

# “Earthquake and Tsunami Disaster Mitigation Research in Colombia”

International Symposium on Earthquake and Tsunami Disaster  
Mitigation in Latin America

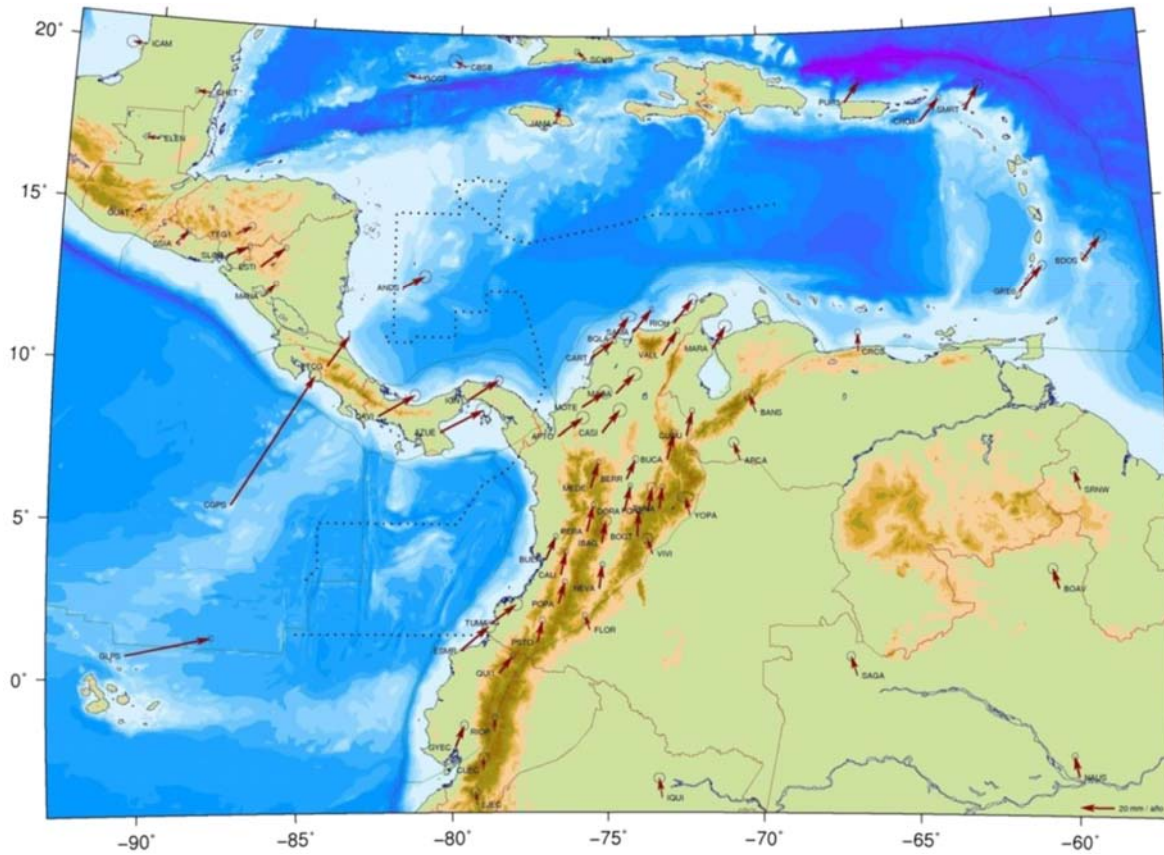
Tokyo - March 7, 2014



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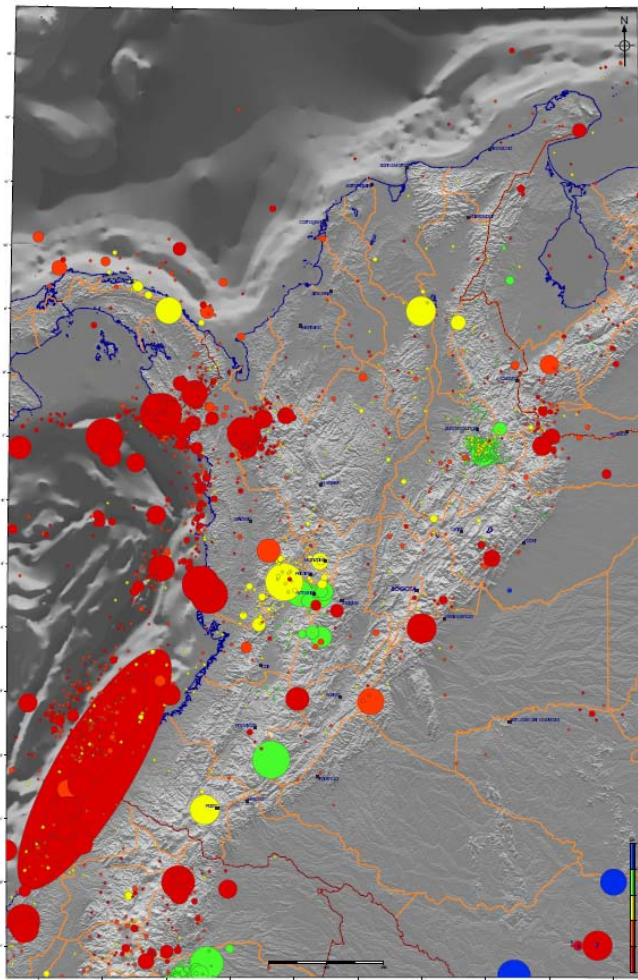
