



Still about ionospheric earthquake precursors formation mechanism

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It is generally accepted that earthquakes (EQ) are the most dangerous natural phenomena leading to multiple losses in human lives and economics. Studies of the possibility to reliably detect the EQ precursors in order to predict them have been carried out during more than 50 years. Beginning from the late 70ies, the data collected from satellites also have been actively used in an attempt to detect the EQ precursors because they offer a clear advantage of global coverage compared to ground observations being mostly local.

An immediate question arises about appropriateness of satellite detection when obviously more powerful precursory phenomena on the Earth's surface have not been reliably connected yet with the processes preceding an EQ. A possible justification could be a difficulty of detecting ground signals connected with the EQ preparation because of the low energy flux density emanating from EQ preparation site and usually high interference level from natural and man-made sources, the latter leading to low signal-to-noise ratio in ground-based sensors. A satellite in orbit at typical ionospheric altitudes would cross all disturbed space there – if it exists – and measure a total signals radiated from all area influenced by the EQ preparation process. It is clear that before obtaining reliable answer for the question – is it possible to predict EQs using the information from satellites – necessary to answer at least three important questions. First, whether variations in the ionosphere definitely connected with the EQ preparation process do exist, second, if they do, what is their source in the lithosphere, and third, what is the mechanism of precursory signals transfer from lithosphere to ionosphere. Knowing this will allow substantiating satellite payload composition formation optimal for this task.

The processing of data collected by advanced onboard instrumentation of DEMETER satellite, by our opinion, gave the answer at least to the first one of these questions – yes, EQ precursors do exist in the ionosphere, and for strong and shallow EQs the probability of precursors observations may approach even more than 70%.

The commonly accepted answers to the second and third questions do not exist for the moment. Here an attempt is made to substantiate the most probable energy transfer mechanism in the lithosphere-atmosphere-ionosphere coupling (LAIC) system – from a future EQ epicentre to the ionosphere – basing on the available experimental data. First the commonly accepted for today LAIC model with amplification mechanism is analysed. Then a LAIC model which may use, but not need the amplification mechanism is discussed. It presumes atmospheric gravity waves formation and propagation as energy carrier from lithosphere to ionosphere, and recently, new strong confirmations of the trustfulness of such a mechanism are obtained.