Draft Plan on Tsunami Advisory Products for the South China Sea Regional Tsunami Warning and Mitigation System

(submitted to the 4th Regional Working Group Meeting of the South China Sea Tsunami Warning and Mitigation System)

Jakarta, Indonesia

February 2015
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1 Overview

1.1 Background
The South China Sea, the South-West Pacific and the South-East Pacific, are identified as high tsunami-prone areas and currently no regional tsunami warning systems are in operation. The PTWS took the establishment of the SCS Tsunami Warning and Mitigation System as a priority action in its Medium-Term Strategy 2014-2021.

ICG/PTWS-XXV Session in Vladivostok Russia approved the proposal of the South China Sea Tsunami Warning and Mitigation System, and decides further establish a Task Team on the Establishment of a South China Sea Tsunami Advisory Center (SCSTAC). The 1st Task Team Meeting of the SCSTAC, and the 3rd SCS Regional Working Group Meeting that immediately followed, were both hosted by Hong Kong Observatory on 8-9 Apr. 2014. The SCS Working Group adopted the recommendations of the SCSTAC Task Team that the SCSTAC advisory products should comprise a suite of text and graphic products to keep pace with the PTWS New Enhanced Products, and the design of the SCSTAC advisory products should be accomplished and submitted for consideration of the SCS WG in the 4th Regional Working Group Meeting.

The provision of the SCS tsunami advisory products aims at allowing the recipient countries to take appropriate actions against regional threats, in collaboration with the ocean-wide service provided by PTWC. The development of tsunami advisory products that account for regional features and particular requirements of the SCS Member States is crucial for an effective regional tsunami warning system. In that regard, the in-depth involvement of all Member States in the development of the SCS regional products during the design period is very important.

The SCS tsunami advisory products should incorporate the state-of-the-art forecasting skills such as tsunami scenario database and fast numerical model. The benchmark of numerical model and validation of forecasting results are essential. The development of the SCS tsunami advisory products will continue until the consent of all Member States is achieved and experimental operation of the SCSTAC starts.

1.2 Geographical coverage
The SCS Tsunami Advisory is issued when a major earthquake with moment magnitude 6.5 or greater is detected in the AoR of the SCSTAC, which include the main body of the SCS, the Sulu Sea and the Celebes Sea. For major earthquake occurred beyond the SCS region that may pose threat the SCS region, the tsunami advisory products might be issued in parallel with PTWC and NWPTAC.
1.3 Bulletin Types and Criteria
For a long time, PTWC issues four basic categories of bulletins to PTWS Member States mainly based on earthquake magnitude and imminence/distance of expected tsunami threat on target areas. PTWC put somewhere into a warning or watch based only on whether either the area is within a 1000 km of the source of a potential destructive tsunami (under a Regional Fixed Tsunami Warning); the area is within 3 hrs of a potentially destructive tsunami ETA for a warning or within 3 to 6 hrs of ETA for a watch (under a Regional Expanding Tsunami Warning and Watch); or the area is in PTWC’s Pacific AoR (under a Pacific-wide Tsunami Warning).

At the ICG/PTWS 25th Session held 11-13 September 2013, all Member States agreed on a changeover of PTWC New enhanced Products suite since 1 October 2014. As each Member State is sovereign and thus responsible for taking actions to ensure the safety of its own population, the PTWC New Enhanced Products no longer use levels of alert (i.e., watch and warning) to define the tsunami bulletins, instead provide levels of threat based on numerical modeling. The levels of threat now are provided as expected maximum tsunami wave amplitudes relative to the tide within four categories which are: i) less than 0.3 m, ii) 0.3 to less than 1 m, iii) 1 m to 3 m, and iv) greater than 3 m.

The SCS Tsunami Advisory Products will stick to the PTWC and NWPTAC’s practice to provide quantitative tsunami threat to recipients, rather than warning levels that are more meaningful for domestic warnings. According to numerical studies in the SCS region, the basin-wide tsunami triggered by Manila Trench will strike the Philippines
within hr and arrive at China, Vietnam, Malaysia, Brunei in 1-4 hrs, thus there are not much time left for emergency response. Basically, the SCSTAC will send out the initial bulletin as soon as possible mainly based on the preliminary earthquake parameters like location, magnitude and focal depth. Whether a Member State will be put into ‘threat area’ depends on the earthquake magnitude and imminence/distance.

PTWC now use W-phase Centroid Moment Tensor (WCMT) analysis, which typically available about 20-30 minutes after the earthquake, to trigger the numerical model. It makes big stride that the WCMT can yield a more accurate initial condition which is critical to modeling result. It is appropriate for Pacific Ocean-wide tsunami; however, for regional and local tsunamis in the SCS region, should it be late to provide the quantitative forecasts if the SCSTAC waits for the WCMT analysis. Therefore, tsunami scenario database based on the preliminary earthquake parameters, in combination with rapid tsunami models, will be adopted to evaluate coastal threat levels quantitatively in the subsequent bulletin that comes up 3-5 minutes after the first one. After that, the supplementary bulletins may be issued if major earthquake magnitude revision occurs. The SCSTAC will also run the high-resolution regional model when WCMT analysis is available, however the main purpose is to update and validate the preceding forecasting results.

<table>
<thead>
<tr>
<th>Bulletin type</th>
<th>Criteria</th>
<th>Content</th>
<th>Timeline</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tsunami Information</strong></td>
<td>Only one bulletin</td>
<td>Mag. of 6.0-6.5; or on land; or ≥100km depth</td>
<td>EQ parameters and statement of ‘No tsunami threat’</td>
</tr>
<tr>
<td></td>
<td>Only one bulletin unless minor waves observed and should be reported</td>
<td>Mag. of 6.6-7.0</td>
<td>EQ parameters and statement of ‘No tsunami threat’</td>
</tr>
<tr>
<td><strong>Tsunami Threat Message</strong></td>
<td>Bulletin with quantitative forecast</td>
<td></td>
<td>EQ parameters and quantitative forecasts on threat level and ETA</td>
</tr>
<tr>
<td></td>
<td>Supplementary with observations</td>
<td>Mag. &gt; 7.0</td>
<td>EQ parameters, quantitative forecast and tidal gauge observations</td>
</tr>
<tr>
<td></td>
<td>Final bulletin</td>
<td></td>
<td>Statement of ‘No tsunami confirmed or threat passed’</td>
</tr>
</tbody>
</table>

In the Tsunami Information and Tsunami Threat Message, the tsunamigenic potential is provided based on preliminary earthquake parameters. The criteria are as follows:

