Lessons from Recent Tsunami Events

Camana, Peru June 2001
Most tsunami deaths are caused by sources nearby:

<table>
<thead>
<tr>
<th>Decade</th>
<th>number tsunami events</th>
<th>number distant tsunami</th>
<th>number runup &gt;1 meter</th>
<th>deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>130</td>
<td>5</td>
<td>37</td>
<td>2306</td>
</tr>
<tr>
<td>1970</td>
<td>108</td>
<td>0</td>
<td>33</td>
<td>9347</td>
</tr>
<tr>
<td>1980</td>
<td>73</td>
<td>0</td>
<td>11</td>
<td>177</td>
</tr>
<tr>
<td>1990</td>
<td>98</td>
<td>1</td>
<td>30</td>
<td>4263</td>
</tr>
<tr>
<td>2000 - 2003</td>
<td>21</td>
<td>0</td>
<td>11</td>
<td>80</td>
</tr>
</tbody>
</table>

Source: National Geophysical Data Center

Over 98% of casualties since 1960 are from near source locations.
Since 1990:

119 tsunamis observed
23 tsunamis have caused damage
At least 13 have caused deaths
International Tsunami Survey Teams ITST
Mapping inundation

La Punta

- Sand deposited on 3rd floor stairs
- Peak wave height: 7 meters
- Stagnant water line
- Roof gone
- Roof intact
- Ground surface
- Ambient sea level

Elevation (meters):
0 2 4 6 8

Debris & trash
July 17, 7:00 PM local time
Magnitude 7.1
The Papua New Guinea Tsunami produced very high waves that affected only 40 miles of coast - the signature of a landslide-caused tsunami.
What is the lesson for California from the Papua New Guinea tsunami?

Submarine landslides can occur here too!
Evidence for landslides off of Palos Verdes

Numerical simulation for a Palos Verdes landslide