



Seismically induced pressure transients at geothermal reservoirs in the eastern Marmara region

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The potential role of fluids in processes related to the triggering of earthquakes and volcanic eruptions is frequently emphasized. Here, we focus on the response of hydrogeological systems to earthquakes, specifically on seismically induced pore-pressure variations in geothermal areas located in the eastern Marmara region. At a 500 m deep artesian geothermal well the pressure is continuously being monitored at a sampling rate of 100 Hz. A seismometer is co-located close to the well-head and the data are recorded by the same digitizer. Hydro-seismograms were recorded in relation to local and distant earthquakes. The ML=5.2 Manyas earthquake which occurred on 20 October 2006 at a distance of 77 km led to a dynamic response of the pore pressure of the order of 4 mbar triggered upon the arrival of the S-wave. Four days later, the ML=5.2 Gemlik earthquake at a distance of 20 km led to a dynamic pore pressure response of the order of 15 mbar triggered upon the arrival of the P-wave. In both cases the peak amplitude of the ground velocity was about 2 mm/s. Weak oscillations of the pore pressure were observed during the passage of surface waves generated by remote earthquakes at distances of up to 9,000 km. Additionally to the dynamic response, a small persistent pressure increase of 1 and 2 mbar had been recorded after both local earthquakes. According to preliminary results, the observed pressure increase is opposite to the static pressure decrease predicted by Okada's model. At the present stage we conclude that the response of the Armutlu geothermal system to earthquakes is likely caused by a dynamic interaction of passing seismic waves (P-, S-, and surface waves) with the fluid reservoir in case a threshold of the ground shaking is exceeded.