
Depth:	10 km
Date :	15 Jun 2011
Origin Time:	0600 UTC
Latitude:	7.2 N
Longitude:	92.9 E
Location:	Nicobar Islands, India
Land/ Ocean:	Ocean part
Water Level Depth (if Ocean):	2163 m

EVALUATION

Sea level observations have confirmed that a TSUNAMI WAS GENERATED. Maximum wave amplitudes observed so far:

Station	Latitude	Longitude	Wave Arrival (UTC)	Wave Amplitude (m)
CampbellBay(India)	6.90	93.74	15-Jun-2011 06:05:00	12.5
Nancowry(India)	7.96	93.53	15-Jun-2011 06:18:00	2.5
Kamorta(India)	8.13	93.50	15-Jun-2011 06:19:00	14.7
TB01(India)	8.50	94.50	15-Jun-2011 06:26:00	0.6
Sabang (Indonesia)	5.83	95.33	15-Jun-2011 06:27:00	8.5
TB04(India)	9.31	89.45	15-Jun-2011 06:29:00	0.9

Based on pre-run model scenarios, the zones listed below are POTENTIALLY UNDER THREAT.

TSUNAMI THREAT FOR THE INDIAN OCEAN

The list below shows the forecast arrival time (T1) of the first wave estimated to exceed 0.02 m amplitude, forecast arrival time (T2) of the first wave estimated to exceed 0.5 m amplitude, forecast arrival time (T3) of the maximum wave & forecast arrival time (T4) of the last wave estimated to exceed 0.5 m amplitude at the beach in each zone, and the amplitude of the maximum beach wave predicted for the zone. Zones where the estimated wave amplitudes are less than 0.5m at the beach are not shown.

The list is grouped by country (alphabetic order) and ordered according to the earliest estimated times of arrival at the beach.

Please be aware that actual wave arrival times may differ from those below, 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.

The threat is deemed to have passed two hours after the forecast time for last exceedance of the 0.5m threat threshold for a zone. As local conditions can cause a wide variation in tsunami wave action, CANCELLATION of national warnings and ALL CLEAR determination must be made by national/state/local authorities.

Country (Filter: All)	State/Teritory (Filter: All)	Zone	T1(UTC)	T2(UTC)	T3(UTC)	T4(UTC)	Amplitude (m)	max deep (m)	depth (m)	Threat Status
AUSTRALIA	COCOS ISLAND	COCOS ISLAND (AU)	15-Jun-2011 08:29	15-Jun-2011 08:34	15-Jun-2011 09:11	15-Jun-2011 20:58	1.1	0.2	1390	Threat
DJIBOUTI	OBOCK	MUHAMMAD ALI BIN FATHA SUMANA	15-Jun-2011 14:58	15-Jun-2011 15:38	15-Jun-2011 15:59	15-Jun-2011 16:02	0.8	0.3	166	Threat
AUSTRALIA	WESTERN AUSTRALIA	MANDURAH TO CAPE LEEUWIN	15-Jun-2011 12:31	15-Jun-2011 12:46	15-Jun-2011 17:00	15-Jun-2011 20:10	1.5	0.6	58	Threat
MOZAMBIQUE	NAMPULA	CALAJULO	15-Jun-2011 15:03	15-Jun-2011 15:15	15-Jun-2011 15:23	15-Jun-2011 18:48	1.2	0.5	917	Threat
INDONESIA	NUSA TENGGARA BARAT	NTB Kota-Bima S	15-Jun-2011 10:50	15-Jun-2011 13:21	15-Jun-2011 15:37	15-Jun-2011 19:52	1.2	0.3	631	Threat
MYANMAR	MON	YE	15-Jun-2011 08:32	15-Jun-2011 08:49	15-Jun-2011 10:37	15-Jun-2011 20:18	1.9	0.8	42	Threat
SEYCHELLES	SEYCHELLES	ILE DESROCHES	15-Jun-2011 12:37	15-Jun-2011 12:44	15-Jun-2011 12:52	15-Jun-2011 20:45	1.5	0.2	1742	Threat
BANGLADESH	CHITTAGONG DIVISION	COXS BAZAR	15-Jun-2011 08:43	15-Jun-2011 08:53	15-Jun-2011 15:14	15-Jun-2011 19:35	3.4	1.4	44	Threat
INDONESIA	NUSA TENGGARA TIMUR	NTT Lembata S	15-Jun-2011 11:49	15-Jun-2011 12:28	15-Jun-2011 12:47	15-Jun-2011 12:54	0.7	0.1	2276	Threat
INDONESIA	SUMATERA UTARA	SUMUT Nias-Selatan P.Nias	15-Jun-2011 07:01	15-Jun-2011 07:06	15-Jun-2011 15:47	15-Jun-2011 20:18	3.1	1.1	433	Threat

