



## Possible Role of the Main Makran Fault in the Collapse of the Ancient Civilizations Along the Makran Shoreline

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### Abstract

The Makran is the location of ancient civilizations and one of the most important tsunamigenic zones in the world. Historical and instrumental records indicate the occurrence of large earthquakes on the main Makran fault and the resulting tsunamis but the accuracy of a number of these has been questioned. Geological and tectonics studies alone cannot confirm the occurrence of paleo-tsunamis. Archaeological data showing the collapse of the ancient civilizations along with geological records of paleo-tsunami can be of great help to have a better understanding this phenomenon in the future. The interaction of geology and archaeology can lead to a re-reading of the history of tsunamis which have influenced coastal civilizations, so provide a better estimate of the occurrence of tsunamis and their catastrophe in the future. Thus, to assess the environmental causes for the collapse of the ancient civilizations in the Makran shoreline, it is necessary to support geoarchaeological studies.

**Keywords:** Makran Fault, Tsunami, Ancient Civilization, Tectonic Archaeology.

**ArticleType:** Short Article

### Introduction

Collapse of civilizations, in addition to social and other reasons, could have been affected by natural hazards and disasters. One of these disasters that can cause a catastrophe in a short time is a tsunami (Barnes 2021). The dependence of the ancient civilizations to sea in terms of food supply as well as their transportation has made them very vulnerable to disasters such as tsunamis. Archaeological evidence indicates that from the third millennium BCE onwards, Makran coastlines in Iran, Pakistan and Oman have been considered by sailors and local people for livelihood and trade. The Makran subduction zone and the presence of the Makran main fault with a length of 900 km with 100 km from the coast are talented to destructive tsunamis in the region. Ancient tsunamis have been destroyed the coast to a depth of several kilometers. Therefore, studying the geological evidence of ancient tsunamis along with archaeological studies of the ancient civilizations along the Makran coast, in addition to understanding the reasons for

the collapse of ancient civilizations can provide valuable evidence for predicting future disasters in these areas. Recorded historical data show that the last major tsunami recorded in the Makran region occurred in November 1945 due to an earthquake of magnitude 8.1 that killed at least 4000 people on the shorelines (Ambraseys and Melville 1982). The high probability of a tsunami in the area reveals the importance of the history of ancient tsunamis for future planning to save the lives of coastal residents and reduce economic losses.

### Makran

The Makran Region, which is now located in Iran and Pakistan (Figure. 1), covers an area with high potential of archaeological sites from different periods in the eastern Iranian plateau. Several European and Iranian scholars have traveled to the shores of the Makran sea to discover and assess many of the ancient sites in order to have a better understanding of ancient cultures. Based on the ancient texts, the Babylonians and Assyrians considered the name of Makran as the land of ships



and the place where ships sailed in the crocodile land in southern Iran (Eggermont 1975) during the Achaemenid Period. At the same time, the area was controlled by different Satraps in southeast Iran. The oldest documents in which the name of Makran is mentioned are the inscription of Maka, “Mecca” created by Darius the Great, the second king of the Achaemenid dynasty in Biston and Persepolis (Moradi Ghiasabadi 2008).

### Archaeology and Tsunami

One of the subdivisions of geological archaeology is tectonic archaeology, which deals with the impact of earthquakes, volcanoes, and tsunamis on the archaeological sites (Barnes 2021; 2017). In this field, the history of ancient tsunamis can be studied by investigating of the sedimentary deposits and human and animal remains left on the coast. (Nanayama *et al.* 2000; Tuttle *et al.* 2004)

### Main Makran Fault

The main Makran fault with a length of about 900 km is the location of subduction line between Oman oceanic plate and the Iranian continental plate, (Haberland *et al.* 2021; Vernant *et al.* 2004). This destructive fault, which can create a tsunami, is located parallel to the coastline of Makran, where much archaeological evidence have discovered. Any tsunami caused by the Makran fault will directly hit the shores of the Makran area. Historical and instrumental data indicate the occurrence of destructive tsunamis caused by the activity of this fault in the region. To have a better understanding of the possible ancient tsunamis, archaeological fieldworks are suggested under direction of archaeologists and geologists.

### Earthquake and tsunami of Makran

The Makran region has experienced 8 earthquakes larger than 7 since 1483, the largest of which was during the 1945 earthquake with a magnitude of more than 8 (Byrne *et al.* 1992). Dominey-Howes *et al.* (2006) collected a catalog of major tsunamis that occurred in the Indian Ocean Region between 326 BCE and 200 ADS, three of which are occurred in the Makran region. If the entire length of the Makran main fault is activated during an earthquake event, it can cause an earthquake with a magnitude of more than 8, like the 1945 earthquake and tsunami, therefore, it can be predicted that this event can be repeated in a 175-year cycle. Based on the dating of

the beaches and sea terraces of the Makran beaches, Ambraseys and Melville (1982) suggested that these beaches have risen over the last 10000 years due to numerous earthquakes like the one occurred during 1945 AD.

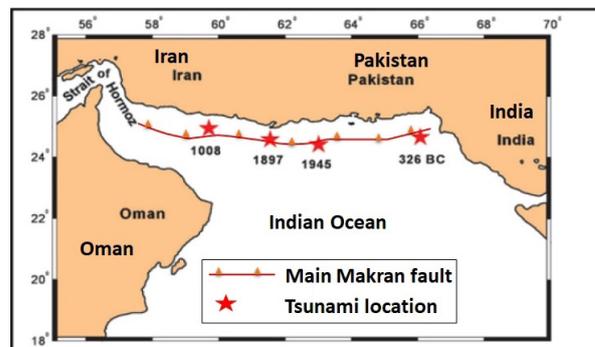


Figure 1: Historical Tsunami along the Main Makran Fault

### Discussion

Perhaps one of the most important steps in assessing the hazard of the shorelines in the Makran coast is to obtain a historical tsunami catalog. In fact, without information of the ancient tsunamis, it is not possible to make an accurate estimate of the return period and the affected area. Accurate knowledge of the history of tsunamis in each region can provide a good estimate of the return period of this phenomenon as well as hazardous areas. For this reason, historical tsunamis have always been of interest to researchers and so far, collect an acceptable source of data around the world (Heidarzadeh *et al.* 2008). Thus, different methods have been proposed by different researchers to compile catalogs of historical tsunamis (Atwater and Moore 1992), many of which are questionable. To increase accuracy, the matching of archaeological information and geological evidence can be used as a useful tool to assess the ancient tsunamis, therefore, archaeological fieldwork must be aimed on the tsunamic studies. In tsunamigenic zone such as Makran, which have historically been one of the main corridors for long-distance trade, archaeological sites can declare enough evidence for the phenomena during long time. The area, in terms of geology and seismicity have a high potential for tsunamis during the past, while no information about the collapse of the civilizations is available based on the tsunami phenomenon. On the other hand, in tsunamigenic zone such as Makran, which has historically been a good place for the emergence

of ancient civilizations and long-distance trade, no information is yet available about connections between these civilizations and ancient tsunamis.

### Conclusion

Scientific cooperation between archaeologists and geologists in order to support interdisciplinary studies can facilitate to estimate the return of tsunami courses. Finally, to assess the environmental causes for the collapse of the ancient civilizations, it is necessary to support geoarchaeological studies in the Makran Region in order to predict the future tsunamis.

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