

A recommendation for improvement of the Seismic Sea - Wave Warning System

Recommendation No. 7

Tsunami Research Group

Addition of Field Office on Atlantic Ocean

by

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## Addition of Field Office on Atlantic Ocean

### Part 1: Current Policy

The Seismic Sea-Wave Warning System now serves only the Pacific Ocean. This limitation of the warning system is based on the high seismicity of the rim of the Pacific Ocean and on the numerous tsunamis which have occurred in the Pacific Ocean.

The number and size of tsunamis in the Atlantic Ocean is not widely known.

### Part 2: Idealized Example

Tsunamis in the Atlantic Ocean are generally assumed to be so rare and of such small amplitude as to not constitute a hazard.

### Part 3: Desired Feature

There have been sizable tsunamis recorded in the Atlantic Ocean. A listing is attached as Table 1.

It is recommended that a regional service be instituted for the Atlantic Ocean. The density of seismograph stations in Europe and the United States, the numerous tide gages along the coastlines, and the high quality communications systems available should make this system easy to institute and easily operable using only variable costs (i.e., marginal costs).

### Part 4: Suggested Procedure for Installation

An Atlantic region should be arranged, using the existing rules of the SSWWS for admission of participants and for services rendered. Existing seismograph observatories and tide gages should be utilized. The



communication network should be a time-sharing of existing measuring and communicating systems. As in the Pacific SSWWS, testing of the system should be conducted. Possibly this regional center could be tied into an existing hazards-warning center such as for hurricanes.

Research conducted for the improvement of the Pacific SSWWS might also be applicable to such a system in the Atlantic.

#### Part 5: References

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3. Svyatlovski, E. A., 1961, Tsunamis, destructive waves originating  
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of the Academy of Science USSR, Moscow, 1957, pp. 15-22.



Table 1: List of the Atlantic Tsunamis

<u>Date</u>	<u>Place</u>	<u>Data</u>
1. 1591 Jul. 26	Azores, St. Michael	Sea greatly agitated.
2. 1641 Dec. 21	Azores, San Jorge	At noon, three waves overran the port of San Jorge; a convent and several houses were destroyed. 50 victims.
3. 1653 - -	Azores, island of Terceira	Tsunami destroyed a large part of the coastal fortification of the island of Terceira.
4. 1668 Nov. 23	Azores, San Jorge	The sea penetrated into the village of Calheta, San Jorge, causing havoc. A number of houses were destroyed.
5. 1676 - -	Azores, island of Terceira	Tsunami destroyed a convent of nuns at Paria, island of Terceira. The site of this convent is now below the water of the Bay of Paria, as a result of the progressive settling of this part of the coast.

For the 1676 earthquake a large tsunami was observed throughout the Azores and its time of arrival was 10:00 local time. At Faial, time of arrival was 10:30 with epicenter of earthquake near the Gulf of Cadiz. It took from 2 to 2-1/2 hours to reach the Azores at speeds of 350 to 450 miles per hour. At Praca Velha, a place situated 300 meters inland, the sea rose to a height of 15 meters.

At Praia (Terceira) the sea rose in three successive waves with fairly long intervals between. Fifteen houses were destroyed. At the port of Juden (Terceira) the wave height was 2 meters.

At Horta (Faial) the sea rose suddenly, then dropped three times with increasing violence. Wave height was 1.8 meters.