ADVICE

This bulletin is being issued as advice. Only national/state/local authorities and disaster management officers have the authority to make decisions regarding the official threat and warning status in their coastal areas and any action to be taken in response.

UPDATES

Additional bulletins will be issued by RTSP INDIA for this event as more information becomes available.

Other RTSPs may issue additional information at:
RTSP AUSTRALIA: www.bom.gov.au/tsunami/rtwp/
RTSP INDONESIA: http://libra.caf.dlr.de/bmkg

In case of conflicting information from RTSPs or the IAS (PTWC, JMA), the more conservative information should be used for safety.

CONTACT INFORMATION

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Indian National Centre for Ocean Information Services (INCOIS)
Address:"Ocean Valley", P.B No.21,IDA Jeedimetla P.O,
Hyderabad - 500 055, India.
Tel: 91-40-23895011
Fax: 91-40-23895012
Email: tsunami@incois.gov.in
Website: www.incois.gov.in

Elapsed Time: This Earthquake happened 00 Hours, 29 Minutes, 43 Seconds ago

INDIAN NATIONAL CENTRE FOR OCEAN INFORMATION SERVICES
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Indian Tsunami Early Warning Centre (ITEWC)

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RTSP-INDIA-20110615-0600-003 (TYPE - III)

TSUNAMI BULLETIN NUMBER 3

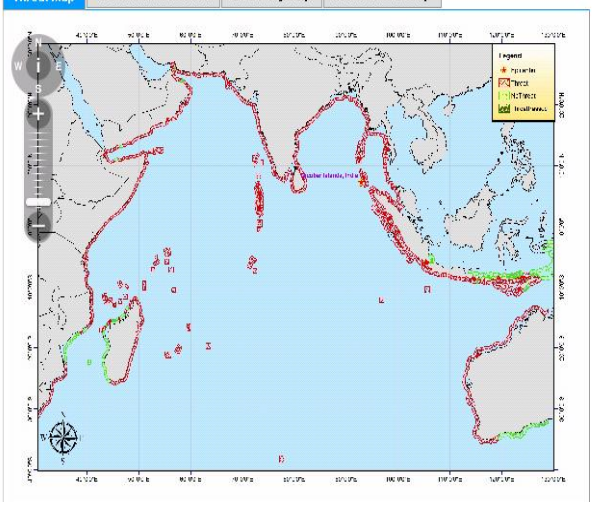
REGIONAL TSUNAMI ADVISORY SERVICE PROVIDER RTSP INDIA (ITEWC)

