

Satellite monitoring of seismic hazard area geodynamics using the method of lineament analysis

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The results of monitoring of seismic hazard area geodynamics using the method of satellite image lineament analysis are presented. Studies of lineament system dynamics were carried out during the period of preparation and occurrence of strong earthquakes in 2001-2004 in California. Increase of lineament system evidence during the earthquake preparation is determined. This increase begins 2 – 3 months before an earthquake and reaches its maximum 20 days (on average) before it. After an earthquake the intensity of lineament evidence decreases gradually and after 2 – 3 months reaches its usual conditions. The possibility of use of such analysis results is based on the assumption that lineament systems in a satellite image are closely connected to the systems of seismogenic irregularity and respond to deformation scheme change which is caused by change in earth's crust stress field. As a rule, lineaments are arranged as a net with several dominating directions which are consistent with planet's fracturing. Depending of their extension lineaments are divided into transcontinental, transregional, regional and local. Their evidence in satellite imagery is different. Lineaments form either narrow distinct lines or linear zones with internal structure, or wide (first hundreds of kilometers) bands consisting of extended lineament zones. Thus, the level of image generalization is very important when studying various lineaments of various depths. To monitor processes preceding earthquake, it is expedient to use imagery having resolution of first tens of meters. Due to such generalization it is possible to see the dynamics of wide lineament zones corresponding to fault systems. Systematization and operational processing of a series of satellite images taken by TERRA and AQUA (MODIS (620 – 670 nm spectral band, 250 m spatial resolution) were carried out for the territory of California (USA) during the monitoring of seismic hazard area geodynamics. Geodynamical precursors of a series of earthquakes occurred in August – November 2004 in California were detected as a result of performed satellite monitoring. Thus, the performed researches have shown that use of lineament analysis of satellite imagery together with other remote methods of precursor study allow us to organize operative seismic monitoring for the purpose of detecting precursors of time, intensity and location of an earthquake.