British Geological Survey

Developing the national seismic monitoring network

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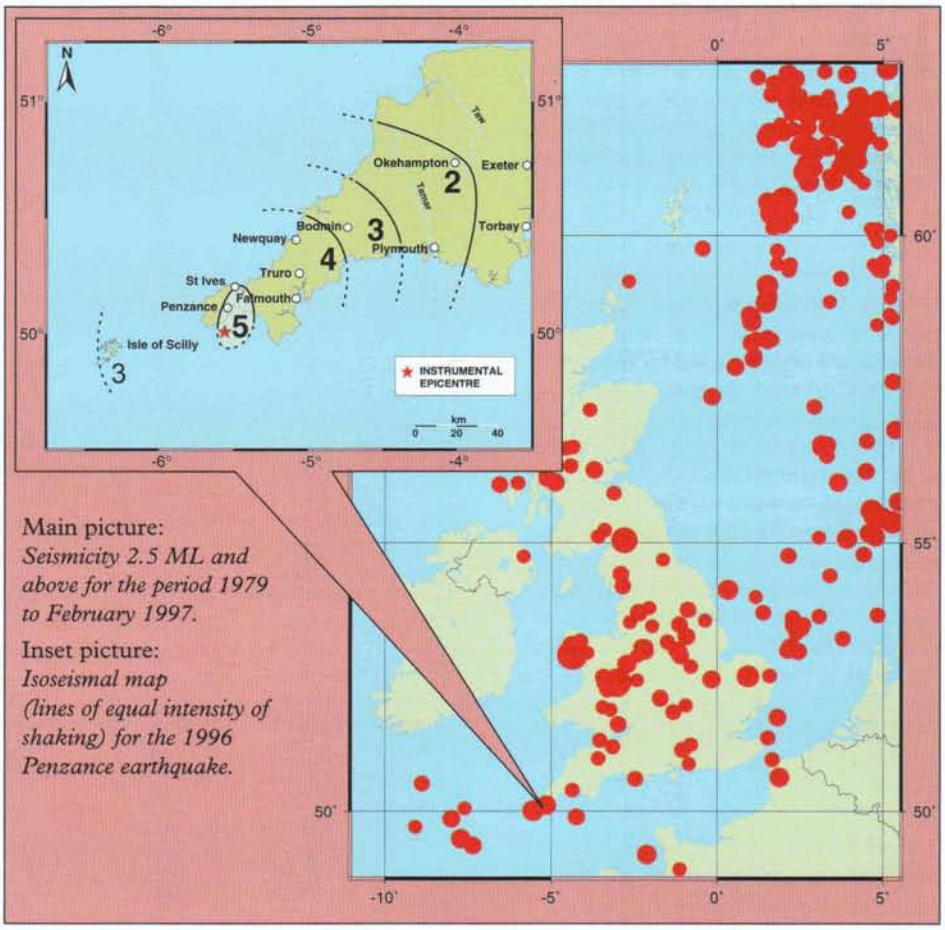
British earthquakes

The largest earthquake in 1996 occurred near Penzance, Cornwall. It had a magnitude of 3.8 (Richter Scale) and was felt over an area of 14,000 square kilometres throughout Cornwall, the Scilly Isles and in parts of Devon. Felt reports included "bottles on a shelf shook and fell off" and that people "ran outside to see if an explosion had demolished a house". A survey, with 900 replies, showed a maximum intensity of 5 EMS (European Macroseismic Scale) close to the epicentre where minor damage (cracked plaster) occurred. This is the largest event to have affected mainland UK since the 15 February 1994 Norwich earthquake (magnitude 4.0), which was also felt with an epicentral intensity of 5 EMS. Around 25% of our earthquakes occur in coalfield areas and most of those are caused by present-day mining. The latest to cause concern were east of Edinburgh between October 1996 and March 1997. Their locations and pattern of activity (following the working week with few events at weekends), provided conclusive evidence of the cause. Many of these tremors were felt intensely over a small area (up to 2 or 3 km) by local residents but did not cause damage.

The national monitoring network enables the BGS to locate all earthquakes on land above magnitude 2.0 (and many smaller ones). It has to discriminate natural earthquakes from man-made seismic vibrations including quarry blasts, underwater explosions and sonic booms. The goal is an improved assessment of seismic hazard for Government, Local Authorities, planners and industry, together with immediate information for the public and authorities whenever a seismic tremor is felt at a level which causes concern. Almost all earthquakes greater than magnitude 2.5 can be felt by people and this occurs for about 10% of the 200-300 earthquakes located by the BGS each year.

Twenty five years of instrumental recordings are supplemented with archival information covering several centuries. Analysis of all of the data indicates that, in the UK, a damaging magnitude 6 earthquake is likely every 500 years on average, a magnitude 5 at 10 year intervals and a magnitude 4 every 2 years. These are felt at distances of about 500 km, 200 km and 50 km, respectively. The most damaging earthquake known in our history occurred, fortunately, some 120 km off the east coast of England in 1931 and damage was, therefore, restricted to roofs and chimneys along the coast. It had a magnitude of 6.1 on the Richter Scale.

Seismic networks deliver at high data rates to central computers from remote locations away from cities. It is a relatively simple exercise to add sensors for other environmental and climate monitoring (e.g. UVB, ozone, radiation, particulates, nitrous gases, sulphur dioxide, meteorology). The BGS has established an experimental station to demonstrate the potential, and envisages a spread of this technology through the UK, Europe and more widely, to capitalise on modern seismic networks for determining environmental baselines, climate change and the impacts of traffic, power station plumes and incidents like Chernobyl.



Main picture:
Seismicity 2.5 ML and above for the period 1979 to February 1997.

Inset picture:
Isoseismal map (lines of equal intensity of shaking) for the 1996 Penzance earthquake.