



## **Studying of modern growth dynamics of gully using instrumental methods**

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Gully growth rate is good indicator of the intensity of the water and sediment runoff from agricultural lands. The Russian Plain is one of the largest agricultural area in the temperate climate zone with high quality of soils. Climate changes and some land use changes had affected on the erosion processes rate during last 20-30 years. Six key sites were selected in the different landscape zones (forest, forest-steppe and steppe) of the Southern half of the Russian Plain. This sites were selected for the detail monitoring of the gully linear, planar and volumetric growth rates based on application the different methods, including benchmark pins, repeated geodesic survey and 3D terrestrial laser scanning. 44 different types of gullies were selected for monitoring within the 5 key sites, located in Tatarstan Republic, Saratovskaya, Voronezhskaya and Orenburgskaya regions and Stavropolskiy krai, where investigation is carried out during 2015-2016. 168 gullies were included in monitoring in Udmurt Republic, where observation is carried out during 1978-2016. Measurements of gully growth are undertaken twice per year after spring snow-melt in May and after rainfall warm year season in October. Results of long-term monitoring in the Udmurt Republic allow to identified considerable the reduction of the gully head retreat rates from 1.3 m/yr in 1978-1997 up to 0.3 m/yr in 1998-2016. It was established that decrease of gully head retreat rates had occurred during snow-melt because of the increasing of air temperature during winter, decline of soil freezing depth and reduction of surface runoff from the gully catchments during spring snow-melt, as a consequence. The gully head retreat rates on the other 5 key sites are in the range 0 - 0,3 m/yr according initial results of the monitoring.

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