Further study of cores from other subduction zones, such as Sumatra and the 2004 earthquake, for which there is a good record of turbidity current deposition, will allow us to better understand the role of sediment source on turbidity current dynamics. By comparing the characteristics of turbidity currents from different subduction zones, we can gain insights into the processes that control the delivery of sediment to the ocean floor. This will help improve our understanding of the sedimentary record and its implications for earthquake hazard assessment.

Abstract

The past occurrence of great earthquakes in Cascadia is now well established by both the coastal and turbidite event paleoseismic record. The 1964 Great Alaska Earthquake, the 1980 Mount St. Helens eruption, and the 2004 Sumatra-Andaman Earthquake have all provided valuable insights into the potential for future seismic activity in this region. However, the relative timing and magnitude of these events is not well understood, and it is difficult to estimate the probability that future earthquakes will produce similar deposits.

Background

Current models of turbidite formation and deposition are based on observations of modern turbidity currents and their deposits. However, the influence of historical seismic activity on the sedimentary record is not well understood. This study aims to address this gap by analyzing the turbidite record from the Cascadia margin.

Preliminary Tank Experiments

Initial experiments were performed to determine the sediment composition for small-scale experiments. The deposit was composed of a mix of sand and clay, with a silt fraction also present. The sediment was placed in a circular tank and allowed to settle under the influence of gravity.

30 Gallon Tank Experiment

The experiment was then developed into a larger scale test. This tank is 10 feet long by 2 feet wide, and the sediment used for the test was composed of a mix of sand, silt, and clay. The deposit was allowed to settle for a period of time, and the resulting sediment was analyzed to determine the effects of the earthquake on the sedimentary record.

130 Gallon Tank Experiment

The experiment was then developed into a larger scale test. This tank is 10 feet long by 2 feet wide, and the sediment used for the test was composed of a mix of sand, silt, and clay. The deposit was allowed to settle for a period of time, and the resulting sediment was analyzed to determine the effects of the earthquake on the sedimentary record.

Real World Examples

Sumatra

The 2004 Sumatra-Andaman Earthquake is one of the most recent examples of a great earthquake that produced a significant turbidite deposit. The deposit was identified in the sediments of the Indian Ocean and was used to calibrate the models used in this study.

San Andreas

The 1906 San Andreas Earthquake produced a turbidite deposit that was well preserved and has been used as a benchmark for understanding the sedimentary response to seismic activity.

Conclusion

This study has demonstrated that turbidity currents can be used as a tool for understanding the sedimentary record of past earthquakes. By analyzing the turbidite deposits from different subduction zones, we can gain insights into the processes that control the delivery of sediment to the ocean floor. This will help improve our understanding of the sedimentary record and its implications for earthquake hazard assessment.

References


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