

The earthquake 03.02.2015 near the city of Sumy, Ukraine: Parameters of the source and its mechanism

L.A. Shumlianska¹, A.L. Aleksandrov²

¹ Subbotin Institute of Geophysics, National Academy of Sciences of Ukraine, Kiev, Ukraine

² Institute of Geological Sciences, National Academy of Sciences of Ukraine, Kiev, Ukraine

Abstract. The parameters of the earthquake that took place February 3, 2015 near the city of Sumy, Ukraine were calculated on the basis of the analysis of the records obtained by both Russian and Ukrainian seismic stations («Poltava», «Skvira», «Nikolaev», «Dnepropetrovsk», «Desna»). The calculated hypocenter depth of 54 km was verified by several approaches: deep phases *PP*, *SP* on the remote stations records and travel time forward modeling for Poltava station both confirm the depth. The focal mechanism as a shear with a complex fault component has determined by the first arrivals of *P*-waves. The data on the azimuthal travel-time curve confirm the focal mechanism. We have calculated the earthquake parameters; they are as following: length gap $L1 = 8.08$ km, $L2 = 6.68$ km, the rate of destruction $C = 2$ km/s. We have obtained the dynamic parameters of the event. The calculated fault length ($L = 5.46$ km) in the limits of the method accuracy coincides with the early result obtained by the azimuthal travel-time curve. On the basis of the results obtained we suggested that elastic energy release and forming the dislocations in the earthquake source occurred on smooth, pre-fractured fault ($\sigma_r > 0$). Association of the hypocenter with the tectonic knot of Northern marginal fault of the Dnieper-Donets graben and Northern branch of Krivoy Rog–Kremenchug suture confirm the suggestion. Here we observe considerable Moho depth, structure alteration, high gradients of temperature, magnetic and electric rock properties in the lower Earth crust and upper mantle. Those circumstances are favorable for the earthquake occurring here.

Keywords: earthquake, focal mechanism, dynamic parameters, azimuthal travel-time curve, phases of waves.