Issued at: 0629 UTC Wednesday 15 June 2011

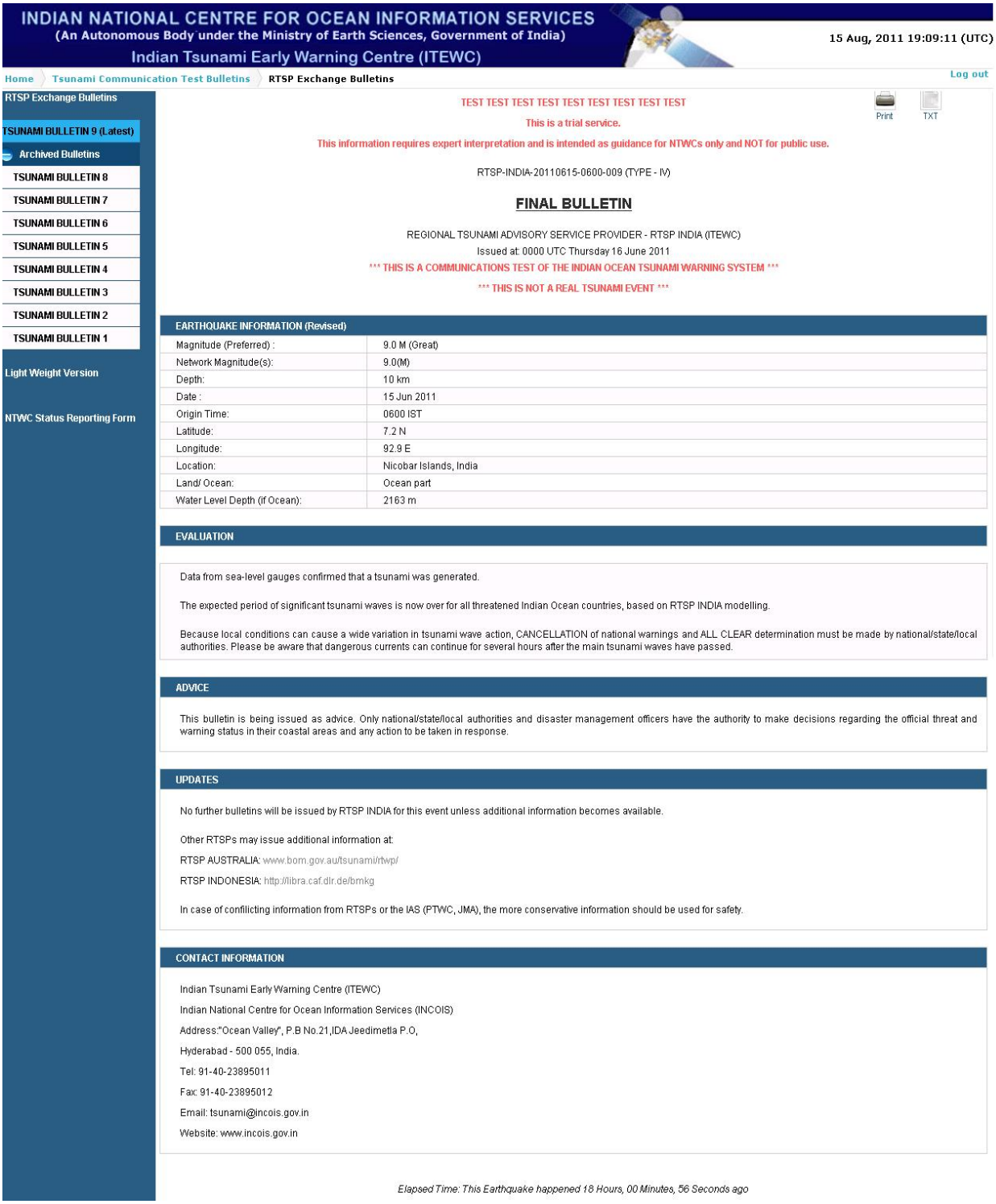
*** THIS IS A COMMUNICATIONS TEST OF THE INDIAN OCEAN TSUNAMI WARNING SYSTEM ***

*** THIS IS NOT A REAL TSUNAMI EVENT ***

Threat Map | Tsunami Information | Directivity Map | Travel Times map



FINAL Bulletin with Threat Passed information



INDIAN NATIONAL CENTRE FOR OCEAN INFORMATION SERVICES
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Indian Tsunami Early Warning Centre (ITEWC)

15 Aug, 2011 19:09:11 (UTC)

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RTSP-INDIA-20110615-0600-009 (TYPE - IV)

