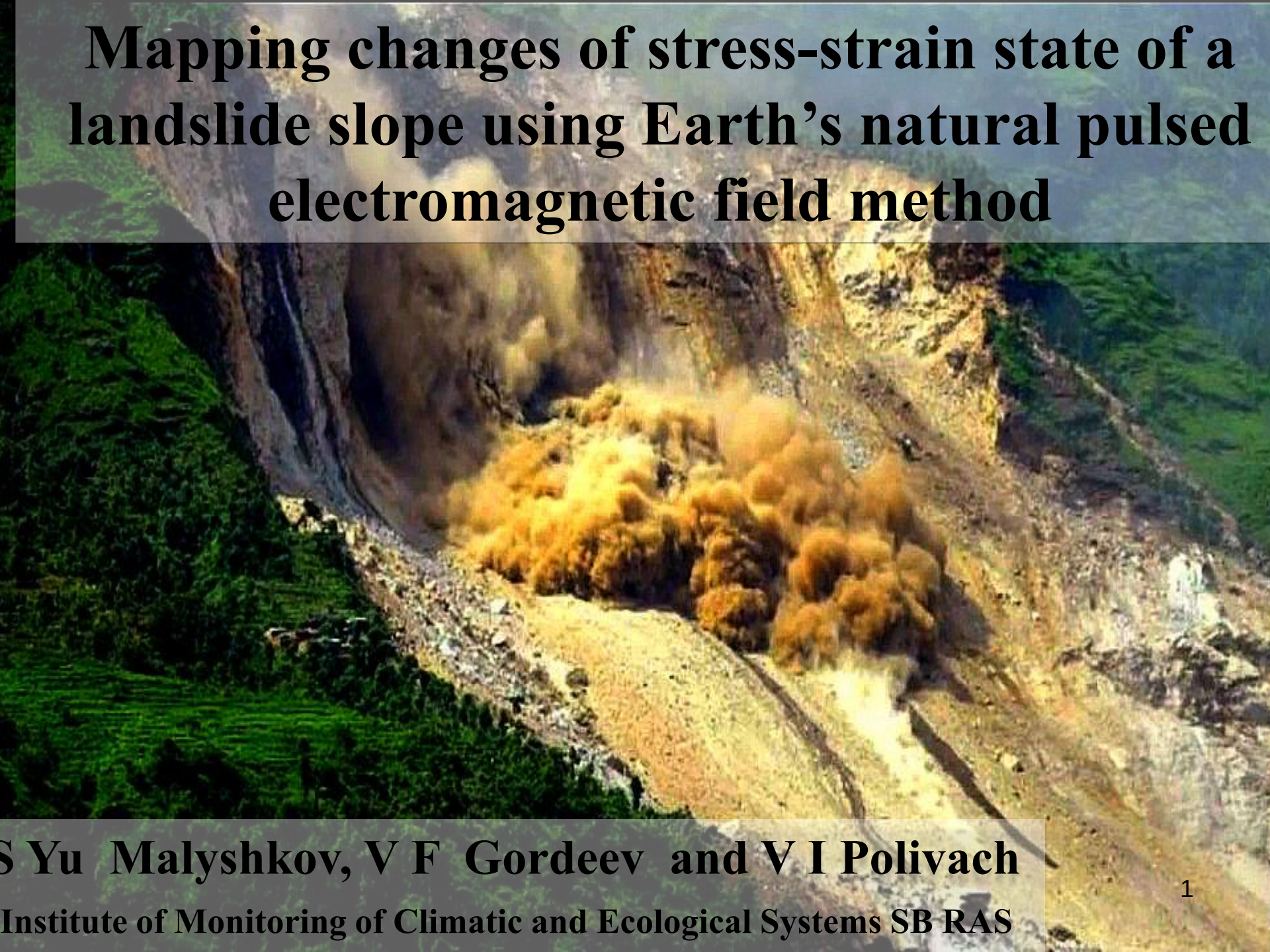
Mapping changes of stress-strain state of a landslide slope using Earth's natural pulsed electromagnetic field method