Velocity determined with SIRGAS-CON GPS permanent stations, which in Colombia is operated and processed by the Instituto Geográfico Agustín Codazzi (IGAC).  
*SIR11P01 in ITRF08, 2005.0 epoch*



## ADVANCES IN COLOMBIA

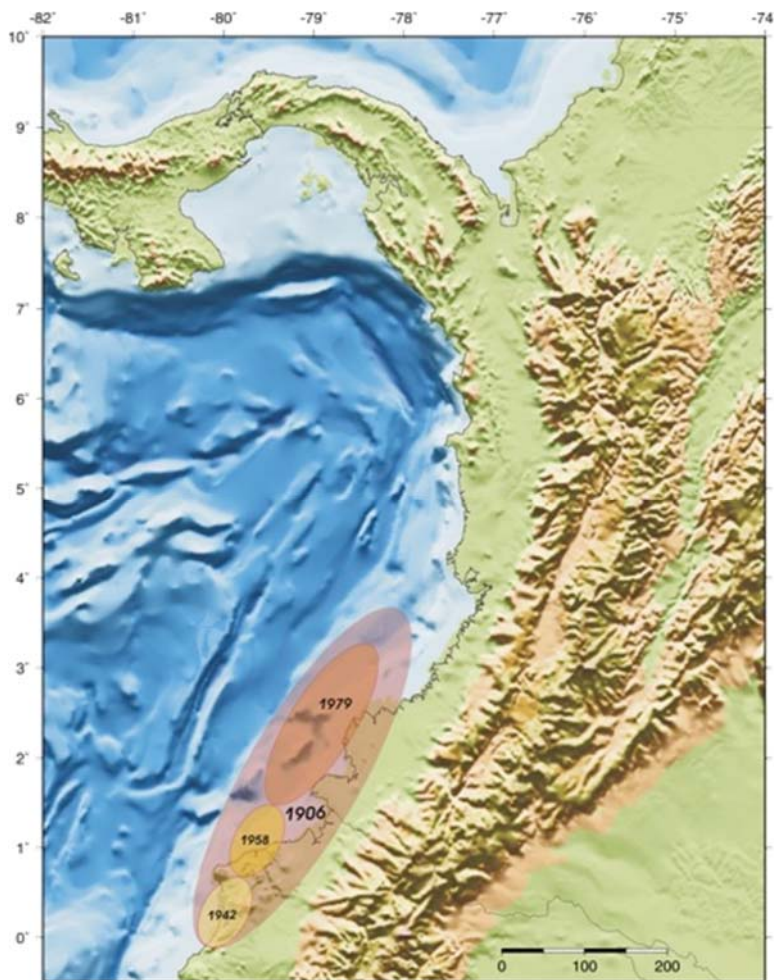


Tsunami Warning Focal Point (TWFP): Now OSSO /soon DIMAR  
 Tsunami National Contact (TNC): Colombian Ocean Commission