<table>
<thead>
<tr>
<th>Magnitude(Mw)</th>
<th>Tsunami Potential Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.0 ≤ Mw ≤ 7.0</td>
<td>There is no tsunami threat from this earthquake</td>
</tr>
<tr>
<td>7.1 ≤ Mw ≤ 7.5</td>
<td>Possibility of a destructive local tsunami confined to 100-300 km of the epicenter</td>
</tr>
</tbody>
</table>
Possibility of a destructive basin-wide tsunami

1.4 Implementation Timeline
According to <Proposal for the Tsunami Warning and Mitigation System of the South China Sea> approved by ICG/PTWS 25th session, the SCSTAC should start its experimental operation in 2016. It is appropriate that the experimental tsunami advisory products should be available before 2016. Activities and timelines in the time table comprise:

February 2015: Collecting opinions and suggestion on the SCSTAC products;

March 2015 - August 2015: Continuous research on experimental products and associated tsunami scenario database and models;

September 2015 - October 2015: Experimental products submitted to TT-SCSTAC for further comment and opinion;


1.5 Dissemination of Products
According to experience adopted by IOTWS and PTWS, text message should be available to both NTWC and the public via WMO Global Telecommunication System, Website and Facsimile, while scientifically more complex graphical products should only be accessible to National Tsunami Warning Centres (NTWC) and Tsunami Warning Focal Points (TWFPs) via excluded channels such as Email or Security-authenticated website in order to minimize public confusion and misunderstanding. A public and NTWC accessible website is needed to facilitate the spread of tsunami advisories.

<table>
<thead>
<tr>
<th>Approach</th>
<th>Services</th>
<th>Advantages &amp; Disadvantages</th>
</tr>
</thead>
</table>
| GTS      | Text Message | • Fast, reliable  
|          |           | • Not accessible for all MSs |
| Website  | Text Message for public and Graphical products for authenticated users | • More information, flexible  
|          |           | • Require stable Internet connection |
| Facsimile| Text Message for NTWCs and TWFPs | • Available to all MSs  
|          |           | • Relatively slower |
| Email    | Text and Graphical products for NTWCs and TWFPs | • Easily accessible  
|          |           | • Require stable Internet connection |

2 Tsunami Propagation Scenario Database and Forecast Model
2.1 Description of Tsunami Propagation Scenario Database
A tsunami propagation scenario database covering the NW Pacific and the SCS region is under development as a part of the National Funding on ‘Key Technologies on Tsunami Monitoring and Warning in the South China Sea Region’ in NMEFC/SOA, with the
objective to use preliminary earthquake parameters to retrieve pre-computed scenarios and provide an immediate forecast of nearshore tsunami amplitude. Now NWPTAC operated by JMA takes this skill as the primary approach to yield numerical guidance on tsunami advisory. The database is developed for different levels of depth (2, 20, 40, 60, 80 & 100 km) and magnitudes (6.5, 7.0, 7.5, 8.0, 8.5, 9.0) for 2010 pre-defined sources covering the main thrust faults in the NW Pacific and the SCS region. Each source is separated with a spatial interval of half a degree within the SCS region and the Ryukyu Trench, and a interval of one degree beyond the above region. The database adopts the Okada Model as the source model to calculate seismic deformation. The strike, dip angles are determined by statistically analyzing Harvard CMT catalogue, while the slip angles is set to 90 degree for conservation. The total scenarios sum up to 72360 cases.

The modeling scenario covers 5 S to 52 N latitude and 99 E to 160 E longitudes with a grid spacing 4 minutes, and simulation time length is 54000 second (15 hrs). The governing equations adopted is linear momentum equation that is not suitable for very shallow water. Hence the coastal forecast points are selected along the 10 meter isobath, and the coastal amplitude along the 1 meter isobath is scaled by Green Law. Each coastal forecast point are spaced with an interval of 12 minutes (approximately 20 km) covering the SCS rim countries. The maximum wave amplitude, ETAs at each coastal forecast point are stored in database for fast retrieval. Whenever an earthquake occurs, the closest scenarios to the event is extracted from the database and then interpolated to yield coastal amplitude forecast.

![Figure 2](image_url)

Figure 2 Tsunami-genic sources identified in the Tsunami Propagation Scenario Database

### 2.2 Description of Tsunami Forecast Model

Two sets of tsunami numerical forecasting model are in operation now in NMEFC/SOA. The first model is based on an OpenMP version of COMCOT, and the other is based on
ADCIRC running on unstructured mesh grid.

The computation domains for COMCOT include the NW Pacific and the whole Pacific with a resolution of 4 arc-minute. The linear shallow water equation was adopted as the governing equation and the minimum water depth was 10 meters. For the focal mechanism input, the initial forecast could start when earthquake location and magnitude are available, while the strike, slip and dip angles are chosen based on the Harvard Global CMT catalog in a conservative manner. As a W-phase CMT solution becomes available, the model can be run again to generate a more accurate forecast. A 15-hr forecast for the NW Pacific model domain at 4-arc-min can be obtained within 1 min, and a 30-hr forecast for the entire Pacific region can be achieved in less than 15 minutes.

The computation domain for ADCIRC now include the NW Pacific and the entire Pacific as well. The main advantages of ADCIRC are its variable mesh grid size and MPI parallel computation capability. The spatial resolution can reach up to several hundreds meters within the seismic source zones and coastal areas, while lower to tens of kilometers in the tsunami propagation stage. The initial condition based on the static seafloor deformation formula of Okada [1985] was implemented in the ADCIRC.

Figure 3 the computation domain for ADCIRC

2.3 Interpretation of Database and Model results
The uncertainties associated with the tsunami propagation scenario database and numerical models come from the CMT solution, the interpolation among neighboring scenarios, numerical modeling of propagation, as well as Green’s Law Scaling. Each uncertainty could result in large errors. For example, numerical forecast results can vary easily by a factor of two because of uncertainties in the earthquake magnitude, depth and assumed mechanism; Green’s Law is very sensitive to local topography and bathymetry, coastal amplitude could be over- or under-estimated by a factor of 2-3 depending on coastal features; wave dispersion effect is non-negligible for distant propagation of tsunami wave.
Hence, how to comprehend numerical forecasts is very important for users to recognize the tsunami threats correctly. Basically the main tsunami service provider like PTWC, NWPTAC interpret the numerical results by classifying them into several categories. The NWPTAC categorizes tsunami amplitude into ‘0.5 m; 1 m; 2 m; 3 m; 4 m; 6 m; 8 m; and Over 10 m’. In the PTWC New Enhanced Products, the coastal amplitude forecast at each forecast point is categorized into four threat levels of ‘<0.3 m; 0.3-1 m, 1-3 m and above 3 m’, which are illustrated by different colors along the coastlines.

