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Lg-wave attenuation and earthquake source parameters in the UK

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We investigated *Lg*-wave attenuation and earthquake sources in the UK with the purpose of improving our understanding of ground motion in a region where there are few ground motion data of engineering significance. The regional average *Lg*-wave quality factor (Q_{Lg}) in Britain was determined using data from the UK seismic network ($Q(f) = 266 f^{0.53}$ between 1 and 10 Hz). The dataset used to constrain the model consists of vertical, mostly short-period recordings of 64 earthquakes in the magnitude range 2.7-4.7 ML recorded between January 1984 and April 2007. Using this model, seismic moment, stress drop and rupture radius are determined from vertical shear-wave displacement spectra for these earthquakes using a grid search method. Source parameters for three of the largest British earthquakes that have occurred during the instrumental period are also determined from a limited number of on-scale records. These are Lleyn Peninsula (19 July 1984, 5.4 ML), Bishop's Castle (2 April 1990, 5.1 ML) and Lincolnshire (27 February 2008, 5.2 ML). Moment magnitudes for the whole dataset (i.e. 2.7-5.4 ML) range from 2.5-4.8 Mw. These values are consistent with estimates made using a quadratic relation for converting ML to Mw that was determined for north-west Europe (Grünthal and Wahlström, 2003). Stress drops lie in the range 1-250 bars. In general, this parameter is poorly constrained because of the uncertainty in the near-surface attenuation and no attempt has been made to characterise near-surface attenuation in the modelling. The median stress drop for the dataset is relatively low (c. 15 bars). The highest stress drop (250 bars $\pm$87) is associated with the 2008 Lincolnshire earthquake. This appears to be a relatively unusual event within the context of UK seismicity. The next highest stress drop is just over 100 bars. Stress drop does not appear to be magnitude-dependent but does seem to increase with depth. The results are used to model ground motion for key events.