Seismicity from global networks  
(1900 - 2013)

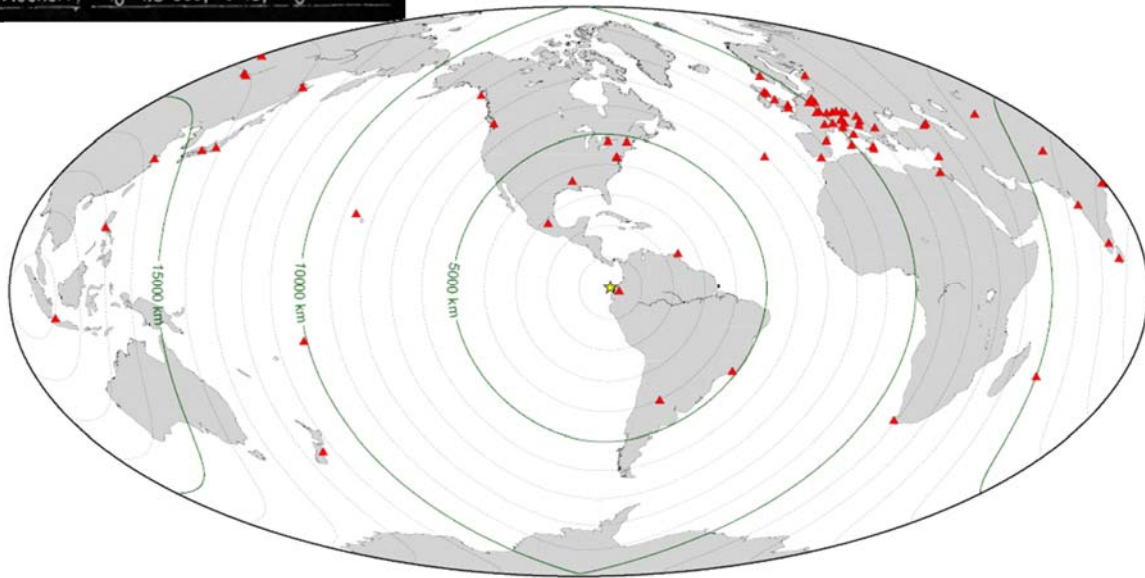
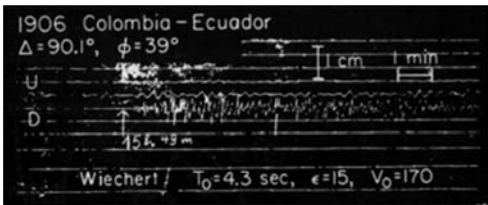
The size of the circles is proportional to the elastic energy released by the quake. The red circles represent earthquakes of shallow depth, yellow and green intermediate event, and blue deep earthquakes



## MAJOR EARTHQUAKES

In the Southern segment of subduction zone, the 1906 and 1979 earthquakes ( $M_w \geq 8,0$ ) were generated, which caused the tsunamis which affected mainly the town of Tumaco, located in the Pacific coast of Nariño





*Location of the earthquake of January 31, 1906 (Mw = 8.8), and global stations that recorded*

The 1906 earthquake, with magnitude Mw = 8.8 and shallow depth, was located in the Pacific Ocean off the northern coast of Ecuador. According to observations of witnesses, produced several waves with heights between 2 and 5 m and hit the coast between Bajo Baudo (Chocó) in the North, and Esmeraldas (Ecuador) to the south.



