

# Analysis of the results of geodeformation monitoring of offshore fields of the Northern Caspian

---

**Kuzmin Y.O. (1), Deshcherevskii A.V. (1), Fattakhov E.A. (1),  
Kuzmin D.K. (1), Kazakov A.A. (2), Aman D.V. (2)**

(1) Schmidt Institute of Physics of the Earth of the Russian Academy of Sciences, Moscow, Russia

(2) OOO «LUKOIL-Nizhnevolzhskneft», Astrakhan, Russia

e-mail: fea@ifz.ru

The analysis of the results of geodeformation monitoring, which was carried out on the production platforms located on the offshore fields by the oil and gas company PJSC "LUKOIL" in the Northern Caspian sea, is demonstrated. The installed set of measuring instruments (inclinometers, accelerometers, etc.) in constant monitoring mode allows to estimate the stability of the platforms in time [Kuzmin et al., 2018]. Processing of time series of inclinometric observations was carried out using specialized software developed at the Institute of physics of the Earth. O. Yu. Shmidta RAN (package WinABD). According to their purpose inclinometer is a typical tiltmeter, similar to the traditional pendulum [Aleshin et al., 2017]. The amplitudes of tidal and seiche impacts are estimated, and the dynamics of changes in the position of the production platforms in time are also described. The Fourier spectral and temporal analysis combined with the periodogram analysis [Fattakhov, 2017] allowed us to identify a number of periodic oscillations of roll and trim of the platforms. The calculations made it possible to conclude that gravitational tides (both sea and earth) in the Northern Caspian do not affect the stability of the platform.

In addition, in conjunction with the processing of inclinometric observations, mathematical modeling of sea bottom deformations was carried out due to the development of deposits, which allowed to estimate the maximum vertical displacements and slopes of the sea bottom [Zhukov et al., 2002].

1. Kuzmin, Yu. O., Deshcherevskii, A. V., Fattakhov, E.A., Kuzmin, D. K., Kazakov, A. A., & Aman, D. V. (2018). Inclinometric Observations at the Korchagin Deposit // *Izvestiya, Atmospheric and Oceanic Physics*, 2018, Vol. 54, No. 8, pp. 932–940.

2. Aleshin, I.M., Ivanov, S.D., Koryagin, V.N., Kuzmin, Yu.O., Perederin, F.V., Shirokov, I.A., Fattakhov, E.A., Online publication of tiltmeter data based on the SeedLink protocol, *Seism. Instrum.*, 2017, vol. 54, no. 3, pp. 254-259. doi 10.21455/si2017.3-3

3. Fattakhov, E. A. (2017). Spectral-temporal analysis of laser rangefinder observations on the Kamchatsky and Ashgabad geodynamic polygons. *Vestnik SGUGiT [Vestnik SSUGT]*, 22(4), 5-17.

4. Zhukov, V.S., Kuzmin, Yu.O., and Poloudin, G.A., Assessment of processes of the Earth's surface subsidence during gas field development (the test case of North-Stavropol field), *Geol., Geofiz. Razrab. Neft. Gaz. Mestorozhd.*, 2002, no. 7, pp. 54-60.