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Short-period variations of the Earth's rotation rate and global deformation processes in the Lithospere

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Strain data recorded by two laser interferometer-strainmeters operating in the Baksan (Northern Caucasus, Russia) and Gran Sasso (Italy) underground observatories, and the length-of-day (LOD) data describing the variable rate of the Earth's rotation are used to study the relation between the deformation processes in the lithosphere and the global geodynamics of the Earth over short time intervals. The methods applied are based on analysis of the coherence of the studied processes, and correlation analysis.

A significant (90%) correlation is revealed between the local deformation fields at two remote observation stations, which proves the existence of a global (at least on the scale of the Eurasian plate) component in the Earth's deformation field that manifests itself at characteristic time intervals of up to 1–2 months. At the same level of significance, the correlation between the local deformation fields and variations in the rate of the Earth's rotation has also been identified. The found correlations in the tidal low-frequency range are caused by the direct impact of the long-period tidal loading (M_f and M_{tm} waves) on the lithosphere and the length-of-the-day (LOD).

On the contrary, the significant correlation in the non-tidal range is probably linked to irregular perturbations of the continental character, which create a coherent interference in the studied processes. The global mechanism that causes this coherent noise requires further study. As candidates, the atmospheric influence, the strongest earthquakes, and other global geodynamic processes can be considered.

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