3 Description of Products

The SCSTAC should be committed to ensuring all NTWCs and TWFPs can receive, understand and respond appropriately to tsunami advisory products. Overall, the SCS advisory products should be informative, intuitive and comprehensive, and more importantly, be compatible with PTWC’s New Enhanced products so as to minimize confusion and facilitate usage.

3.1 Definition of Geographic areas

Employing Flinn-Engdahl regionalization to name the region of epicenter.

<table>
<thead>
<tr>
<th>Southwestern Japan and Ryukyu Islands</th>
<th>Bornea – Sulawesi</th>
</tr>
</thead>
<tbody>
<tr>
<td>231 SOUTH KOREA</td>
<td>261 BORNEO</td>
</tr>
<tr>
<td>232 WESTERN HONSHU, JAPAN</td>
<td>262 CELEBES SEA</td>
</tr>
<tr>
<td>233 NEAR S. COAST OF WESTERN HONSHU</td>
<td>263 TALAUD ISLANDS, INDONESIA</td>
</tr>
<tr>
<td>234 NORTHWEST OF RYUKYU ISLANDS</td>
<td>264 NORTH OF HALMAHERA, INDONESIA</td>
</tr>
<tr>
<td>235 KYUSHU, JAPAN</td>
<td>265 MINAHASSA PENINSULA, SULAWESI</td>
</tr>
<tr>
<td>236 SHIKOKU, JAPAN</td>
<td>266 NORTHERN MOLUCCA SEA</td>
</tr>
<tr>
<td>237 SOUTHEAST OF SHIKOKU, JAPAN</td>
<td>267 HALMAHERA, INDONESIA</td>
</tr>
<tr>
<td>238 RYUKYU ISLANDS, JAPAN</td>
<td>268 SULAWESI, INDONESIA</td>
</tr>
<tr>
<td>239 SOUTHEAST OF RYUKYU ISLANDS</td>
<td>269 SOUTHERN MOLUCCA SEA</td>
</tr>
<tr>
<td>240 WEST OF BONIN ISLANDS</td>
<td>270 CERAM SEA</td>
</tr>
<tr>
<td>241 PHILIPPINE SEA</td>
<td>271 BURU, INDONESIA</td>
</tr>
<tr>
<td></td>
<td>272 SERAM, INDONESIA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Taiwan Area</th>
<th>Sunda Arc</th>
</tr>
</thead>
<tbody>
<tr>
<td>242 NEAR COAST OF SOUTHEASTERN CHINA</td>
<td>273 SOUTHWEST OF SUMATERA, INDONESIA</td>
</tr>
<tr>
<td>243 TAIWAN REGION</td>
<td>274 SOUTHERN SUMATERA, INDONESIA</td>
</tr>
<tr>
<td>244 TAIWAN</td>
<td>275 JAVA SEA</td>
</tr>
<tr>
<td>245 NORTHEAST OF TAIWAN</td>
<td>276 SUNDRA STRAIT, INDONESIA</td>
</tr>
<tr>
<td>246 SOUTHWESTERN RYUKYU ISL., JAPAN</td>
<td>277 JAVA, INDONESIA</td>
</tr>
<tr>
<td>247 SOUTHEAST OF TAIWAN</td>
<td>278 BALI SEA</td>
</tr>
<tr>
<td></td>
<td>279 FLORES SEA</td>
</tr>
<tr>
<td></td>
<td>280 BANDA SEA</td>
</tr>
<tr>
<td></td>
<td>281 TANIMBAR ISLANDS REG., INDONESIA</td>
</tr>
<tr>
<td></td>
<td>282 SOUTH OF JAVA, INDONESIA</td>
</tr>
<tr>
<td></td>
<td>283 BALI REGION, INDONESIA</td>
</tr>
<tr>
<td></td>
<td>284 SOUTH OF BALI, INDONESIA</td>
</tr>
</tbody>
</table>
### 3.2 Coastal Forecast Points

Tsunami amplitude and arrival time are provided for each coastal forecast point. These coastal forecast points should be agreed-upon points chosen by the SCSTAC and Member States. They may correspond to important coastal populated cities and locations of sea level gauges. In order to keep consistent, now most of these coastal forecast points come from PTWC and NWPTAC’s forecast points for ETAs and amplitude (refer to Appendix 2). In the tsunami threat message, all forecast points with maximum amplitude greater than 0.3 meter are listed in groups that are entitled as Member States. Tsunami amplitude estimates are extracted and interpolated from tsunami scenario database and grouped into four bins of ’<0.3 m; 0.3 to 1 m; 1 to 3 m and above 3 m’.

### 3.3 Text Message

Text message is available to the public and NTWCs. Typically a text product contains earthquake parameters, tsunamigenic potential, tsunami amplitude and ETA forecasts for each Coastal Forecast Point, tsunami observations, recommended actions. The earthquake parameters for major earthquakes should be coordinated and consistent with those of the PTWC bulletin (refer to Appendix 1 for bulletin templates).
3.4 Tsunami Energy Map
The tsunami energy map gives the color-filled distribution of maximum tsunami amplitude. Direction of tsunami energy beam and the threatened areas can be easily identified by different color scale. The contour map of Tsunami Travel Time (TTT) is shown in light-gray lines and overlapped on tsunami energy map.

3.5 Coastal Forecast Map
The coastal forecast Map gives a detailed view of tsunami threat on coasts. It divides the SCS coastlines into a number of segments. Each segment is colored according to the tsunami amplitude of the model grid points closest to the segment. Dividing the coastline into segments by administrative boundaries is encouraged since it is more meaningful and have guidance on NTWCs. The tsunami energy map is shown in gray-shading style and overlapped by contour lines of TTT.
Appendix I  Products Templates

A. Tsunami Information (NO TSUNAMI THREAT: (1) Earthquake magnitude 6.0-6.5; (2) Earthquake occurs inland; (3) Earthquake occurs at a depth of 100 km or more; (4) Minor tsunami expected for entire area with earthquake magnitude 6.6-7.0 )

A.1 TSUNAMI INFORMATION ( EARTHQUAKE MAGNITUDE 6.0-6.5)

WMO HEADING

TSUNAMI BULLETIN NUMBER 01
ISSUED BY SOUTH CHINA SEA TSUNAMI ADVISORY CENTER (SCSTAC)
ISSUED AT 1028 UTC MAY 15 2014

... TSUNAMI INFORMATION ...