**El Charco - Nariño (Fotografía Diario El Tiempo)**



**Hotel Americano – Tumaco (Fotografía Diario El Tiempo)**

**Avenida La Playa – Tumaco (Fotografía Diario El Tiempo)**

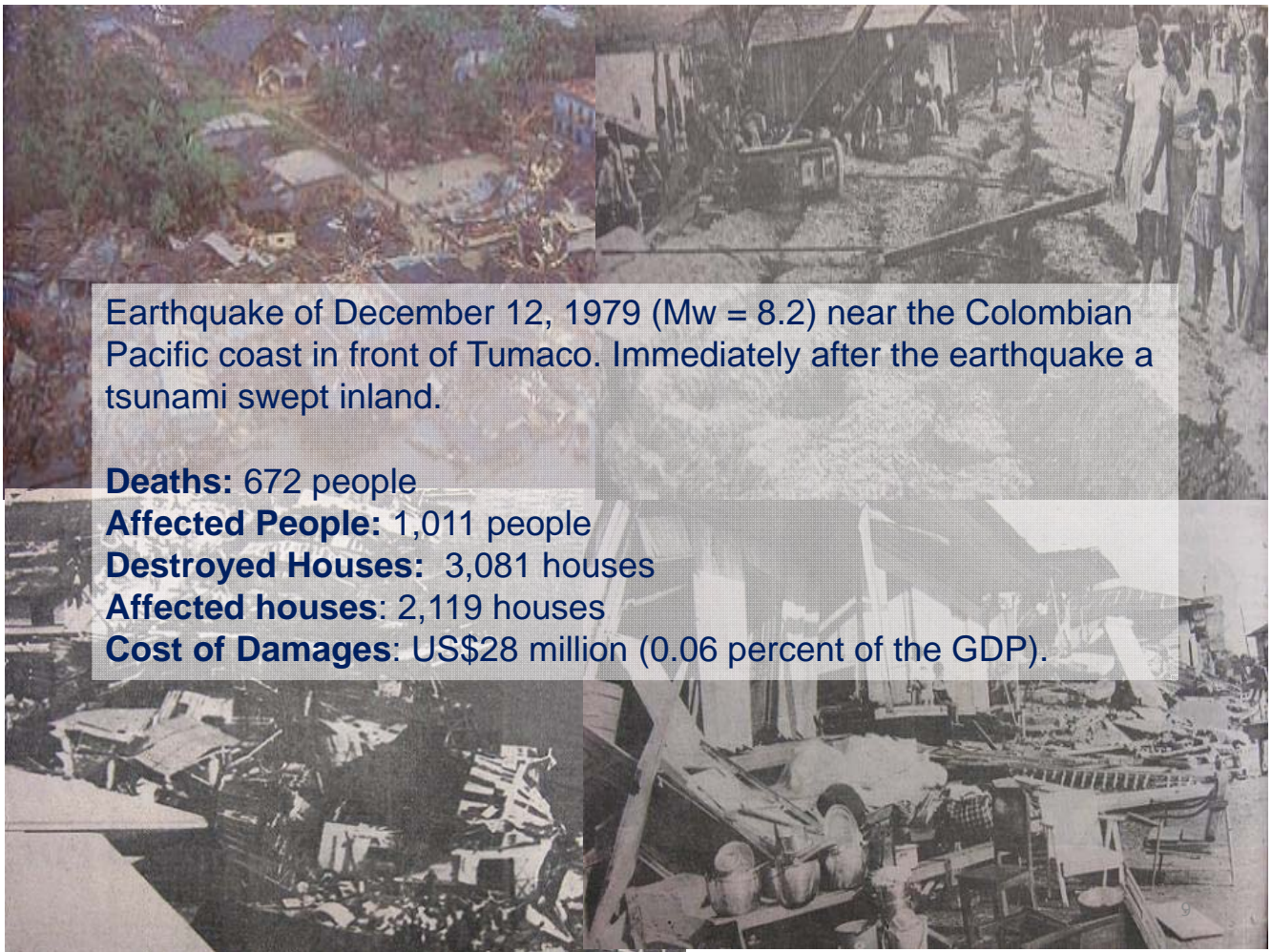


**Tumaco (Fotografía Diario El Tiempo)**



**Earthquake December 12, 1979**





Earthquake of December 12, 1979 (Mw = 8.2) near the Colombian Pacific coast in front of Tumaco. Immediately after the earthquake a tsunami swept inland.

