

# Studying the Landslide Processes at "dalgiya Yar" Landslide Circus by Combined Use of GNSS and InSAR

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## SUMMARY

The main objective of this research is monitoring the ongoing landslide processes by complementary use of satellite borne SAR data and GNNS measurements. It will be achieved by means of proved methodology for continuous monitoring of landslide areas by integrating interferometric images and GNSS data from permanent and local geodetic networks. The study has delivered reliable information for ongoing risky geo-processes for the region of the Northeastern Bulgaria known with several large active landslides.

Initially a local archive with Sentinel-1A/B images for this region was created and a number of interferograms covering the period January 2015 – Dec 2018 were produced. A raster heat map based on the obtained from the interferograms displacement values was produced. The area of investigated in the framework of this study is "Dalgiya yar" - a landslide circus in which concentration of ground deformations has been observed for the last 30 years.

For the study, a newly created geodynamic network in and around the landslide area "Dalgiya yar" – “Fara” was established consisting of 30 points. To study the landslide process, several types of points are needed – ones fixed on geologically stable terrain, others located inside the landslide. For stable points located in the non-deformable zone of the landslide permanent GNSS network created and maintained by the National Institute of Geophysics, Geodesy and Geography-BAS were used.

In the geodynamic network "Dalgiya yar" 6 points that have been used in previous surveys to track deformations are included. A preliminary study based on data provided by Ministry of Regional Development and Public Works of the landslide processes was done. The analysis of horizontal and vertical deformations for the period 2013 - 2018 show a good correlation with those from SAR data. In this study also reported are the results including in the last GNSS measurement cycle carried out

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in June 2019.

The results are important for understanding the origin and the dynamics of landslide processes as well as assessing the resulting hazards.

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