Variations of mercury vapor flow from Earth crust

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Changes of Hg concentration in the soil gas as well as mercury vapor flow from soil surface to the atmosphere is a well known phenomena. In geochemical exploration it serves as one of the best pathfinder elements for finding precious metals such as gold and silver, base metal sulphide deposits and volcanogenic deposits. Moreover, a permanently existing flow of mercury vapor through upper layer of soil as a result of earth's crust degassing is a main source of Hg in the atmosphere. The registration of this flow can serve as a good indicator of the earth crust's condition.

A group of Russian scientists from the Academy of Science performed a continuous measurements of Hg flow from the Earth's crust for several years (1981-1985). All measurements of Hg in soil gas have been performed by portable atomic fluorescence mercury analyzer with Hg preconcentration. The equipment was installed in the vault completely buried in a soil. The measurements were carried out each hour in a round-the-clock mode. Calibration was carried out daily by an injection method.

Using a method of controllable indignation the linear velocity of an ascending mercury flow was measured. The total velocity of vertical upward flow (8 sm/h) consist of an ascending flow (2,64 cm/h) and diffusional flow (5,36 cm/h). The strong dependence of mercury concentration in the soil gas from temperature, humidity and atmospheric pressure on the soil surface don't registered.

The round-the-clock long-duration detection of mercury has shown distinct periodic variations of Hg concentration in a soil gas. The mean logarithmic value of mercury flow was 220 pg/m^2h. Computer Fourier-analysis detect a harmonic components in variations of mercury flow with periods 7.8; 11.8; 23.4 h and 13.6 day which coincide with periods of the tide oscillations, caused by gravitational forces among Earth-Moon-Sun.

High sensitivity of monitoring allows detect the earthquake precursors as sharp increasing of Hg flow. The real earthquake precursor for magnitude 3 and distance from epicenter 15-20 km demonstrated 5-fold rise of mercury flow 29 h before and 90-fold rise 19 h before earthquake. The duration of precursors was usually 6-10 h. Implementation of the method in several points could allow estimate the time and intensity of earthquakes.