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Investigation of hydro-geochemical precursors of several earthquakes occurred in the territory of Armenia

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Abstract. The regime seismo-geochemical observations in the territory of Armenia are performed permanently on the seven observation stations: Ararat, Surenavan, Kajaran, Karchakhbyur, Akhurik, Tsovagyugh and Saratovka. The gases (He, CO_2, O_2, R), macro-components (HCO_3, Cl, SO_4, Ca, Mg, Na), micro-components (K, NH_4, NO_3, NO_2, Li) and some parameters such as debit, temperature, gas-factor, pH, Eh are daily investigated. All the regime geo-chemical observations are accompanied with metrological works on all the stages: sample selection, sample storage, analysis.

There are daily sample selection and analysis on all the sites, and on the automated Readiness stations from 1 our to several seconds. All observation drills are located in the zones of active faults. Selected location of observation drills allows to observe the geochemical reaction on the earthquakes not only in the territory of Armenia but also in the territory of Turkey, Georgia, Azerbaijan and Iran.

Since 1994 In Kajaran and Akhurik, and since 2000 in Karchakhbyur and Saratovka fully automated geochemical stations of Readiness network, installed thanks to GeoForschungZentrum organization, are operating. Those four stations are equipped with satellite data transfer system to the data acquisition and processing centers which allows to carry out complex geophysical, hydro-geological and geochemical monitoring in the real time scale and to use daily data for current seismic hazard assessment. The relation between the change of micro- and macro-components in underground waters and the process of strong seismic events preparing is well studied. A large amount of pre-, co-, and post-seismic anomalies of physical and chemical parameters of underground waters are defined.

With the aim to current seismic hazard assessment in the territory of Armenia and adjacent regions the research of hydro-geochemical data was carried out and earthquake precursors have been distinguished.

In this paper the techniques of data processing and results of analysis of hydro-geochemical earthquake precursors by the example of He diluted in mineralized water, are presented. On data analysis the modern techniques and Seishelp, Dynamic Fields, Expert software developed at the NSSP, have been used. In the result of He concentration time series analysis, the hydro-geochemical precursors of a row of earthquakes occurred in the territory of Armenia are distinguished (Seishelp), amplitude and frequency characteristics of anomalies-precursors are defined (DF) and the zones of the highest current seismic hazard by the hydro-geo-chemical precursors by the example of helium (He) are distinguished (Expert).

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