Preliminary Simulations of 1986 & 2002 Taiwan Hualien Tsunami

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Part 1: 1986 Taiwan Hualien Tsunami

Earthquake Information

Date: November 14, 1986
Magnitude: 6.3 (Harvard CMT)

<table>
<thead>
<tr>
<th>Table Fault Parameters of 1986 Hualien Earthquake</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focal depth (km)</td>
</tr>
<tr>
<td>Length of Source Area (km)</td>
</tr>
<tr>
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</tr>
<tr>
<td>(Strike, dip, slip)</td>
</tr>
<tr>
<td>Dislocation (meter)</td>
</tr>
<tr>
<td>Epicenter (longitude, latitude)</td>
</tr>
</tbody>
</table>

Initial Displacement

The seafloor displacement is evaluated by Mansinha and Smylie’s elastic finite fault plane theory (1971).


Maximum amplitude: 1.006m, minimum amplitude: -0.153m
Simulated Region

Totally, three coupled grids were implemented to simulate this tsunami; the simulated
regions are shown in the following figures.

**Region 1:**
- Range: (121.286E, 23.142N) to (122.95E, 24.93N)
- Dimension: (205*220), Mesh size: 0.49min, Time step: 1.0sec
- Spherical Coordinates and Linear shallow-water equations

Figure Region 1

**Region 2, covering the East region of Hua-lien area:**
- Range: (121.5E, 23.75N) to (122.30E, 24.28N)
- Dimension: (495*340), Mesh size: 150m, Time step: 0.5sec
- Cartesian Coordinates and Linear shallow-water equations

Figure Region 2
Region 3, covering the Hua-lien harbor:
Range: (121.589E, 23.935N) to (121.643E, 24.017N)
Dimension: (190*270), Mesh size: 30m, Time step: 0.25sec
Cartesian Coordinates and Nonlinear shallow-water equations with Moving boundary.
Numerical Results

Figure Maximum Wave Amplitude along Shoreline
Comparisons with Gage records detailed analysis are available in *Computer Programs for Tsunami Propagation and Inundation* by Philip L.-F. Liu, Seung-Buhm Woo and Yong-Sik Cho (1998).
Part 2: 2002 Hualien Tsunami

Earthquake Information:
Time: 6:53:00 (UTC) on March 31, 2002
Magnitude: 7.1 (Harvard CMT)

Table Fault Parameters of 2002 Hualien Earthquake

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focal depth (km)</td>
<td>31.0</td>
</tr>
<tr>
<td>Length of Source Area (km)</td>
<td>50.0</td>
</tr>
<tr>
<td>(Strike, dip, slip)</td>
<td>(280.0, 56.0, 97.0)</td>
</tr>
<tr>
<td>Dislocation (meter)</td>
<td>1.5</td>
</tr>
<tr>
<td>Epicenter (longitude, latitude)</td>
<td>(122.17E, 24.24N)</td>
</tr>
</tbody>
</table>

Initial Displacement

Maximum amplitude: 0.24m, minimum amplitude: -0.03m

Figure Contours of Initial Displacement
Simulated Region

Range: Lower-left Corner (121.0E, 21.5N) to upper-right corner (126.0E, 26.0N)
Grid size: 900m, Time step: 1.0sec
Spherical Coordinates, and Linear shallow-water equations
Numerical Results

Figure Gage Record at ChengKung Station is overlaid with Numerical Result