[ PRELIMINARY EARTHQUAKE PARAMETERS ]
* MAGNITUDE 6.3
* ORIGIN TIME 1016 UTC MAY 15 2014
* COORDINATES 9.4°N, 122.1°E
* DEPTH 15 KM
* LOCATION SULU SEA

[ EVALUATION ]
THERE IS NO TSUNAMI THREAT FROM THIS EARTHQUAKE BASED ON PRELIMINARY EARTHQUAKE PARAMETERS.

[ RECOMMENDED ACTIONS ]
NO ACTIONS IS REQUIRED.

[ UPDATES ]
THIS WILL BE THE ONLY BULLETIN REGARDING THIS EVENT UNLESS MAJOR REVISION ON EARTHQUAKE PARAMETERS BECOME AVAILABLE OR TSUNAMI WAVES ARE CONFIRMED.

[ ADDITIONAL INFORMATION ]
* MORE DETAILED INFORMATION CAN BE FOUND AT WEBSITE WWW.SCSTAC.ORG
* TEL: +86-10-62104561
* EMAIL: TSU@NMEFC.GOV.CN

---------------------------------------------------------------END OF BULLETIN---------------------------------------------------------------
A.2 TSUNAMI INFORMATION (EARTHQUAKE OCCURS INLAND)

<table>
<thead>
<tr>
<th>WMO HEADING</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSUNAMI BULLETIN NUMBER 01</td>
</tr>
<tr>
<td>ISSUED BY SOUTH CHINA SEA TSUNAMI ADVISORY CENTER (SCSTAC)</td>
</tr>
<tr>
<td>ISSUED AT 0912 UTC JUL 10 2014</td>
</tr>
</tbody>
</table>

... TSUNAMI INFORMATION ...

[ PRELIMINARY EARTHQUAKE PARAMETERS ]
* MAGNITUDE 6.9
* ORIGIN TIME 0900 UTC JUL 10 2014
* COORDINATES 17.5°N, 121.2°E
* DEPTH 30 KM
* LOCATION LUZON, PHILIPPINES

[ EVALUATION ]
THERE IS NO TSUNAMI THREAT FROM THIS EARTHQUAKE BASED ON PRELIMINARY EARTHQUAKE PARAMETERS.

[ RECOMMENDED ACTIONS ]
NO ACTIONS IS REQUIRED.

[ UPDATES ]
THIS WILL BE THE ONLY BULLETIN REGARDING THIS EVENT UNLESS MAJOR REVISION ON EARTHQUAKE PARAMETERS BECOME AVAILABLE OR TSUNAMI WAVES ARE CONFIRMED.

[ ADDITIONAL INFORMATION ]
* MORE DETAILED INFORMATION CAN BE FOUND AT WEBSITE WWW.SCSTAC.ORG
* TSUNAMI BULLETIN REGARDING THIS EVENT MAY BE ISSUED BY PACIFIC TSUNAMI WARNING CENTER. IN CASE OF CONFLICTING INFORMATION, MORE CONSERVATIVE INFORMATION SHOULD BE ADOPTED.
* TEL: +86-10-62104561
* EMAIL: TSU@NMEFC.GOV.CN

---------------------------------------------END OF BULLETIN ---------------------------------------------
A.3 TSUNAMI INFORMATION (EARTHQUAKE OCCURS AT A DEPTH OF 100 KM OR MORE)

WMO HEADING

TSUNAMI BULLETIN NUMBER 01
ISSUED BY SOUTH CHINA SEA TSUNAMI ADVISORY CENTER (SCSTAC)
ISSUED AT 0525 UTC DEC 02 2014

... TSUNAMI INFORMATION ...

[ PRELIMINARY EARTHQUAKE PARAMETERS ]
* MAGNITUDE 6.6
* ORIGIN TIME 0511 UTC DEC 02 2014
* COORDINATES 6.2°N, 123.1°E
* DEPTH 614 KM
* LOCATION MORO GULF, PHILIPPINES

[ EVALUATION ]
THERE IS NO TSUNAMI THREAT FROM THIS EARTHQUAKE BASED ON PRELIMINARY EARTHQUAKE PARAMETERS.

[ RECOMMENDED ACTIONS ]
NO ACTIONS IS REQUIRED.

[ UPDATES ]
THIS WILL BE THE ONLY BULLETIN REGARDING THIS EVENT UNLESS MAJOR REVISION ON EARTHQUAKE PARAMETERS BECOME AVAILABLE OR TSUNAMI WAVES ARE CONFIRMED.

[ ADDITIONAL INFORMATION ]
* MORE DETAILED INFORMATION CAN BE FOUND AT WEBSITE WWW.SCSTAC.ORG
* TSUNAMI BULLETIN REGARDING THIS EVENT MAY BE ISSUED BY PACIFIC TSUNAMI WARNING CENTER. IN CASE OF CONFLICTING INFORMATION, MORE CONSERVATIVE INFORMATION SHOULD BE ADOPTED.
* TEL: +86-10-62104561
* EMAIL: TSU@NMEFC.GOV.CN

---------------------------------------------END OF BULLETIN ---------------------------------------------
A.4 TSUNAMI INFORMATION (MINOR TSUNAMI EXPECTED WITH EARTHQUAKE MAGNITUDE 6.6-7.0 )

WMO HEADING

TSUNAMI BULLETIN NUMBER 01
ISSUED BY SOUTH CHINA SEA TSUNAMI ADVISORY CENTER (SCSTAC)
ISSUED AT 1024 UTC NOV 21 2014

... TSUNAMI INFORMATION ...

[ PRELIMINARY EARTHQUAKE PARAMETERS ]
  * MAGNITUDE       6.9
  * ORIGIN TIME     1010 UTC NOV 21 2014
  * COORDINATES     2.1°N, 127.0°E
  * DEPTH           10 KM
  * LOCATION        HALMAHERA INDONESIA

[ EVALUATION ]
THERE IS NO TSUNAMI THREAT FROM THIS EARTHQUAKE BASED ON HISTORICAL EARTHQUAKE AND TSUNAMI DATA. HOWEVER, NON-DESTRUCTIVE SEA LEVEL FLUCTUATIONS MAY BE GENERATED ALONG COASTS NEAR THE EPICENTER.

[ RECOMMENDED ACTIONS ]
PERSONS ALONG COASTAL AREAS NEAR THE EPICENTER SHOULD BE AWARE OF POSSIBILITY OF MINOR TSUNAMI WAVES AND UNUSUAL CURRENT. NO OTHER ACTION IS REQUIRED.

