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Source parameters and ground motion pattern of the October 27, 2004 intermediate depth Vrancea earthquake

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The October 27, 2004 earthquake occurred in the northeasterly end of the Vrancea seismic region. This region, centered in the SE-Carpathians, is confined to an area of about 20 x 60 km^2. Weak and strong earthquakes occur at depths between 60 and 180 km on two parallel vertical planes, separated by less than 10 km.

With a moment magnitude of 6, the October 27 earthquake is the strongest event, which occurred after the May 1990 earthquake sequence (with two major shocks of M_w 6.9 and 6.4, respectively). It was felt countrywide. The K2 strong motion network, operated jointly by the Collaborative Research Center 461 'Strong Earthquakes' of Karlsruhe University and the National Institute for Earth Physics, Bucharest, recorded peak accelerations in the 100 to 200 cm/s^2 range at several locations. Although the maximum-recorded acceleration of 265 cm/s^2 was close to the peak accelerations of the strong and damaging events of 1977, 1986 and 1990, the maximum intensity was 6.5 at most, calculated on the basis of Fourier Amplitude Spectra. This explains why no significant damage was registered.

Joint Hypocenter Determination shows that the earthquake is located at a depth of about 100 km in the more northern trending seismogenic plane. The fault plane solution is a nearly pure thrust mechanism with a B-axis striking NE, which is typical for the strong Vrancea intermediate depth earthquakes. Source parameters, retrieved by deconvolution with empirical Green's functions and waveform inversion, show a

high stress drop event (100-200 MPa). These features and the great number of on-scale observations stress the importance of the event for scaling purposes and for the modeling of the suite of scenario events, necessary for the refinement of the seismic hazard estimation. Furthermore, the better knowledge of the geometry of the source zone, i.e. the existence of a double zone of seismic activity, will contribute to a significant improvement of the existing Vrancea rupture-models (e.g. Oncescu and Bonjer, 1997).