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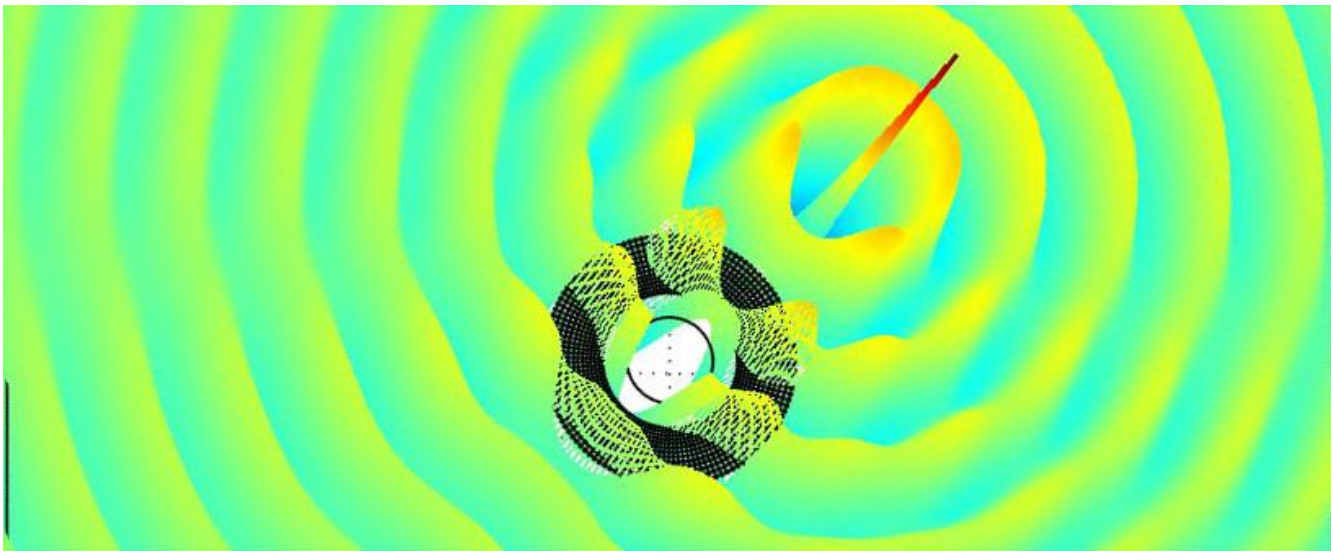

Boreholes to protect against earthquakes

Scientists are developing technology to protect towns and villages against earthquakes by drilling holes in the ground.

12 July 2013 - By DEBORAH FORSYTH

Researchers from the ANAMORPHISM project have developed a way to place boreholes at carefully spaced intervals in front of an area they want to protect and create a barrier which can deflect the shockwave from an earthquake.

They've proved the technique works in tests near Grenoble, France. A construction firm, Menard, drilled three rows of 10 holes, each five metres deep, in the ground based on designs supplied by ANAMORPHISM. The scientists then tested the installation by generating a small 50 hertz surface earthquake wave, and the boreholes deflected the wave backwards.

If it can be scaled up, the technique could save hundreds of thousands of lives by protecting heavily populated areas against earthquakes.

'Imagine a city of the future,' said Dr Sébastien Guenneau, coordinator of the European Research Council-funded project. 'You might be able to bore holes by the city to protect it from seismic surface waves.'

Dr Guenneau's wife was born in Sri Lanka, which was heavily affected by the 2004 Indian Ocean tsunami, one of the deadliest natural disasters recorded in history, and he first developed the idea as a way to protect costal towns against tsunamis.

'I started to think, why not look into the possibility of building a mechanism which would make fishing villages invisible to incoming tsunami waves by diverting them around the villages rather than through them,' Dr Guenneau said.

The ANAMORPHISM team has carried out small-scale tests on tsunami waves in a 17-metre-long pond, and the technique works. The tests resemble the seismic wave experiment, except that in place of boreholes, a series

of pillars are built on the waterbed. Like the boreholes, the pillars deflect the waves that approach them.

Invisibility cloak

Dr Guenneau got his inspiration from the idea of invisibility cloaks, first developed by British theoretical physicist Professor John Pendry in 2006. An invisibility cloak deflects light waves around a hidden object, while Dr Guenneau's technology is instead deflecting the shockwaves from earthquakes and tsunamis.

'We're really applying the same tools, or tricks, that can be done for light waves,' Dr Guenneau, said.

By the end of the project in 2016, Dr Guenneau, who is based at the Institut Fresnel at France's Centre National de la Recherche Scientifique, hopes to have refined the prototypes for deflecting tsunami and seismic waves, and to have made a proposal as to how they could be used in practice.

Five of the deadliest earthquakes in Europe

Earthquakes happen as the world's continental plates rub against each other. While the world's most seismically active regions lie along the coast of the Pacific Ocean, such as California and Japan, Europe has had its own fair share of earthquakes. These happen more frequently in the Mediterranean as it is where the Eurasian and African continental plates join. Here are some of the worst:

- Italy - 28 December 1908 - Over 100 000 people died in the Sicilian port of Messina and in Reggio di Calabria, across the Strait of Messina.

- Greece – December 856 - The city of Corinth was almost completely destroyed, killing an estimated 45 000.

- Portugal - 1 November 1755 - Lisbon was practically wiped out, killing tens of thousands of people.

- Greece - 3 May 1481 - An earthquake in Rhodes triggered a tsunami and left an estimated 30 000 people dead.

- Italy - 13 January 1915 - A quake in the central Abruzzi region killed approximately 30 000 people.

Map of seismically active regions of Europe

More info

Institut Fresnel, France