



# Seismic spaces

Benjamin Hennig charts the growth and impact of the world's earthquakes

**E**arthquakes are seismic activity in the Earth's lithosphere. This release of energy occurs most frequently at the boundaries of the tectonic plates. The frequency and intensity of earthquakes in these regions therefore varies depending on the specific geological structures.

Modern digital national and global seismograph networks allow us to get a very detailed global picture of earthquakes in recent times. However, the phenomenon has been known and described by humans over a long period of time.

The Global Significant Earthquake Database by the US National Geophysical Data Center/World Data Service has compiled historic and contemporary records of the occurrence of globally significant earthquakes in a database published by the National Oceanic and Atmospheric Administration. The database 'contains information on destructive earthquakes from 2150BC to the present day that meet at least one of the following criteria: moderate damage

(approximately \$1million or more); ten or more deaths; magnitude 7.5 or greater; Modified Mercalli Intensity X or greater, or the earthquake generated a tsunami.'

There is an uncertain nature of historic records as these are more likely to be incomplete. However, these help to get a more complete picture of global seismic risk zones. The most recent update of the database contains more than 5,500 individual entries.

The cartogram above visualises the records from this database by calculating the relative risk occurring from destructive earthquakes. For each area, the number of earthquakes as well as their destructive strength is taken into account to estimate the risk intensity. The data is then visualised using a gridded cartogram transformation in which each area is resized according to the higher and lower intensities. Areas at most risk are therefore largest in the map, while less active areas disappear. The countries are coloured by their major geographical region.

The map shows which parts of the world are most exposed to what is among the most destructive natural hazards. Among these is Indonesia in Southeast Asia. In this region, much of the actual hazard is triggered in the oceans rather on land. In contrast, other

threatened regions such as Italy, Greece, and Turkey in the Mediterranean, or Mexico in the Americas become more prominent through a much higher seismic activity also occurring on land. Even some islands that are relatively small in size are visible more prominently due to their location over active zones, such as Haiti, Iceland, or New Zealand.

A full picture of these seismic spaces is given in the inset cartogram. Here the seismic activity is not only calculated over land, as in the main map, but over the entire planet's surface so that all less seismic active areas disappear almost entirely.

What this unobstructed view of seismic zones also reveals is how few of the spaces that are still left in this cartogram are actually unpopulated. Much of what we see in this map are at the same time quite populated areas of the planet that leave many people vulnerable and at risk.

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