[ UPDATES ]
THIS WILL BE THE ONLY BULLETIN REGARDING THIS EVENT UNLESS MAJOR REVISION ON EARTHQUAKE PARAMETERS BECOME AVAILABLE OR TSUNAMI WAVES ARE CONFIRMED.

[ ADDITIONAL INFORMATION ]
  * MORE DETAILED INFORMATION CAN BE FOUND AT WEBSITE WWW.SCSTAC.ORG
  * TSUNAMI BULLETIN REGARDING THIS EVENT MAY BE ISSUED BY PACIFIC TSUNAMI WARNING CENTER. IN CASE OF CONFLICTING INFORMATION, MORE CONSERVATIVE INFORMATION SHOULD BE ADOPTED.
  * TEL: +86-10-62104561
  * EMAIL: TSU@NMEFC.GOV.CN

------------------------------------------------------------------------END OF BULLETIN------------------------------------------------------------------------
A.5 TSUNAMI INFORMATION (SUPPLEMENTAL BULLETIN WITH MINOR TSUNAMI OBSERVATION)

WMO HEADING

TSUNAMI BULLETIN NUMBER 02
ISSUED BY SOUTH CHINA SEA TSUNAMI ADVISORY CENTER (SCSTAC)
ISSUED AT 1024 UTC NOV 21 2014

... TSUNAMI INFORMATION (SUPPLEMENT) ...

[ PRELIMINARY EARTHQUAKE PARAMETERS ]
* MAGNITUDE  6.9
* ORIGIN TIME  1010 UTC NOV 21 2014
* COORDINATES  2.1°N, 127.0°E
* DEPTH  10 KM
* LOCATION HALMAHERA INDONESIA

[ TSUNAMI OBSERVATIONS ]

<table>
<thead>
<tr>
<th>GAUGE NAME</th>
<th>REGION</th>
<th>COORDINATES</th>
<th>TIME (UTC)</th>
<th>MAX. AMPL</th>
</tr>
</thead>
<tbody>
<tr>
<td>BITUNG</td>
<td>INDONESIA</td>
<td>1.4°N, 125.2°E</td>
<td>1100</td>
<td>0.13 M</td>
</tr>
<tr>
<td>DAVAO</td>
<td>PHILIPPINES</td>
<td>7.1°N, 125.6°E</td>
<td>1310</td>
<td>0.08 M</td>
</tr>
</tbody>
</table>

* MAX. AMPL - TSUNAMI AMPLITUDE MEASURED RELATIVE TO NORMAL SEA LEVEL.

[ EVALUATION ]
ACCORDING TO AVAILABLE SEA LEVEL READINGS, THERE IS NO TSUNAMI THREAT FROM THIS EARTHQUAKE.
* TSUNAMI OBSERVATIONS INDICATE MINOR TSUNAMI WAVES WERE ACTUALLY GENERATED BY EARTHQUAKE. TSUNAMI AMPLITUDES MAY VARY ALONG COASTS DUE TO LOCAL FEATURES.

[ RECOMMENDED ACTIONS ]
PERSONS ALONG COASTAL AREAS NEAR THE EPICENTER SHOULD BE AWARE OF POSSIBILITY OF MINOR TSUNAMI WAVES AND UNUSUAL CURRENT. NO OTHER ACTION IS REQUIRED.

[ UPDATES ]
THIS WILL BE THE FINAL BULLETIN REGARDING THIS EVENT UNLESS FURTHER INFORMATION BECOMES AVAILABLE.

[ ADDITIONAL INFORMATION ]
* MORE DETAILED INFORMATION CAN BE FOUND AT WEBSITE WWW.SCSTAC.ORG.
* TSUNAMI BULLETIN REGARDING THIS EVENT MAY BE ISSUED BY PACIFIC TSUNAMI WARNING CENTER. IN CASE OF CONFLICTING INFORMATION, MORE CONSERVATIVE INFORMATION SHOULD BE ADOPTED.
  * TEL: +86-10-62104561
  * EMAIL: TSU@NMEFC.GOV.CN

-------------------------------------------------------------------END OF BULLETIN-------------------------------------------------------------------
B. Tsunami Threat Message (POSSIBILITY OF TSUNAMI THREAT: (1) with tsunami amplitude forecast; (2) Supplemental bulletin with revision on earthquake information or tsunami observations)

B.1 TSUNAMI THREAT MESSAGE (SUPPLEMENT WITH MAJOR REVISION)

WMO HEADING

TSUNAMI BULLETIN NUMBER 01
ISSUED BY SOUTH CHINA SEA TSUNAMI ADVISORY CENTER (SCSTAC)
ISSUED AT 0242 UTC NOV 15 2014

... POTENTIAL TSUNAMI THREAT EXISTS FOR PHILIPPINES ...

[ PRELIMINARY EARTHQUAKE PARAMETERS ]
* MAGNITUDE 7.4
* ORIGIN TIME 0232 UTC NOV 15 2014
* COORDINATES 18.4°N, 119.3°E
* DEPTH 25 KM
* LOCATION LUZON, PHILIPPINES

[ EVALUATION ]
THERE IS A POSSIBILITY OF A DESTRUCTIVE LOCAL TSUNAMI CONFINED TO 100-300 KM OF THE EPICENTER BASED ON AVAILABLE DATA AND MODEL RESULTS.

[ TSUNAMI AMPLITUDE AND ETA FORECASTS ]

<table>
<thead>
<tr>
<th>FORECAST POINT</th>
<th>COORDINATES</th>
<th>ETA(UTC)</th>
<th>MAX. AMPL</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHILIPPINES</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CURRIMAO</td>
<td>18.0°N, 120.5°E</td>
<td>0330</td>
<td>0.3-1 M</td>
</tr>
</tbody>
</table>

THERE IS NO TSUNAMI THREAT FOR CHINA, VIETNAM, CAMBODIA, THAILAND, MALAYSIA, BRUNEI, SINGAPORE, INDONESIA BASED ON THE MODEL RESULTS.