**Deaths:** 672 people

**Affected People:** 1,011 people

**Destroyed Houses:** 3,081 houses

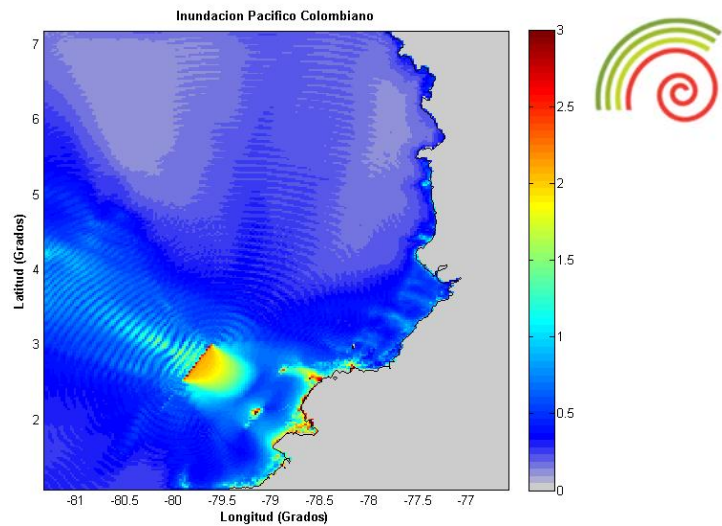
**Affected houses:** 2,119 houses

**Cost of Damages:** US\$28 million (0.06 percent of the GDP).



Simulacro binacional de tsunami  
(Colombia y Ecuador)

- █ Grave amenaza en tierra (2 - 5 m)
- █ Amenaza en tierra (< 2 m)



## TSUNAMI IN COLOMBIA

- The Pacific region is exposed to high seismic hazard associated with the Pacific subduction zone, the seismic source with the ability to release the greatest amounts of energy in the country.
- The Caribbean region, is much less exposed because it does not have the capability of generating earthquakes as large as those that can be generated in the Pacific





## Tsunami 1979



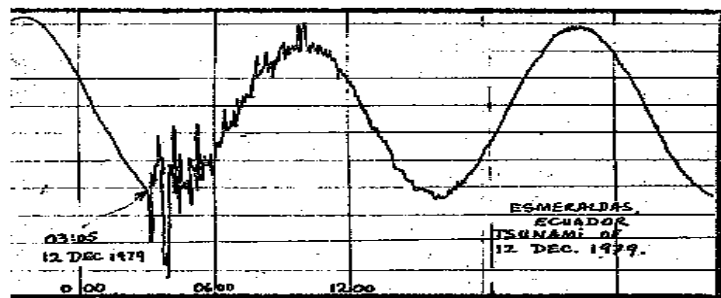
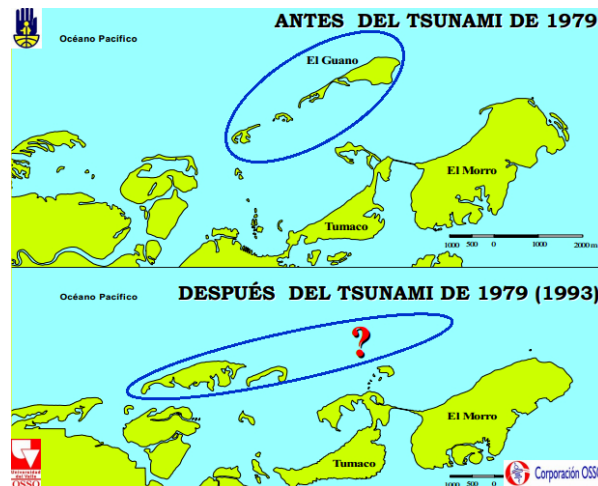
San Juan de la Costa (OSSO, 1979)



Tumaco, (Occidente, 1979)



(Pararas-Carayannis, 1979)



