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Observation of crustal deformations by the long-base wide-band laser interferometer: the problems of global and local geodynamics

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The long-base wide-band laser interferometer with a measurable armlength of 75m, situated in Baksan valley (the North Caucasus, Russia), is used for monitoring crustal deformations over a wide frequency range. The optical scheme of the interferometer, installed in an underground tunnel, is the two passes (N=2) Michelson-type interferometer. The long-term monitoring strains of the Earth is provided in several channels: from very low frequencies up to 1.6 kHz. Unique geodynamical features of the region, the proximity of the Elbrus volcanic edifice and existing long-term high-quality time series of observed deformations allow to study a wide class of geophysical phenomenae. Some of them are listen below.

The existence of the deformations having a global character on short time scale (order of month) is proved at a statistically significant level. The links between global component of strain field, global seismic processes and global geodynamics of the Earth (variations of the velocity of rotation) are shown. The new method for a control of the state of magmatic structures of the Elbrus volcano was developed. The method is based on revealing resonant modes, exited by the magmatic resonant structures upon incidence of a broadband teleseismic signals. Revealed resonant modes are related to the shallow magmatic chamber of the Elbrus volcano with the characteristic size of about 9 km and setting down on the depth of 1-7 km. Four-year observation of tidal deformation revealed 12% anomaly of tidal wave M2 amplitude factor. Numerical

modeling showed that observed anomaly is apparently caused by the deep magmatic source of the Elbrus volcano.

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