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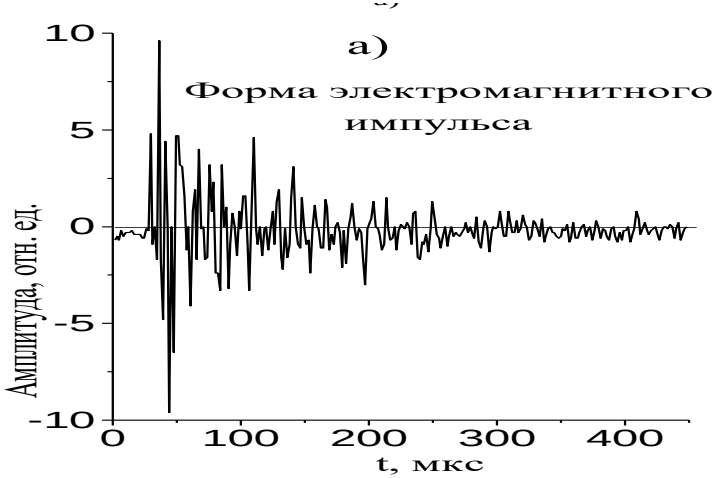
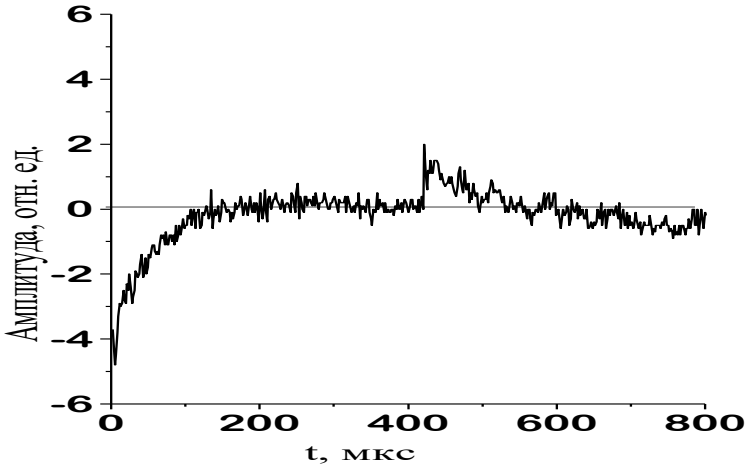
The research used Earth's natural pulsed electromagnetic field (ENPEMF) method based on the phenomenon of electromagnetic emission - dielectric materials emissive ability when they are acted on.

