Geophysical Research Abstracts,
Vol. 10, EGU2008-A-11738, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-11738
EGU General Assembly 2008


# Tectonic implications of the 28 April 2007 MW4.0 Dover Straits earthquake

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An earthquake of magnitude 4.3ML occurred beneath the town of Folkestone, south-east UK, on 28 April 2007 at 07:18 (UTC). The earthquake caused damage in Folkestone and was strongly felt across SE England. Estimated macroseismic intensites are as large as VI on the European Macroseismic Scale and the earthquake was the most damaging in the UK for some decades, with damage including chimney collapse and narrow cracks in brick masonry walls. Data from a strong motion instrument approximately 5km from the hypocentre suggest that peak ground acceleration (PGA) may have been as large as 0.1g. This was the largest earthquake in this region since a magnitude 4.4 ML earthquake in 1950. Significant earthquakes also struck the Dover Straits in 1776 and 1580; the latter had a magnitude of 5.7 ML and caused damage as far as London. The earthquake was well recorded on seismic stations across western Europe from Norway to Spain. We used both P- and S-wave arrivals at stations across Europe to determine the earthquake hypocentre. The epicentre is well constrained due to good azimuthal station coverage and a detailed knowledge of the shallow velocity structure near the epicentre, resulting in horizontal errors of +/-5km. The focal depth from travel time inversion is 5.3 +/- 4 km. Analysis of source spectra gives a seismic moment of 5.7x1014 Nm, a source radius of 0.5 km and a stress drop of 28 +/-24 bars. We determined a source mechanism for the earthquake by moment tensor inversion of broadband data at regional distances. The solution shows predominantly strike-slip faulting with a small normal component, resulting from either right lateral movement on a WSW-ENE striking fault plane or left lateral movement on a NNW-SSE striking fault plane. We find the lowest variance for a depth of 3km. We used two additional methods to constrain the source depth: (1) identifying and modelling pP observed at

teleseismic distances, and (2) waveform modelling of the observations at the closest stations. The former gives a source depth of between 4 and 5 km, with a clearly observed pP phase at around 2 seconds after the initial arrival. The latter, though less well constrained suggests a source depth of around 3 +/-2 km.The regional tectonics of the Dover Straits area are dominated by Variscan structures with a predominantly NW orientation, which may suggest that NNW striking fault plane is the causative fault, re-activated by the overall regional stress regime. The axis of maximum compressive stress for this solution is roughly EW and in good agreement with other regional stress indicators. However, the relationship between this earthquake and seismicity in the Dover Straits remains unclear.