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The role of deep degassing in the problem of earthquake prediction and mininig accidents with gas explosions

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Results of about 40 officially registered short-term earthquake predictions developed using the empirical scheme of short-term earthquake prediction for different earthquake hazardous regions are presented in the works [1-3]. In [1] the main regularities of empirical scheme giving the most probable dates, epicenter locations and potential magnitudes of future earthquakes were verified neglecting the geophysical specifics of different earthquake hazardous regions. In the following earthquake prediction experiments, it was tested the possibility of short-term earthquake prediction for M6+ earthquakes in the defined region and defined time-frame without false alarms and missing events. Such experiments were successfully conducted for the Taiwan region for M6+ events [2] and for the Kamchatka region for M7+ events [3].

The important role of deep hydrogen degassing [4] was pointed out in [1-3] for the process of formation of cloud seismotectonic indicators (CSTI). CSTIs are new and the most informative earthquake precursors. They give not only additional localization of earthquake epicenter in the zones of seismomagnetic meridian (SMM) action, but also allows to calculate the potential magnitude of a preparing earthquake using the length of CSTI [1].

Periodic modulation of deep degassing in the weakened regions of lithosphere usually occurs in the time vicinity of specific lunar phases (new moons and full moons) as the result of tidal forces acting on the lithosphere and earth interior. Intensification of hydrogen degassing results in strength reduction for shearing forces in the weakened regions of lithosphere and, as a consequence, establishes conditions for earthquakes, mining accidents or gas explosions depending on the specific region, geological conditions and mining activity [4].

Regional indicators of hydrogen degassing intensification are negative anomalies of total ozone content in the stratosphere (so called ozone holes), which were revealed for the first time above the Antarctica. In recent years, these anomalies become frequently observed above the northern regions of Russia.

Results of the last seismic forecasting experiments and examples of the most tragic mining accidents with gas explosions since the 2000 year (mainly for the former ex-USSR regions) were presented. Total ozone content anomalies and other indicators and phenomena associated with each event are shown. Examples of strong earthquakes and mining accidents with gas explosion occurred in the regions located along the same SMM are shown.

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1. L. N. Doda, V. L. Natyaganov, I. V. Stepanov, “An empirical scheme of short-term earthquake prediction,” Doklady Earth Sciences, vol. 453, no.5, pp.551–557, Dec., 2013
2. L.N. Doda, V.R. Dushin, V.L. Natyaganov, N.N. Smirnov, I.V. Stepanov. “Earthquakes forecasts following Space and ground-based monitoring”, Acta Astronautica, vol. 69, issues 1-2, pp. 18-23., Jul.-Aug, 2011
3. L.N. Doda, A.A. Malashin, V.L. Natyaganov, I.V. Stepanov. “Seismotectonics and Ground-Space Monitoring of Signs of Natural Disasters in the Earth”, Acta Astronautica, vol. 109, pp. 254-263, Apr.-May, 2015
4. V.L. Syvorotkin. Glubinnaja degazacija Zemli i global’nye katastrofy [Earth deep degassing and global catastrophes], Moscow: Geoinformcentr, 2002, 250pp., [In Russian]