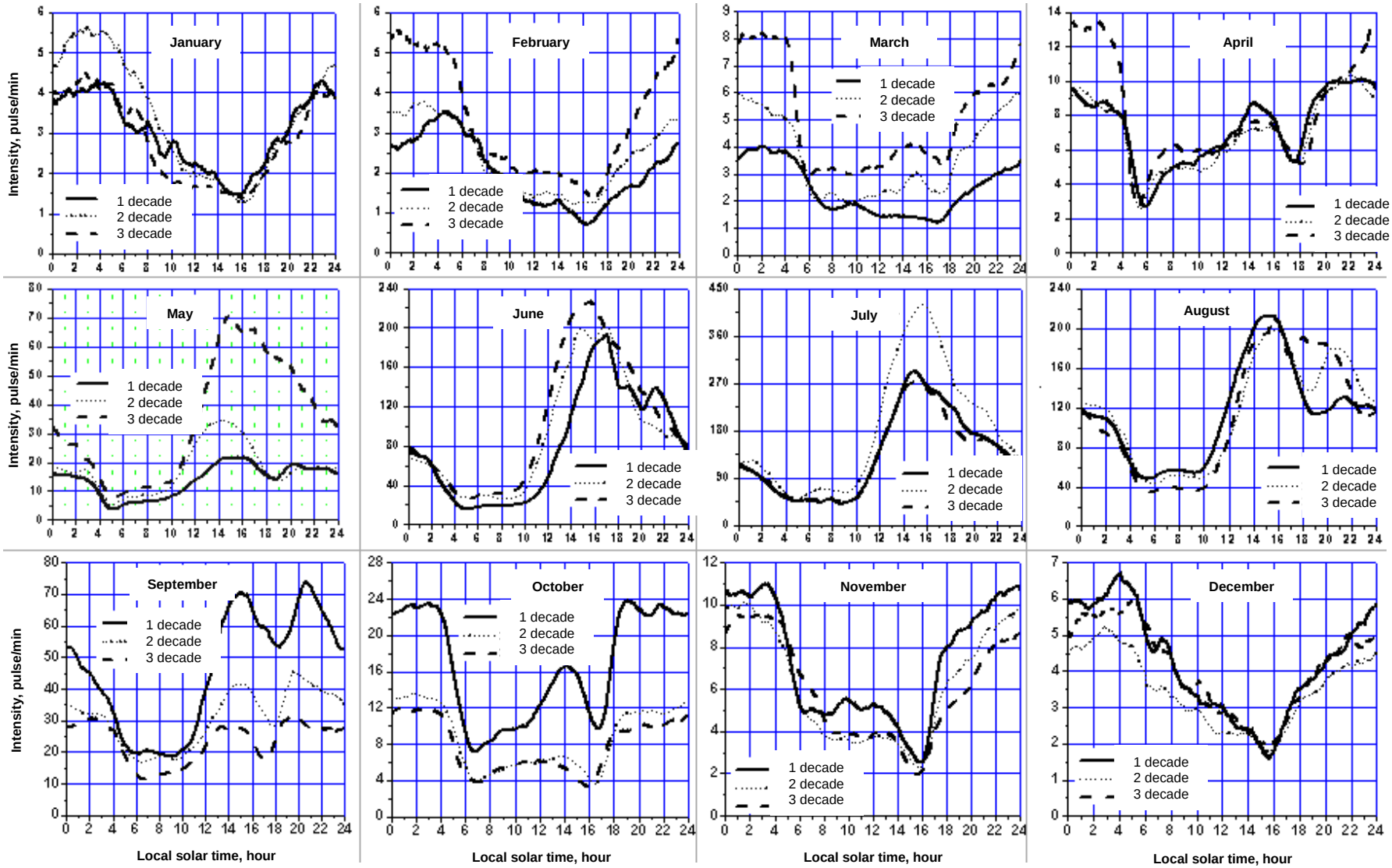




In rock formations there can be the following sources of natural electromagnetic fields: soil structure inconsistencies, unequally strained structures, fractures and microfractures.

Electromagnetic emission emerges in the process of charges generation and relaxation on fracture planes during the stress state of the rocks. Pulses emerge both when dielectric uniformity changes and when electrolyte-filled capillars rift. Observing electromagnetic emission allows the monitoring of stress-strained state of the rock formation

Diurnal Variations of NPEMFE, Discrepancy to Atmospheric Mechanisms



From 1997 to 2004 period averaged and smoothed diurnal variation of NPEMFE intensity for various months of the year (Talaya, Pribaykalye), N-S channel

(on each curve there is 1440 points)

NIEM Method In Monitoring.

