Variations of hydrogen in the surface-atmosphere in connection with the manifestation of seismic activity in the Eastern Caucasus

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Abstract According to the literature, modern ideas about the earthquake center as one of the blocks of the hierarchical structure of the earth's crust, which loses stability during energy and mass exchange with the environment, are considered. Long-term continuous measurements (6 years) of hydrogen concentrations in the surface-atmosphere were carried out at two observation points in the Dagestan wedge tectonic region (Republic of Dagestan). It is shown that variations of hydrogen concentrations in the surface-atmosphere have annual periodicity. At the same time, in adjacent time intervals of the series, a change in the dispersion of hydrogen concentrations is noted. Initially, there is an increase in the value of the dispersion, after which it is marked by an abrupt decrease, the stages of which in most cases correspond to seismic events. A change in the dispersion value in adjacent time intervals of hydrogen concentrations implies a corresponding change in the entropy in the exciting thermodynamic system, i.e. in the earthquake focus. As a result of relaxation of elastic energy, the thermodynamic system passes to the most probable, steady-state and accordingly values of dispersion of concentrations of hydrogen tend to a minimum.

Keywords monitoring, hydrogen, variations, dispersion, earthquake.

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References

Barsukov, V.L., & Beljaev, A.A. (1992). *Geohimicheskie metody prognoza zemletrjasenij* [Geochemical methods of earthquake forecasting]. Moscow, Russia: Nauka Publ., 213 p. (In Russ.).

Dobrovol'skij, I.P., Zubkov, S.I., & Mjachkin, V.I. (1980). *Modelirovanie predvestnikov zemletrjasenij* [Earthquake Forerunner Modeling] (p. 7). Moscow, Russia: Nauka Publ. (In Russ.).

EEAS, Geophysical Survey of Russian Academy of Sciences. (2019). Retrieved from: http://www.ceme.gsras.ru/cgi-bin/new/equakes.pl

Levkovich, R.A., & Ismailov, A.Sh. (Eds.). (2007). *Seismicheskii monitoring i izuchenie geodinamiki territorii Dagestana i akvatorii Srednego Kaspiia. Sbornik trudov № 1* [Seismic monitoring and study of geodynamics of Dagestan territory and Middle Caspian water. Volume of works No. 1]. Makhachkala, Russia: Epokha Publ., 228 p. (In Russ.).

Levkovich, R.A., Dejnega, G.I., Kasparov, S.A., et al. (1982). *Geodinamicheskij jeffekt, sozdanija krupnyh vodohranilishh v sejsmoaktivnyh oblastjah* [The geodynamic effect of large reservoirs in seismically active areas]. Moscow, Russia: Nauka Publ., 76 p. (In Russ.).

Osika, D.G. (1981). *Fljuidnyj rezhim sejsmicheski aktivnyh oblastej* [The fluid regime of seismically active regions]. Moscow, Russia: Nauka Publ. 204 p. (In Russ.).

Razdel 1.3.1. Otsenka perspektiv vyiavleniia promyshlennykh skoplenii endogennogo vodoroda v litosfere. Ruk. proekta S.V. Belov [Section 1.3.1. Assessing the prospects for identifying industrial accumulations of endogenous hydrogen in the lithosphere. Project Manager S.V. Belov]. (2010). In *Otchet prezidiuma RAN N 14 za 2009 god* [Report of the Presidency of the Russian Academy of Sciences N. 14, 2009]. Moscow, Russia: GGM RAS Publ. (In Russ.).

Rebane, K.K. (1985). *Jenergija, jentropija, sreda obitanija* [Energy, Entropy, Habitat]. Moscow, Russia: Znanie Publ., 64 p. (In Russ.).

Sadovskij, M.A., & Pisarenko, V.F. (1991). [Similarity in geophysics]. *Priroda* [Nature], *1*, 13-23. (In Russ.).

Saidov, O.A. (1991). [Bend deformations and gas geochemical variations in excited earthquakes]. *Izv. AN SSSR, Geohimija* [News of AS USSR. Geochemistry], *1*, 27-38. (In Russ.).

Saidov, O.A., & Danijalov, M.G. (2007). [On the method of processing and interpreting time geochemical series as a harbinger of earthquakes]. In *Materialy II Mezhdunarodnoy seysmologicheskoy shkoly "Sovremennyye metody obrabotki i interpretatsii seysmologicheskikh dannykh"*. [Proceedings of the II International Seismological Workshop "Modern Methods of Processing and Interpretation of Seismological Data"] (pp. 184-189). Obninsk, Russia: GS RAS Publ. (In Russ.).

Saidov, O.A., & Sulejmanov, A.I. (2010). [Study of hydrogen variations in the surface atmosphere, helium and methane and natural gases in connection with seismic events in the Caucasus and adjacent territories]. In *Monitoring i prognozirovanie prirodnyh katastrof. Materialy nauchno-prakticheskoj konferencii k 40-letiju Dagestanskogo zemletrjasenija 14 maja 1970 g.* [Monitoring and forecasting natural disasters. Materials of the scientific-practical conference on the 40th anniversary of the Dagestan earthquake on May 14, 1970] (pp. 159-169). Mahachkala, Russia: DINJeM Publ. (In Russ.).

Vojtov, G.I., & Popov, E.A. (1989). [Earthquake geochemical forecast]. *Priroda* [Nature], *12*, 60-64. (In Russ.).

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