## PORTS AND CITIES EXPOSED TO TSUNAMI IN COLOMBIA

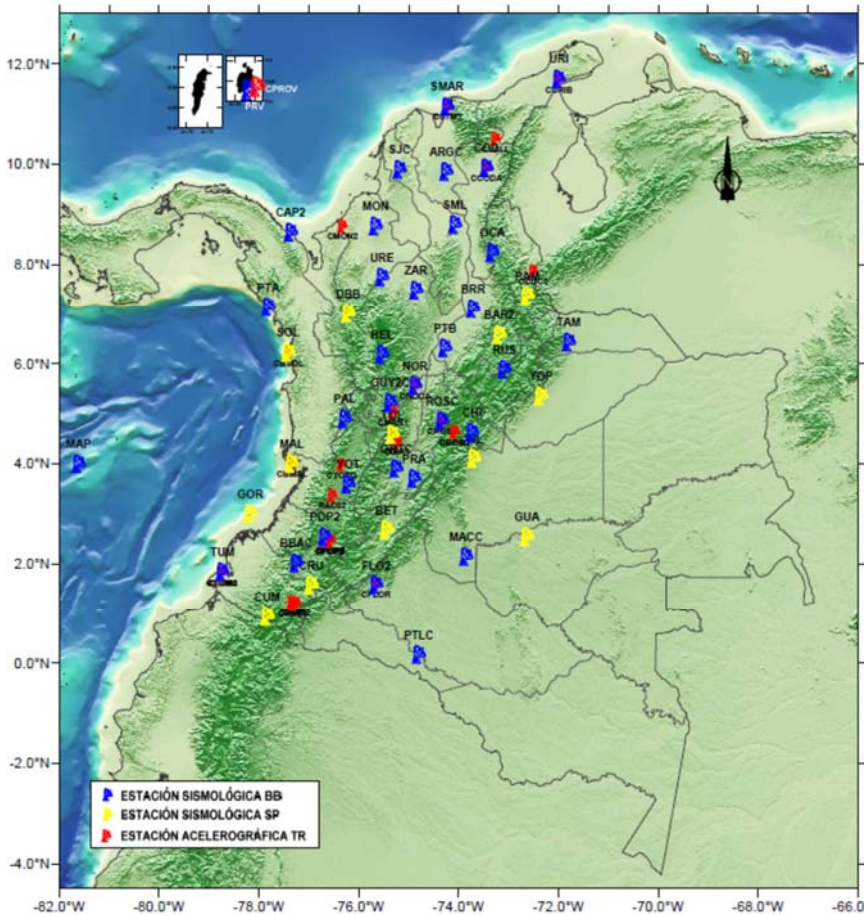
- ❑ 1,300 km of longitude in the Pacific coast is exposed to tsunami hazard.
- ❑ A million people in high level of exposure to tsunami:
  - Buenaventura (500,000 inhabitants) and Tumaco (200,000 inhabitants)
- ❑ Two major ports:
  - Buenaventura and Tumaco



## KNOWLEDGE AND WARNING

### Colombian Geological Survey National Seismic Network

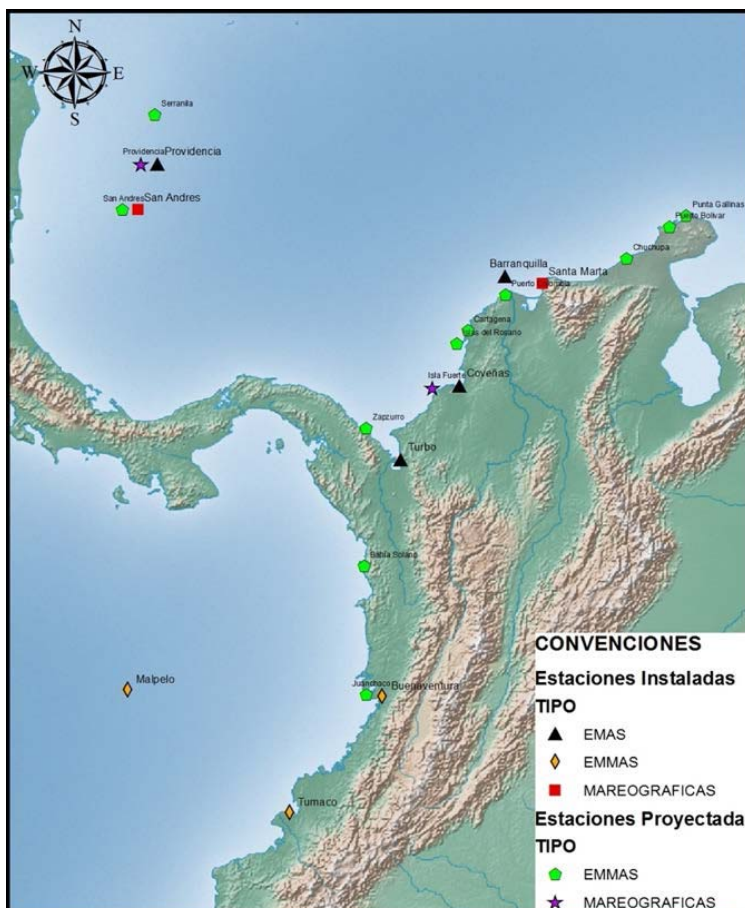
In 2013 we have 38 broadband seismic stations, 13 short period seismic stations and 26 accelerographic stations with real time transmission