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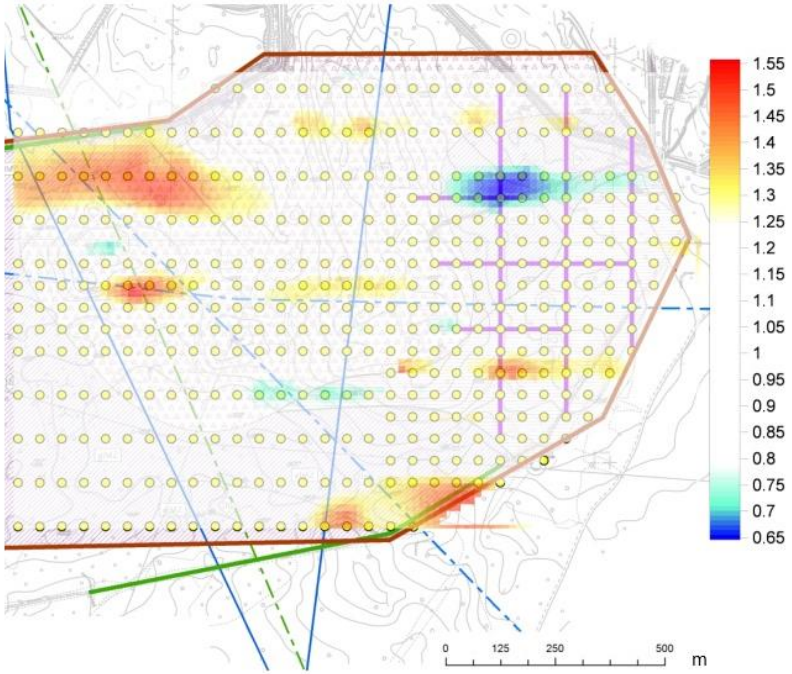
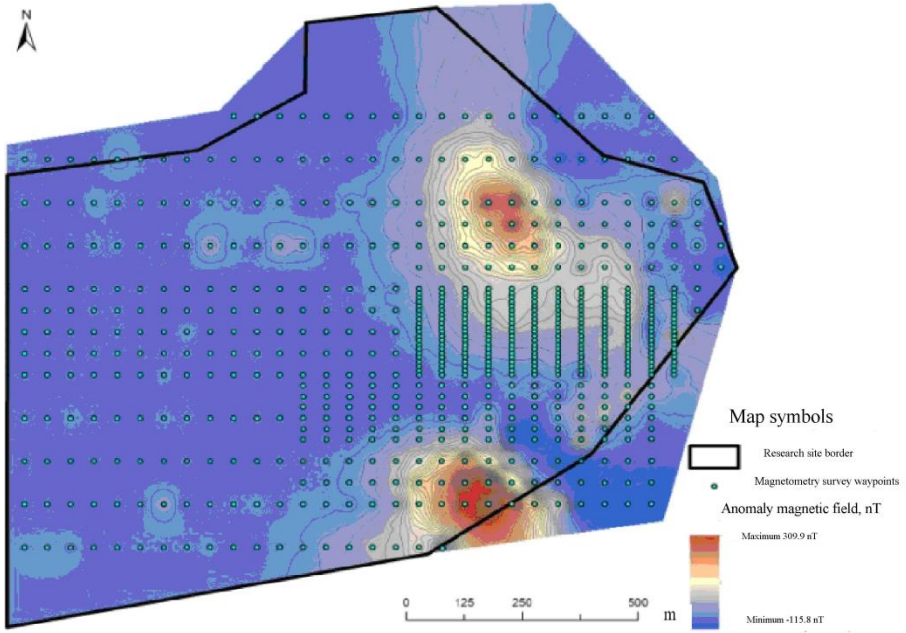
Rocks in a state of stability

Mapping of geophysical anomalies

a)