FINAL BULLETIN

REGIONAL TSUNAMI ADVISORY SERVICE PROVIDER - RTSP INDIA (ITEWC)
Issued at: 0000 UTC Thursday 16 June 2011
*** THIS IS A COMMUNICATIONS TEST OF THE INDIAN OCEAN TSUNAMI WARNING SYSTEM ***
*** THIS IS NOT A REAL TSUNAMI EVENT ***

EARTHQUAKE INFORMATION (Revised)

Magnitude (Preferred) :	9.0 M (Great)
Network Magnitude(s):	9.0(M)
Depth:	10 km
Date :	15 Jun 2011
Origin Time:	0600 IST
Latitude:	7.2 N
Longitude:	92.9 E
Location:	Nicobar Islands, India
Land/ Ocean:	Ocean part
Water Level Depth (if Ocean):	2163 m

EVALUATION

Data from sea-level gauges confirmed that a tsunami was generated.

The expected period of significant tsunami waves is now over for all threatened Indian Ocean countries, based on RTSP INDIA modelling.

Because local conditions can cause a wide variation in tsunami wave action, CANCELLATION of national warnings and ALL CLEAR determination must be made by national/state/local authorities. Please be aware that dangerous currents can continue for several hours after the main tsunami waves have passed.

ADVICE

This bulletin is being issued as advice. Only national/state/local authorities and disaster management officers have the authority to make decisions regarding the official threat and warning status in their coastal areas and any action to be taken in response.

UPDATES

No further bulletins will be issued by RTSP INDIA for this event unless additional information becomes available.

Other RTSPs may issue additional information at:

RTSP AUSTRALIA: www.bom.gov.au/tsunami/rtwp/

RTSP INDONESIA: http://libra.caf.dlr.de/bmkg

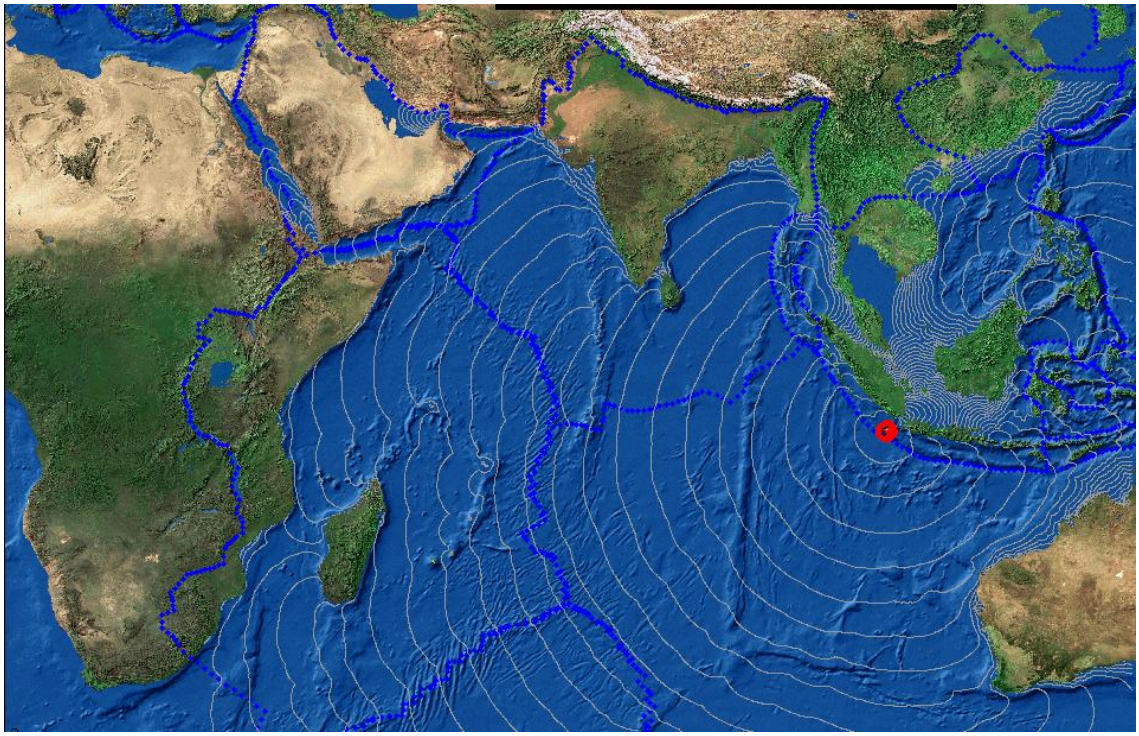
In case of confilicting information from RTSPs or the IAS (PTWC, JMA), the more conservative information should be used for safety.