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## General Maritime Directorate



Tsunami Warning Center Bogota

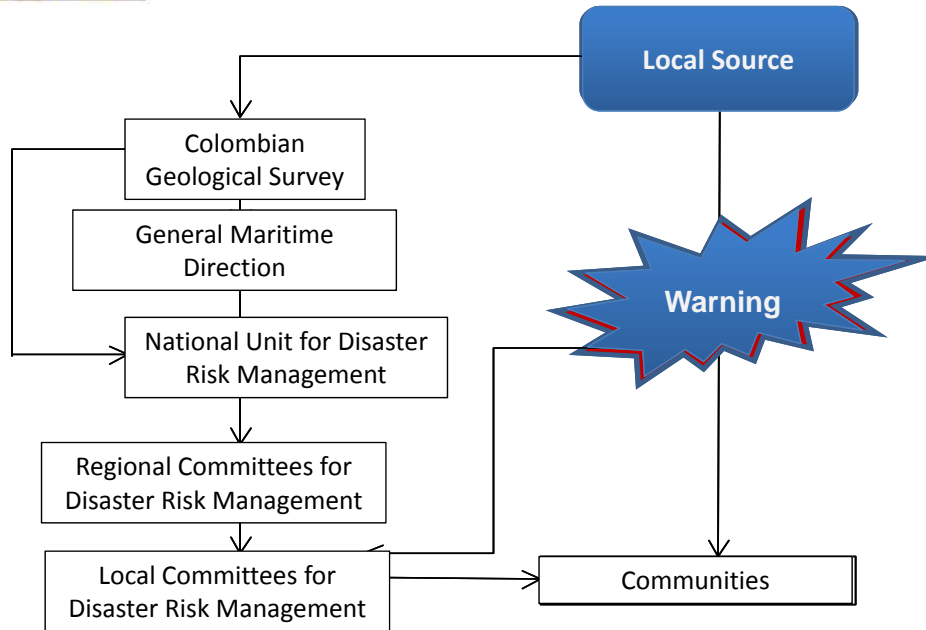
Mareographic stations, 2013





## NEAR-SOURCE TSUNAMIS

### NATIONAL PLAN FOR TSUNAMI RISK MANAGEMENT

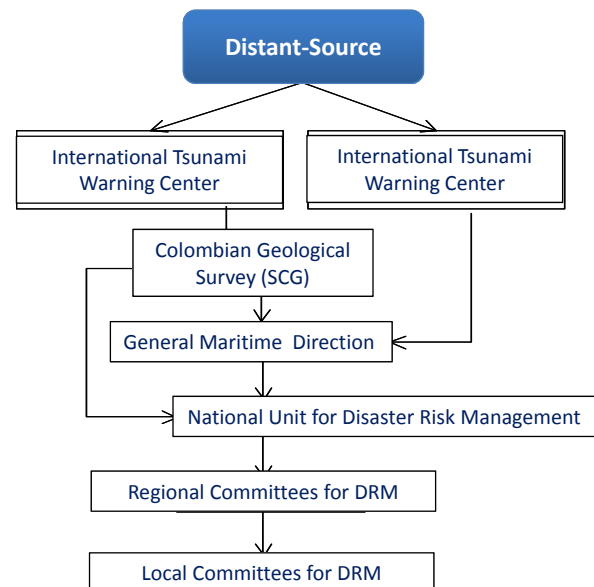


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## FAR-SOURCE TSUNAMIS

### NATIONAL PLAN FOR TSUNAMI RISK MANAGEMENT



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**Thanks!**

