Preparation process of the strong close Zhupanovskoe earthquake (January 30, 2016, MW=7.2, Re=107 km) in the data of complex borehole measurements at the Petropavlovsk-Kamchatskii geodynamical testing site

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The strong Zhupanovskoe earthquake (MW=7.2) occurred on January 30, 2016 at the epicentral distance Re = 107 km from Petropavlovsk-Kamchatskii, at the depth of 161 km. The epicenter of the earthquake was located on land to the north of Petropavlovsk-Kamchatskii. The earthquake was accompanied by ground shaking which was felt in Petropavlovsk-Kamchatskii with intensity up to 6 (Mercalli scale). In terms of the S-parameter (S=39%), this earthquake was strongest over the entire period of borehole measurements at the Petropavlovsk-Kamchatskii geodynamical testing site (since 2000). S=L/R*100 %, where L - is the length (in km) of the earthquake source approximated by ellipse; M is the magnitude of the event calculated from seismic moment; and R is the hypocentral distance in km.

Analysis of the complex boreholes measurements data at the Petropavlovsk-Kamchatskii geodynamical testing site shows that the final stage of the Zhupanovskoe earthquake preparation was detected primarily in anomalous changes in the geoenvironments moisture. According to the data of electromagnetic measurements with underground electric antennas, about four months before the earthquake, a decrease in the resistivity began in the area of the testing site. An abnormally rapid and significant (700%) increase in the resistivity of rocks was registered two days before the earthquake. This growth meant a sharp increase in the rate of deformation processes in the area of the Petropavlovsk-Kamchatskii geodynamical testing site.

The data on the abnormally rapid and significant growth in the resistivity of rocks in the zone of the G-1 borehole served as the basis for the urgent submission on January 29, 2016 of a Report on the seismic hazard for the Kamchatka region. In the Report it was stated that «during the period from January 29, 2016 to February 5, 2016 inclusive there is the increased probability of the earthquakes with $S \geq 12\%$.