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| 6.  | 1692 June 7  | Jamaica   | Large wave on north coast. Sea retired and returned at Liganee.  |
| 7.  | 1722 Dec. 27 | Portugal, Villanova and all south coast from Cape   | Sea was agitated.  |
| 8.  | 1751 Oct. 18 | Santo Domingo Azua (south coast)                    | Overwhelmed by a great sea wave. Damage at city of Santo Domingo.  |
| 9.  | 1755 Nov. 1  | Portugal, Lisbon                                    | Waves 4.6 to 26 m high along Portuguese and Spanish coasts (26 m high in Lisbon, 20 m high at Cadiz), 4.6 m at Madeira. Very high at Cadiz, where 18 waves rolled in. Noted at several places in West Indies with maximum height of 6.4 m. |
| 10. | 1757 July 9  | Azores, San Jorge                                   | Large earthquake destroyed several villages in San Jorge. Sea was violently agitated and came in at St. George Island, the Pio, and Graciosa. Also considerable at Terceira.   |
| 11. | 1761 Mar. 31 | Portugal, Lisbon                                    | Sea rose 2.4 m and flowed in and out. Waves 1.8 m at Cornwall, England. Noted at Madeira, Azores, and Barbados.  |
| 12. | 1770 June 3  | Haiti   | Sea wave in the Gulf of Gonaive. Foot of La Saline mountain was partly submerged.  |
| 13. | 1775 - -     | Haiti   | Great damage done by sea wave following three earthquake shocks.   |
|     | (1780 Oct. 3 | Jamaica, Savanna la Mar                             | Great wave caused by hurricane was definitely not seismic.)  |
| 14. | 1787 - -     | Azores  | Sea inundated shore.   |
| 15. | 1792 Jan. 23 | Azores, San Jorge                                   | Tsunami at Velas (San Jorge) caused serious damage.  |
| 16. | 1802 Mar. 19 | Antigua, St. Christopher, other West Indian Islands | Great agitation of the sea.  |
| 17. | 1823 Nov. 30 | Martinique, St. Pierre                              | A very high tide accompanying an earthquake caused damage in harbor.   |



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| 18. | 1842 May 7   | West Indies, Santo Domingo, Mole-St. Nicholas, Port de Paix, Fort Liberte, Santiago de los Caballeros | On north coast of Haiti there was a destructive tidal wave. At Port de Paix the sea withdrew 60 meters and upon returning covered city with 5 meters of water.  |
| 19. | 1855 Feb. 17 | Azores, Terceira  | The sea invaded the coast on the south and on the east of the island rising to a height of 10 meters.   |
| 20. | 1856 Jan. 6  | Azores, San Jorge   | Strong tsunami at Velas, Damage done to the walls of the town and several houses.   |
| 21. | 1860 Apr. 8  | Haiti, Port-au-Prince l'Anse au Veau, Cayes, Acquia   | Sea wave, Gulf of Gonaive. Sea withdrew and broke with crash on shore.  |
| 22. | 1867 Nov. 18 | Virgin Islands  | A wall of water 6.1 m high swept the harbors of St. Thomas and St. Croix. At St. Thomas the USS <u>De Soto</u> struck against a wharf and lost her propeller. The wave was strong on adjacent islands and east coast of Puerto Rico.          |
| 23. | 1868 Mar. 17 | Virgin Islands  | Small sea wave near St. Thomas.   |
| 24. | 1899 Feb. 3  | Azores, San Jorge   | The town was inundated by three waves which caused destruction and one death.   |
| 25. | 1907 Jan. 14 | Jamaica   | Although principal damage was done at Kingston, the sea wave was principally on the north coast. At Annotta Bay returning wave was 1.8 to 2.4 m high.   |
| 26. | 1916 Apr. 25 | Panama, Bocas   | Slight sea wave carried debris 200 meters inshore.  |
| 27. | 1918 Oct. 11 | Puerto Rico, northwest coast  | Wave from northwest was 4.5 m high at Port Boringuen, and about 3.6 m high at Aguadilla, where it went 100 meters inland. At Point Jiguero the wave was 5.4 m high. Elsewhere it was moderate except at Mona Island, where it was 3.9 m high. |



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| 28. | 1918 Oct. 25 | 18.5N, 65.0W                  | Wave recorded at Galveston tide gage.   |
| 29. | 1929 Jan. 17 | Venezuela, Cumana             | Steamer endangered by huge wave which followed earthquake at 10.6N, 65.6W.  |
| 30. | 1929 Nov. 18 | Newfoundland, Burin Peninsula | A tidal wave from the Grand Banks earthquake swept up several inlets to a height of 15.2 m, destroying villages and causing heavy loss. |
| 31. | 1931 Aug. 31 | Azores, Horta, and Feteira    | Damage by wave.   |
| 32. | 1946 Aug. 4  | Santo Domingo                 | Sea wave swept northeast coast, causing greatest damage at Matanzas. One hundred lives lost. Provisional epicenter 19.5N and 69.0W.     |