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Complexation of signals registered by spatially distributed network of multi-electrode instrumentation systems

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We discuss the method for analysis of signals of instrumentation systems spatially spaced at great distances. For analysis, we use the data of subterranean-electric measurement network realizing the method developed by D.A. Kuznetsov. The network consists of 10 stations: 7 of them are located at Kamchatka, 1 – in Altai, 1 – in Italy, 1 – in Crimea.

System construction is based on the following V.I. Vernadskiy's ideas:
– Earth core contains significant amount of juvenile hydrogen;
– existence of Earth "gas breathing" which is a migration of hydrogen atoms to the near-earth space.
Subsequently, V.N. Larin defined Vernadskiy's model more accurately and showed that migration of hydrogen in the atomic form is impossible, instead, it is taking place in the protonic form and all tectonic processes are a results of proton migration through the Earth shells.
At the end of 1980-s years D.A. Kuznetsov showed that proton migration has the form of proton portions and its most intensive manifestations will take place at the boundary of lithosphere and atmosphere in the form of impulse processes.
Thus, it was formulated the hypothesis that non-stationary electric processes associated with proton migration can be observed in the soils at shallow depths. So, such kind of measurements require registration of potential differences between electrodes in the shallow pits and these measurements were called subterranean electric. We show construction of measurement pit, set of measured parameters and discuss the method of measurements.

First-time prolonged systematic monitoring of subterranean electric processes was started at Kamchatka around 1990 year. Since the 2012 year the monitoring is performed automatically on a twenty-four hour basis.

The data for each station is a multi-channel record containing potential differences measured between the electrode pairs buried into the soil at different depths. Channel count varies from 26 to 32. Several signals recorded before strongest earthquakes are presented including Okhotsk Sea earthquake of 24.05.2013 with M8.3 and the latest Kamchatka earthquakes of 30.01.2016 with M7.2 and 20.03.2016 with M6.4.

Coherence analysis is performed in the time-interval of 2013-2016 years. We show the existence of significant coherence bursts between signals of subterranean-electric measurement network.

The possibility of complexation of subterranean-electric data with other geophysical data is investigated. For this, we use the data of F-net wideband seismic network (Japan) and global GPS monitoring network. The comparison of global seismicity and time-frequency diagrams of evolution of coherence coefficients is discussed. We show statistically significant coherence bursts between data of subterranean electric measurements and F-net data. So, we can make a conclusion that measurements performed at Kamchatka are sensitive to the variations of seismic noise in Japan.

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