* THIS LIST IS GROUPED BY COUNTRIES, AND COUNTRY NAMES IS ORDERED ACCORDING TO THREAT LEVELS.
* ETA - ESTIMATED TSUNAMI ARRIVAL TIME FOR INITIAL WAVE. NOTING THAT IN SOME COASTAL AREA TSUNAMI WAVES MAY ARRIVE EARLIER THAN OUR ESTIMATE DUE TO COARSE BATHYMETRY USED BY MODEL.
* MAX. AMPL. - MAXIMUM WAVE HEIGHT RELATIVE TO NORMAL SEA LEVEL, WHICH ARE EXTRACTED FROM MODEL RESULTS AND GROUPED INTO FOUR BINS OF ‘<0.3 M; 0.3 TO 1 M; 1 TO 3 M and ABOVE 3 M’. NOTING THAT THE INITIAL WAVE MAY NOT NECESSARILY THE LARGEST, AND WAVE ACTIVITIES MAY VARY SIGNIFICANT ALONG COASTS DUE TO LOCAL FEATURES.
[ RECOMMENDED ACTIONS ]

* LOCAL AUTHORITIES SHOULD PAY CLOSE ATTENTION ON THEIR NATIONAL TSUNAMI WARNING CENTER’S EVALUATION ON TSUNAMI HAZARD, AND TAKE APPROPRIATE ACTIONS IN RESPONSE TO THIS POTENTIAL HAZARD.

* PERSONS LOCATED IN THREATENED COASTAL AREAS SHOULD KEEP ALERT FOR WARNING INFORMATION AND FOLLOW INSTRUCTIONS FROM LOCAL AUTHORITIES.

[ UPDATES ]

THE NEXT BULLETIN WILL BE ISSUED AS MORE INFORMATION BECOMES AVAILABLE.

[ ADDITIONAL INFORMATION ]

* MORE DETAILED INFORMATION CAN BE FOUND AT WEBSITE WWW.SCSTAC.ORG.

* TSUNAMI BULLETIN REGARDING THIS EVENT MAY BE ISSUED BY PACIFIC TSUNAMI WARNING CENTER. IN CASE OF CONFLICTING INFORMATION, MORE CONSERVATIVE INFORMATION SHOULD BE ADOPTED.

* TEL: +86-10-62104561

* EMAIL: TSU@NMEFC.GOV.CN

---------------------------------------------------------------------END OF BULLETIN---------------------------------------------------------------------
B.2 TSUNAMI THREAT MESSAGE (SUPPLEMENTAL BULLETIN WITH MAJOR REVISION ON EARTHQUAKE MAGNITUDE AND TSUNAMI FORECASTS)

1. TEXT PRODUCT

WMO HEADING

TSUNAMI BULLETIN NUMBER 02
ISSUED BY SOUTH CHINA SEA TSUNAMI ADVISORY CENTER (SCSTAC)
ISSUED AT 0248 UTC NOV 15 2014

... POTENTIAL TSUNAMI THREAT EXISTS FOR PHILIPPINES, CHINA, VIETNAM, MALAYSIA, BRUNEI...

[ PRELIMINARY EARTHQUAKE PARAMETERS (REVISION) ]

*MAGNITUDE* 8.8
*ORIGIN TIME* 0232 UTC NOV 15 2014
*COORDINATES* 18.4°N, 119.3°E
*DEPTH* 25 KM
*LOCATION* LUZON, PHILIPPINES

[ EVALUATION ]

THERE IS A POSSIBILITY OF A DESTRUCTIVE BASIN-WIDE TSUNAMI IN THE SCS BASED ON AVAILABLE DATA AND MODEL RESULTS.

[ TSUNAMI AMPLITUDE AND ETA FORECASTS (REVISION) ]

<table>
<thead>
<tr>
<th>FORECAST POINT</th>
<th>COORDINATES</th>
<th>ETA(UTC)</th>
<th>MAX. AMPL</th>
</tr>
</thead>
<tbody>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CURRIMAO</td>
<td>18.0°N, 120.5°E</td>
<td>0310</td>
<td>&gt;3 M</td>
</tr>
<tr>
<td>SUBIC_BAY</td>
<td>14.8°N, 120.3°E</td>
<td>0330</td>
<td>&gt;3 M</td>
</tr>
<tr>
<td>LUBANG</td>
<td>13.8°N, 120.2°E</td>
<td>0350</td>
<td>1-3 M</td>
</tr>
<tr>
<td>CHINA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>QINGLAN</td>
<td>19.6°N, 110.8°E</td>
<td>0435</td>
<td>&gt;3 M</td>
</tr>
<tr>
<td>SHENZHEN</td>
<td>22.5°N, 113.9°E</td>
<td>0540</td>
<td>&gt;3 M</td>
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<tr>
<td>HONG KONG, CHINA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>QUARRY_BAY</td>
<td>22.3°N, 114.3°E</td>
<td>0510</td>
<td>&gt;3 M</td>
</tr>
<tr>
<td>VIETNAM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>QUI_NHON</td>
<td>13.8°N, 109.3°E</td>
<td>0440</td>
<td>1-3 M</td>
</tr>
<tr>
<td>VUNG_TAU</td>
<td>10.3°N, 107.1°E</td>
<td>0520</td>
<td>0.3-1 M</td>
</tr>
<tr>
<td>MALAYSIA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAPAR</td>
<td>5.7°N, 115.9°E</td>
<td>0510</td>
<td>0.3-1 M</td>
</tr>
<tr>
<td>BRUNEI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JERUDONG</td>
<td>5.0°N, 114.8°E</td>
<td>0522</td>
<td>0.3-1 M</td>
</tr>
</tbody>
</table>

THERE IS NO TSUNAMI THREAT FOR CAMBODIA, THAILAND, SINGAPORE, INDONESIA BASED ON THE MODEL RESULTS.
* THIS LIST IS GROUPED BY COUNTRIES, AND COUNTRY NAMES IS ORDERED ACCORDING TO THREAT LEVELS.
* ETA - ESTIMATED TSUNAMI ARRIVAL TIME FOR INITIAL WAVE. NOTING THAT IN SOME COASTAL AREA TSUNAMI WAVES MAY ARRIVE EARLIER THAN OUR ESTIMATE DUE TO COARSE BATHYMETRY USED BY MODEL.
* MAX. AMPL. - MAXIMUM WAVE HEIGHT RELATIVE TO NORMAL SEA LEVEL, WHICH ARE EXTRACTED FROM MODEL RESULTS AND GROUPED INTO FOUR BINS OF '<0.3 M; 0.3 TO 1 M; 1 TO 3 M and ABOVE 3 M'. NOTING THAT THE INITIAL WAVE MAY NOT NECESSARILY THE LARGEST, AND WAVE ACTIVITIES MAY VARY SIGNIFICANT ALONG COASTS DUE TO LOCAL FEATURES.

[ RECOMMENDED ACTIONS ]
* LOCAL AUTHORITIES SHOULD PAY CLOSE ATTENTION ON THEIR NATIONAL TSUNAMI WARNING CENTER'S EVALUATION ON TSUNAMI HAZARD, AND TAKE APPROPRIATE ACTIONS IN RESPONSE TO THIS POTENTIAL HAZARD.
* PERSONS LOCATED IN THREATENED COASTAL AREAS SHOULD KEEP ALERT FOR WARNING INFORMATION AND FOLLOW INSTRUCTIONS FROM LOCAL AUTHORITIES.

