

# ***Tsunamis in the World***

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## **Review by Christopher G. Kendall**

This book consists of fifteen papers presented at the Fifteenth International Tsunami Symposium held in Vienna in 1991, and is broken down into three sections: observation; generation, propagation and run-up; and hazard reduction: assessment and warnings application. The first five papers of the book deal with observations of tsunami. The first paper entitled "Tsunami Dispersion Observed in the Deep Ocean" provides an overview of the amplitude and frequency modulation observed in bottom pressure records for the March 1988 Alaskan Bight Tsunami. The dispersion of this tsunami as it responded to this earthquake is described with simple mathematical models. This is followed by a paper on a proposed historical tsunami database for the Kuril-Kamchatka regions. This paper describes various earthquakes and the responding tsunami that have occurred here and how the data base will be set up. Essentially this data base is being developed for the Kuril-Kamchatka region, integrating various kinds of data including numerical, textual and graphical information, mathematical models, and perhaps even audio and video information.

Next is a paper on tsunamis in the Norwegian Sea and North Sea caused by submarine landslides in the Storegga region. This paper records how giant submarine landslides in the Storegga area on the continental slope west of Norway took place on at least three occasions during the Late Quaternary. The paper summarizes the information on the effects of the tsunamis generated as a result of these Storegga slides. Apparently the second Storegga slide took place some 7,000 years ago, and generated a huge tsunami, which probably struck the coastline bordering the eastern North Atlantic. The paper summarizes the geological evidences for this occurrence, comparing it with the results of recent mathematical models.

Next is a paper on tsunamis related to volcanic activity in Italy, recording the occurrence of tsunamis related to volcanic eruptions in the Mediterranean Sea. Most of the work is concentrated in the central Italy and the west coast of the Italian Peninsula. The authors have recognized the occurrence of tsunamis and their tie to volcanic activity in Italy with heavy emphasis on the Gulf of Naples and the association of tsunamis to the eruptions of Mt. Vesuvius. There is also a description of the relationship of tsunamis to the Phlegraen Fields and the Sicily Channel.

The final paper of this section deals with historical tsunamis that have impinged against Mainland Portugal and the Azores, and lists case histories for these areas. The paper records that the tsunamis's, which were generated in A.D. 382 and 1755 and struck Portugal, probably originated from earth movements at widely different localities. The paper shows maps which detail the general bathymetry and location of earthquake epicenters, describing the intensity and effects of various tsunamis, in historical times, on the coast of Portugal, Azores and Madeira.

The next section has papers on generation, propagation and run-up, and begins with an analytical model of tsunamis generated by earthquakes. This is a largely mathematical description of how tsunamis are generated by earthquakes. Then there is a paper on analysis of ocean bottom seismic data and the generation of a numerical simulation for the 1990 Mariana earthquake tsunami. The paper provides data for tidal records and earthquake

records, relating them to tsunamis.

There follows a paper on tsunami resonance in the Gulf of California. This is largely a mathematical explanation for the occurrence of tsunamis in this gulf. Next is a paper on experiments with oblique reflections of solitary wave. These experiments were conducted to see how solitary waves undergo oblique reflection and examines the two dimensional water surface displacement. The results suggest that the difference between the angles of incidence depends on the incident wave height, while the growth rate of the stem wave depends on both the amplitude and the angle of incidence. Next is a paper on dynamic response of structures to tsunami attack.

Finally there is a section on hazard reduction, assessment and warnings application. This begins with an evaluation of tsunami hazards in Calabria and Eastern Sicily, Italy. Essentially this paper shows how tsunamis are obviously generated by local earthquakes in this area and that there is some relationship between the size of the tsunami, the size of the earthquakes, and the epicenters of the earthquake. There is also an attempt to develop a more sophisticated statistical approach to the prediction of tsunamis generation.

Next is a paper on crack propagations, earthquakes and tsunamis in the vicinity of Anatolia. This paper analyzes the seismic history of a variety of areas in Anatolia recording the definite relationship between the earthquake magnitude and crack development. There was apparently no rhythmic relationship between the breaks in segments which are fractured. The papers draw attention to the potential for earthquakes in Anatolia and the occurrence of tsunamis. It records a feeling that there is much more work needed in this area in order to predict these events and prepare for their occurrence.

Next is a paper on an integrated system for real time estimation of seismic source parameters and its application to tsunami warning. This paper is about an integrated system to estimate tsunami risk, providing a broad-band long-period three component seismic station, linked to a personal computer. Next is a paper on tsunami intensity and disasters. This paper describes the logarithmic relationships between local tsunami heights. The paper draws attention to the fact that tsunami are so infrequent a phenomenon that people tend to forget their dangerous effects on the coasts where they are most likely to occur. Finally there is a paper on a complementary land-based tsunami warning system in SW Portugal tied to two projected permanent ocean bottom seismic stations. These seismic stations located in the Gorringer Seamounts will provide a real time, or almost real time, warning system, by transmitting the seismic signals to a central shore station.

This unpretentious handy little book has an amateur feel to it. This is expressed by the fact that the quality of the type varies from one paper to another, though the type and font picked by each author is quite clear. The diagrams and illustrations are equally clear. Similarly the volume could have been edited more thoroughly but all the papers are understandable and clear. The editor has accomplished his objective which was to publish the papers presented at the symposium on tsunami in Vienna. Anybody who is interested in tsunamis on earthquake will probably need this book for their library. The book contains considerable mathematical descriptions of the effects of earthquakes and their propagation on tsunamis. There are numerous diagrams and maps showing the locations of earthquakes and where tsunamis have been generated. Individual papers are extremely well referenced. I am glad to have this book on my shelves. This is not for everybody but it is certainly interesting and a book for the specialists who need to get the latest on tsunamis generation and tsunami prediction, particularly early warnings for the local population close to potential tsunami sites.