CONTACT INFORMATION

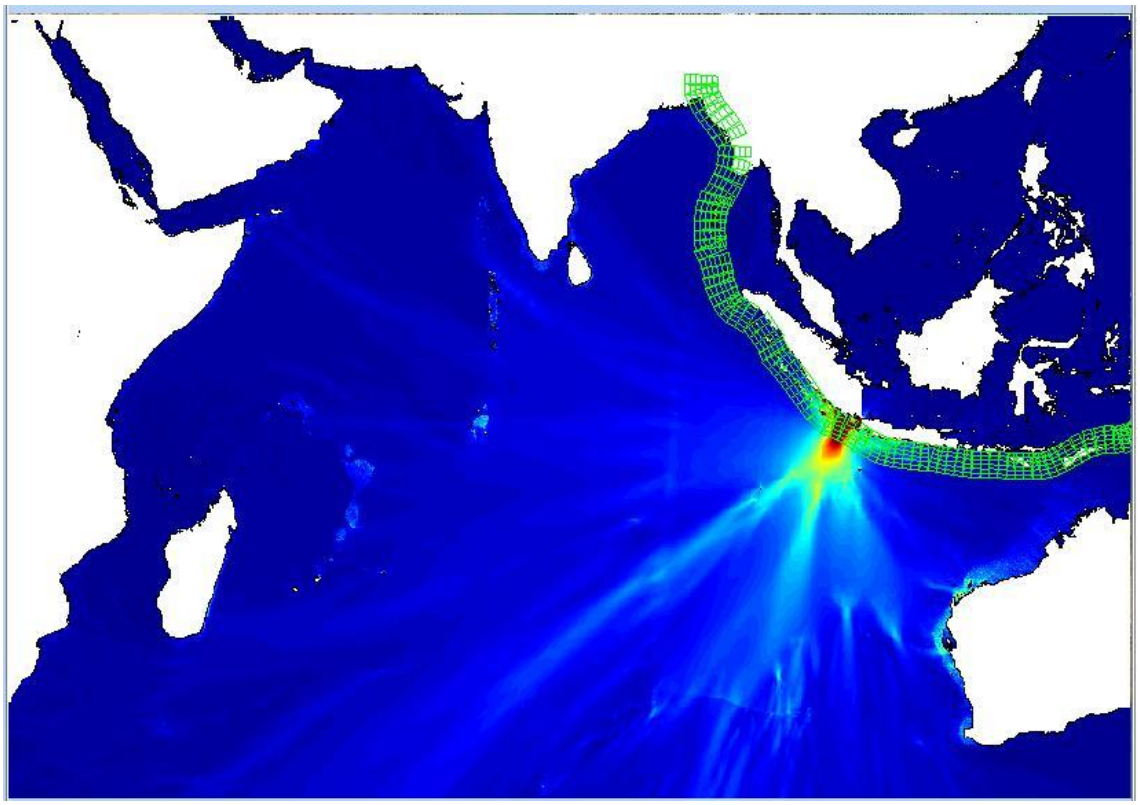
Indian Tsunami Early Warning Centre (ITEWC)
Indian National Centre for Ocean Information Services (INCOIS)
Address:"Ocean Valley", P.B No.21,IDA Jeedimetla P.O,
Hyderabad - 500 055, India.
Tel: 91-40-23895011
Fax: 91-40-23895012
Email: tsunami@incois.gov.in
Website: www.incois.gov.in

Elapsed Time: This Earthquake happened 18 Hours, 00 Minutes, 56 Seconds ago

Sample Graphic Products



Sample Travel Time Map



Sample Directivity Map