[ UPDATES ]
THE NEXT BULLETIN WILL BE ISSUED AS MORE INFORMATION BECOMES AVAILABLE.

[ ADDITIONAL INFORMATION ]
* MORE DETAILED INFORMATION CAN BE FOUND AT WEBSITE WWW.SCSTAC.ORG.
* TSUNAMI BULLETIN REGARDING THIS EVENT MAY BE ISSUED BY PACIFIC TSUNAMI WARNING CENTER. IN CASE OF CONFLICTING INFORMATION, MORE CONSERVATIVE INFORMATION SHOULD BE ADOPTED.
* TEL: +86-10-62104561
* EMAIL: TSU@NMEFC.GOV.CN

---------------------------------------------------------------END OF BULLETIN---------------------------------------------------------------
2. TSUNAMI ENERGY MAP

SCSTAC Tsunami Maximum Amplitude

This map should not be used to estimate coastal tsunami amplitudes or impacts. Deep-ocean amplitudes are usually much smaller than coastal amplitudes.

Earthquake

Time: 2014/06/09
22:21:02
Lat: 18.4
Lon: 119.3
Depth: 25 km
Mw: 8.8

Earthquake Mechanism:

Maximum Amplitude (m)

- 19.10
- 1.00
- 0.75
- 0.50
- 0.25
- 0.10
- 0.05
- 0.01
- 0.00
3. COASTAL TSUNAMI AMPLITUDE MAP

SCSTAC Coastal Tsunami Maximum Amplitude

Actual amplitudes at the coast may vary from forecast amplitudes due to uncertainties in the forecast and local features.
B.3 TSUNAMI THREAT MESSAGE (SUPPLEMENTAL BULLETIN WITH TSUNAMI OBSERVATIONS REPORTED)

WMO HEADING

TSUNAMI BULLETIN NUMBER 03
ISSUED BY SOUTH CHINA SEA TSUNAMI ADVISORY CENTER (SCSTAC)
ISSUED AT 0450 UTC NOV 15 2014

... POTENTIAL TSUNAMI THREAT EXISTS FOR PHILIPPINES, CHINA, VIETNAM, MALAYSIA, BRUNEI...

[ PRELIMINARY EARTHQUAKE PARAMETERS ]
* MAGNITUDE 8.8
* ORIGIN TIME 0232 UTC NOV 15 2014
* COORDINATES 18.4°N, 119.3°E
* DEPTH 25 KM
* LOCATION LUZON, PHILIPPINES

[ TSUNAMI OBSERVATIONS ]
GAUGE NAME REGION COORDINATES TIME(UTC) MAX. AMPL
CURRIMAO PHILIPPINES 18.0°N, 120.5°E 0313 6.9 M
SUBIC_BAY PHILIPPINES 14.8°N, 120.3°E 0330 4.2 M
QINGLAN CHINA 19.6°N, 110.8°E 0445 3.2 M
QUI_NHON VIETNAM 13.8°N, 109.3°E 0435 2.0 M

* MAX. AMPL - TSUNAMI AMPLITUDE MEASURED RELATIVE TO NORMAL SEA LEVEL

[ EVALUATION ]
THERE IS A POSSIBILITY OF A DESTRUCTIVE BASIN-WIDE TSUNAMI IN THE SCS BASED ON AVAILABLE DATA AND MODEL RESULTS.

[ TSUNAMI AMPLITUDE AND ETA FORECASTS (REVISION) ]
FORECAST POINT COORDINATES ETA(UTC) MAX. AMPL
---------------------------------------------
CHINA
SHENZHEN 22.5°N, 113.9°E 0540 1-3 M
HONG KONG, CHINA
QUARRY_BAY 22.3°N, 114.3°E 0510 >3 M
VIETNAM
VUNG_TAU 10.3°N, 107.1°E 0520 0.3-1 M
MALAYSIA
PAPAR 5.7°N, 115.9°E 0510 0.3-1 M
BRUNEI
JERUDONG 5.0°N, 114.8°E 0522 0.3-1 M
THERE IS NO TSUNAMI THREAT FOR CAMBODIA, THAILAND, SINGAPORE, INDONESIA BASED ON THE MODEL RESULTS.
---------------------------------------------
* THIS LIST IS GROUPED BY COUNTRIES, AND COUNTRY NAMES IS ORDERED ACCORDING TO THREAT LEVELS.
* ETA - ESTIMATED TSUNAMI ARRIVAL TIME FOR INITIAL WAVE. NOTING THAT IN SOME COASTAL AREA TSUNAMI WAVES MAY ARRIVE EARLIER THAN OUR ESTIMATE DUE TO COARSE BATHYMETRY USED BY MODEL.
* MAX. AMPL. - MAXIMUM WAVE HEIGHT RELATIVE TO NORMAL SEA LEVEL, WHICH ARE EXTRACTED FROM MODEL RESULTS AND GROUPED INTO FOUR BINS OF ‘<0.3 M; 0.3 TO 1 M; 1 TO 3 M and ABOVE 3 M’. NOTING THAT THE INITIAL WAVE MAY NOT NECESSARILY THE LARGEST, AND WAVE ACTIVITIES MAY VARY SIGNIFICANT ALONG COASTS DUE TO LOCAL FEATURES.

[ RECOMMENDED ACTIONS ]
* LOCAL AUTHORITIES SHOULD PAY CLOSE ATTENTION ON THEIR NATIONAL TSUNAMI WARNING CENTER’S EVALUATION ON TSUNAMI HAZARD, AND TAKE APPROPRIATE ACTIONS IN RESPONSE TO THIS POTENTIAL HAZARD.
* PERSONS LOCATED IN THREATENED COASTAL AREAS SHOULD KEEP ALERT FOR WARNING INFORMATION AND FOLLOW INSTRUCTIONS FROM LOCAL AUTHORITIES.

[ UPDATES ]
THE NEXT BULLETIN WILL BE ISSUED AS MORE INFORMATION BECOMES AVAILABLE.

