Simultaneous earth ground strains and underground water level variations

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The common application of laser interferometers and capacitive transducers has yielded the first results on study the correlated strains of the earth surface, variations of atmospheric pressure and level of underground waters. We present the outcome of comparative analysis of records obtained by long-path laser strain-meters with basis of 10 m and 300 m, which have operated together with the manometer sensors measuring the level of water in non-working wells by depth of 400-1000 m and atmospheric pressure with a resolution 0,03 mbar at sites being about 40 km apart. The temporal and spatial scales of disturbances, velocity of their propagation and seasonal modifications of the defined barometric coefficients have been found. The connection of underground waters regime with the earth surface strains was known earlier. Under the actuation or switching-off (cut-out) of water pumps in wells on depth up to 100 m the ground strain velocities up to 10-20 micron / hour were observed at different sites. Recently we have studied the microstructure of simultaneous earth ground strains, atmospheric pressure, and underground water level variations.We found these geophysical parameters to be subjected to dynamic modifications, which are characterized by spatial and temporal scales. We have refined two of them: near the 400 km (life time about 100 hours) and near the 100 km (life time 20-30 minutes), which differ both the values of strain-barometric and hydro-barometric coefficients, as well as the velocities of their spreading along the earth surface. The seasonal variability of the defined coefficients was detected and the velocity range has been updated to 30-60 km/h. The last one includes the propagation velocities of atmosphere-lithosphere undular disturbances, which we have already observed by the spatially distanced laser and gravity-inertial sensors. The found range corresponds to the velocities of air masses movements in the diverse atmospheric strata.