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Joining forces to predict tsunamis: Pan-European approach to disaster prevention

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[作者] European Science Foundation
[单位] European Science Foundation

[摘要] 06 NOV 2006, Following a series of well documented natural disasters with grave human and economic consequences, the ability to predict these devastating events has once more come to the fore as a research priority for the European scientific community.

[关键词] Tsunami warning;systemeconomic consequences;human

06 NOV 2006, Following a series of well documented natural disasters with grave human and economic consequences, the ability to predict these devastating events has once more come to the fore as a research priority for the European scientific community.

This, amongst other things, is what leading scientists in ocean margin research came together to discuss at the recent EUROMARGINS conference in Bologna, Italy. Margins are the transition zones between the continents and the deep oceans. They are also often at the boundary between two tectonic plates.

EUROMARGINS is a European Collaborative Research (EUROCORES) Programme coordinated by the European Science Foundation (ESF) and supported by science funding agencies in ten European countries.

Tsunami warning system

Tsunamis are large waves presenting extreme threats to coastal areas. The largest recorded tsunami, which hit Alaska in 1958, loomed to a height of 520m. They can come about as a result of continental landslides, rock falls, submarine landslides or earthquakes. In the 1990s, four tsunamis ravaged Nicaragua, Indonesia, Japan and Papua New Guinea causing the loss of 4,000 lives and of course no one can forget the total devastation brought about by the December 2004 Indian Ocean tsunami where 230,000 people lost their lives.

The Gulf of Cadiz has a history of both tsunamis and earthquakes. In fact, the whole Southern area of the Iberian and the facing North African coast are considered high risk areas. As recently as 21 May 2003, a tsunami wave reaching three metres hit the Balearic coastline in just 20 minutes from its origin far out at sea. It took sea levels 24 hours to recover and twenty boats sank.

Despite the Mediterranean being a high risk area, surprisingly, there is no tsunami early warning system in place. "Our goal is to develop an integrated system using earthquakes as a source of tsunami detection with a 20 minute maximum time frame for the alarm to sound," explains one of the conference's external guest speakers Stefano Tinti from the recently launched TRANSFER initiative. Tinti came to talk to the EUROMARGINS community about the first ever funded European project to look at tsunamis with the purpose of developing a tsunami early warning system. This effort is ground

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breaking and aims to understand the tsunami process, contribute to tsunami hazard and risk assessment and, to develop strategies for risk reduction. Research generated from the EUROMARGINS community has helped to make this project possible.

Developing models

One of the EUROMARGINS Principal Investigators Miquel Canals from the Universitat de Barcelona described the area between Ibiza and Mallorca in the Mediterranean as being covered in calcified rock rich in pockmarks of different sizes. This gives the sea bed the appearance of a giant 'orange peel'. Some of these pockmarks are as deep as 50m and more than 1km in diameter. Canal also described submarine landslides in the region, like the one off the Ebro shelf (known as the Big 95) that affected a seafloor area four times that of the island of Ibiza. While the pockmarks are indicative of fluid migrati

"The characteristics of a tsunami depends primarily on the volume and initial acceleration of the released sediment as well as the water depth" explains Carl Bonnevie Harbitz from the Norwegian Geotechnical Institute (NGI) in Oslo.

Harbitz and his colleagues at NGI and University of Oslo have developed models which can predict tsunamis caused by rock falls, submarine slides, earth quakes and even asteroid impacts. To validate and improve the models, Harbitz and his team have put much effort into back

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calculating historical events. Using field observations from the 8200 BP submarine Storegga slide tsunami off Western Norway, the 1934 rockslide Tafjord tsunami and the 2004 Indian Ocean earthquake tsunami, the team has improved the reliability of their models. The complexity of the coastal region of the wave impact is also an important factor when developing reliability.

Harbitz has applied this model to his native North Sea area and found that a possible future tsunami generated in for example the North Sea Fan area will start far off shore and will most likely not reach heights bigger than 1m by the time it reaches the shore.

"Our model has also been used for prediction and hazard and risk assessment for tsunamis generated by rock slides, submarine slides, and earth quakes in several places internationally", says Harbitz.

To wrap up, on the behalf of the TRANSFER initiative, Stefano Tinti urged the EUROMARGINS community to carry on with their important landslide research in order to be able to provide a more reliable tsunami alert system using both landslides and earthquakes as indicators.

Over four years, the EUROMARGINS have gatherered about 75 teams from 12 countries on a variety of complementary topics dedicated to the imaging, monitoring, reconstruction and modelling of the physical and chemical processes that occur in the passive margin system. Further information is available at www.esf.org/euromargins. When it comes to an end in late 2007, EUROMARGINS will be succeeded by new EUROCORES Programmes such as EuroMARC and Topo

-Europe, which will both contribute to the future of European geosciences.

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