



On recently studied possible atmospheric and ionospheric earthquake precursors and proposed physical mechanisms causing these phenomena

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About 20 years ago, a massive search for new, atmospheric and ionospheric precursors of earthquakes began. The aim was to improve the shorttime prediction of earthquakes, which seemed to be impossible using only traditional methods of prediction. Meanwhile, one knows a dozen of new presursors. One investigates thermodynamic parameters of the atmosphere, for instance temperature profiles and humidity, one studies the emanation of gases in seismo-active regions, considers biological and geochemical processes. A lot of work was performed to analyse electromagnetic phenomena occurring before earthquakes. The propagation of infrasound and seismo-gravity waves was investigated. Characteristic parameters of the atmosphere, for instance the foF₂-, foE-, and fbEs-frequencies, were analysed, and Es-spread and F-spread on the ionogrammes of vertical sounding stations were studied. Further, also a lot of models appeared explaining different pre-earthquake phenomena, but unfortunately not all phenomena observed under special conditions.

Thus here, various possible earthquake precursors are reviewed. It is discussed how different precursors might be connected. Special attention is payed on contributions by the authors to develop two mechanisms of the generation of electric field variations before earthquakes, to describe non-equilibrium thermodynamic effects, and to explain excitations of plasma turbulence before earthquakes at different altitudes. Also some first active experiments to predict earthquakes are shortly mentioned.

It is concluded that only the simultaneous analysis of various earthquake precursors and the simultaneous application of different active methods of prediction using earth-based, atmospheric and satellite methods - but also further-developed "traditional" seismic methods, will help to solve the earthquake-prediction problem.