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Mitigation of the effect of changes of atmospheric pressure on gravity detectors

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Low-frequency changes of atmospheric pressure contribute to measurement noise of gravity detectors. On one hand, changes of frequency around 0.1 Hz and less cause tilt of the ground and the instrument placed on it. This results undesirable components of long-wavelength and large amplitude in the signal of torsion balances. On the other hand, infrasound waves propagating in the atmosphere changes the density of air, and hence cause changes in the gravitational field. These result undesired movements of the test-masses of gravitational-wave (GW) detectors. One strategy to mitigate the effects of changes of atmospheric pressure on gravity detectors is installing the instruments under the ground.
I will present recent results of infrasound measurements performed at Sos Enattos mine (Sardinia, Italy). This is one of the candidate sites for Einstein Telescope, a proposed third-generation GW detector currently in the preparatory phase. Infrasound is monitored at three levels below the ground, as well as on the surface. I will talk about the mitigation of infrasound in the function of depth, and its relationship with other noise sources.
I will show the effects of atmospheric pressure changes on a gravity gradiometer, the automated Eötvös balance operating 30 meters below the ground at Jánossy Underground Research Laboratory (Csillebérc, Hungary). I will present an experiment, during which controlled tilting of the balance helps to understand the effects of ground tilts.

Submitted on behalf of a Collaboration?

No

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