[ ADDITIONAL INFORMATION ]
* MORE DETAILED INFORMATION CAN BE FOUND AT WEBSITE WWW.SCSTAC.ORG.
* TSUNAMI BULLETIN REGARDING THIS EVENT MAY BE ISSUED BY PACIFIC TSUNAMI WARNING CENTER. IN CASE OF CONFLICTING INFORMATION, MORE CONSERVATIVE INFORMATION SHOULD BE ADOPTED.
* TEL: +86-10-62104561
* EMAIL: TSU@NMEFC.GOV.CN

------------------------------------------------------------------------------------------------------------------END OF BULLETIN------------------------------------------------------------------------------------------------------------------
C. Final bulletin (Tsunami not confirmed by observations; Tsunami threat has passed)

C.1 FINAL BULLETIN (TSUNAMI NOT CONFIRMED BY OBSERVATIONS)

WMO HEADING

TSUNAMI BULLETIN NUMBER 02
ISSUED BY SOUTH CHINA SEA TSUNAMI ADVISORY CENTER (SCSTAC)
ISSUED AT 0350 UTC NOV 15 2014

... TSUNAMI THREAT NOT CONFIRMED...

[ PRELIMINARY EARTHQUAKE PARAMETERS ]
* MAGNITUDE 7.4
* ORIGIN TIME 0232 UTC NOV 15 2014
* COORDINATES 18.4°N, 119.3°E
* DEPTH 25 KM
* LOCATION LUZON, PHILIPPINES

[ EVALUATION ]
NO EVIDENCE SHOWED A DESTRUCTIVE TSUNAMI ACTUALLY OCCURRED BASED ON ALL AVAILABLE INFORMATION.

[ RECOMMENDED ACTIONS ]
* LOCAL AUTHORITIES MAY ASSUME NO TSUNAMI THREAT EXISTS WHEN NO OBVIOUS SEA LEVEL FLUCTUATION OBSERVED FOR TWO HOURS AFTER THE ESTIMATED TIME OF ARRIVAL.
* PERSONS LOCATED IN THREATENED COASTAL AREAS SHOULD KEEP ALERT FOR WARNING INFORMATION AND FOLLOW INSTRUCTIONS FROM LOCAL AUTHORITIES.

[ UPDATES ]
THIS WILL BE THE FINAL BULLETIN REGARDING THIS EVENT UNLESS ADDITIONAL INFORMATION BECOMESAVAILABLE..

[ ADDITIONAL INFORMATION ]
* MORE DETAILED INFORMATION CAN BE FOUND AT WEBSITE WWW.SCSTAC.ORG.
* TSUNAMI BULLETIN REGARDING THIS EVENT MAY BE ISSUED BY PACIFIC TSUNAMI WARNING CENTER. IN CASE OF CONFLICTING INFORMATION, MORE CONSERVATIVE INFORMATION SHOULD BE ADOPTED.
* TEL: +86-10-62104561
* EMAIL: TSU@NMEFC.GOV.CN

------------------------------------------------------------------------END OF BULLETIN------------------------------------------------------------------------
C.2 FINAL BULLETIN (TSUNAMI THREAT HAS PASSED)

WMO HEADING

TSUNAMI BULLETIN NUMBER 04
ISSUED BY SOUTH CHINA SEA TSUNAMI ADVISORY CENTER (SCSTAC)
ISSUED AT 1250 UTC NOV 15 2014

... TSUNAMI THREAT HAS PASSED...

[ PRELIMINARY EARTHQUAKE PARAMETERS ]
* MAGNITUDE 8.8
* ORIGIN TIME 0232 UTC NOV 15 2014
* COORDINATES 18.4°N, 119.3°E
* DEPTH 25 KM
* LOCATION LUZON, PHILIPPINES

[ EVALUATION ]
BASED ON ALL AVAILABLE DATA, TSUNAMI THREAT NO LONGER EXISTS. HOWEVER, DUE TO LOCAL FEATURES MINOR SEA LEVEL FLUCTUATIONS MAY CONTINUE FOR HOURS.

[ RECOMMENDED ACTIONS ]
* LOCAL AUTHORITIES MAY ASSUME NO TSUNAMI THREAT EXISTS WHEN NO OBVIOUS SEA LEVEL FLUCTUATION OBSERVED FOR TWO HOURS AFTER THE ESTIMATED TIME OF ARRIVAL OR HAZARDOUS WAVES HAVE NOT OCCURED FOR AT LEAST TWO HOURS.
* PERSONS LOCATED IN THREATENED COASTAL AREAS SHOULD KEEP ALERT FOR WARNING INFORMATION AND FOLLOW INSTRUCTIONS FROM LOCAL AUTHORITIES.

[ UPDATES ]
THIS WILL BE THE FINAL BULLETIN REGARDING THIS EVENT UNLESS ADDITIONAL INFORMATION BECOMES AVAILABLE.

[ ADDITIONAL INFORMATION ]
* MORE DETAILED INFORMATION CAN BE FOUND AT WEBSITE WWW.SCSTAC.ORG.
* TSUNAMI BULLETIN REGARDING THIS EVENT MAY BE ISSUED BY PACIFIC TSUNAMI WARNING CENTER. IN CASE OF CONFLICTING INFORMATION, MORE CONSERVATIVE INFORMATION SHOULD BE ADOPTED.
* TEL: +86-10-62104561
* EMAIL: TSU@NMEFC.GOV.CN
---------------------------------------------END OF BULLETIN---------------------------------------------
## Appendix II  List of Coastal Forecasting Points for ETAs and Amplitudes

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>LOCATION</th>
<th>LATITUDE</th>
<th>LONGITUDE</th>
</tr>
</thead>
<tbody>
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<td>MUARA</td>
<td>5.0°N</td>
<td>115.1°E</td>
</tr>
<tr>
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<tr>
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<td>SANYA</td>
<td>18.2°N</td>
<td>109.5°E</td>
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<td>114.2°E</td>
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<td>21.5°N</td>
<td>111.8°E</td>
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<td>1.0°N</td>
<td>109.0°E</td>
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<td>TANJUNG_IONG</td>
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<td>SUBIC_BAY</td>
<td>14.82°N</td>
<td>120.3°E</td>
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<td>CURRIMAO</td>
<td>18.0°N</td>
<td>120.4°E</td>
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<td>120.3°E</td>
</tr>
<tr>
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<td>MANILA</td>
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<td>121.0°E</td>
</tr>
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<td>ILOILO</td>
<td>10.7°N</td>
<td>122.5°E</td>
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<td>7.0°N</td>
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<td>PHILIPPINES</td>
<td>MAIMBUNG</td>
<td>5.9°N</td>
<td>121.0°E</td>
</tr>
<tr>
<td>PHILIPPINES</td>
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<td>125.2°E</td>
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<td>Longitude</td>
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<tr>
<td>TAIWAN</td>
<td>KAOHSIUNG</td>
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<td>120.3°E</td>
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