Istanbul—The earthquake risk of a megacity

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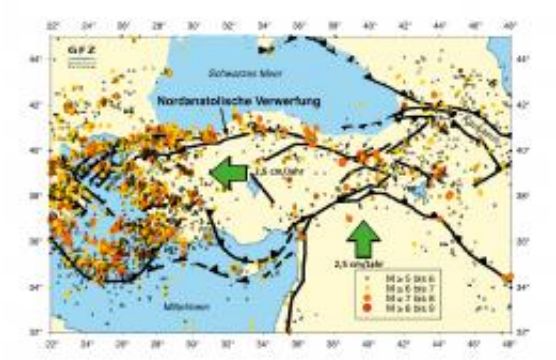

Seismic risk in Turkey, epicentres and main fault zones. © GFZ Deutsches GeoForschungsZentrum

Today the drilling starts for a seismic monitoring network on the Marmara Sea near Istanbul. Specially designed seismic sensors in eight boreholes on the outskirts of Istanbul and around the eastern Marmara Sea will monitor the seismic activity of the region with high precision. In each of the respective 300 meter deep holes several borehole seismometers will be permanently installed at various depths. These detect even barely perceptible earthquakes with very small magnitudes at a high resolution and can thus provide information about the earthquake rupture processes associated with these.

To determine and monitor the seismic hazard of the region and the processes occurring in the fault zone beneath the Marmara Sea off Istanbul with the latest earthquake monitoring technology, the GONAF

plate boundary observatory (Geophysical Observatory at the North Anatolian Fault) was set up under the auspices of the GFZ German Research Centre for Geosciences. "Istanbul with its more than 13 million inhabitants is located in a region that is extremely vulnerable to earthquakes. A high probability of a strong earthquake of magnitude up to 7.4 is assumed for the region,"explains Professor Georg Dresen from the GFZ, one of the organizers of the project GONAF. "The data of small earthquakes in the region that are measured in the borehole can provide important information about the processes before a major earthquake."

The data is continuously transmitted in real time to Potsdam and Ankara and evaluated there. A particular difficulty is that the earthquake zone to be monitored lies under the seabed of the Marmara Sea, about 20 kilometers off Istanbul. Only monitoring below ground in bore holes ensures the required precision of the measurementsdue to the much lower noise level. "This means we have to get as close as possible to the quake source region," explains GFZ researcher Professor Marco Bohnhoff, director of the project. "With our new, specially developed borehole seismometers the ratio of signal to background noise can be improved by at least a factor of 10, and therefore achieve a much higher resolution."

The project involves close cooperation with the Disaster and Emergency Management Presidency of Turkey (AFAD). The drilling is implemented as part of the International Continental Scientific Drilling Program ICDP. Engineers and scientists at the GFZ supervise the construction and installation activities. Upon successful completion and handover of the fully equipped pilot bore hole on the peninsula Tuzla just off Istanbul a first test phase will commence before the remaining seven wells will be drilled. "An earthquake prediction is not the goal of the project," clarifies Marco Bohnhoff. "Earthquake prediction is still not possible. But the data gathered in our project of the seismic activity

before, during and after the expected strong quake will mean a great advance in the study of earthquakes."

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