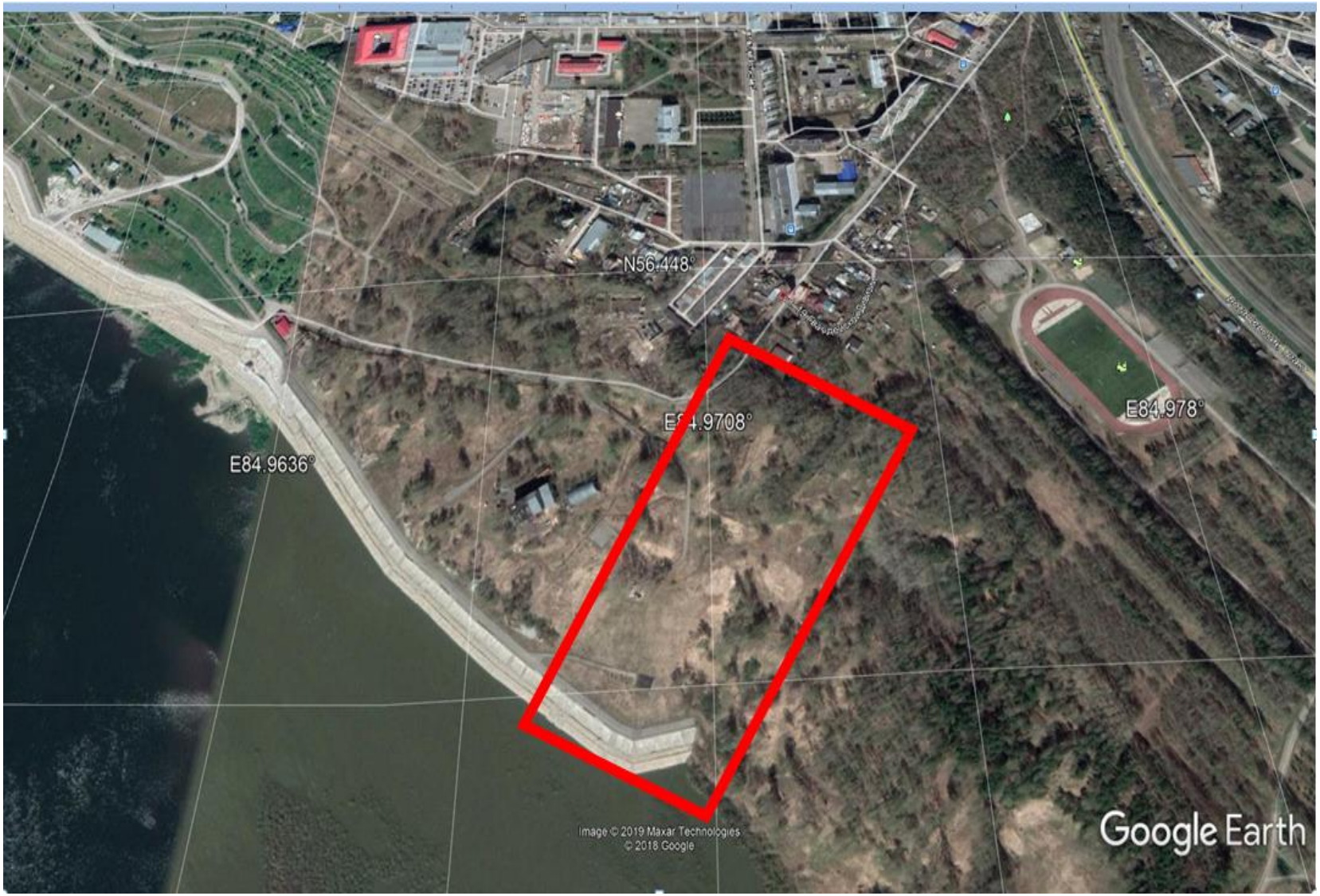


b)



Anomaly field layout based on
ENPEMF recording (a) and magnetometry (b).

Satellite image of areal research site

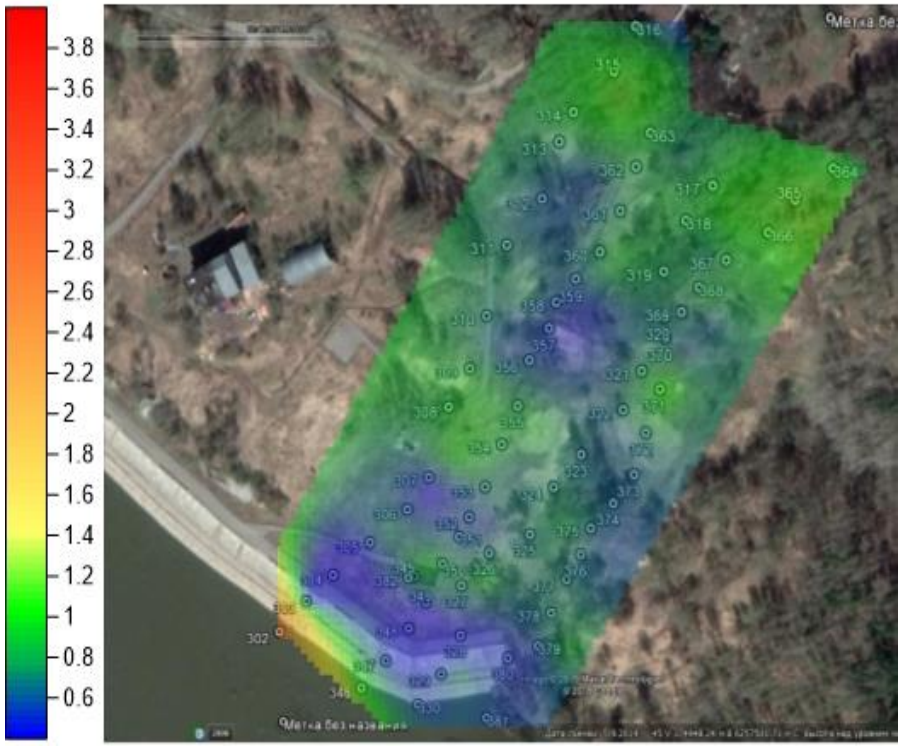


Photos from the field work site

ENPEMF anomaly map 7.08.2019: a – channel N-S; b – channel W-E.

a)

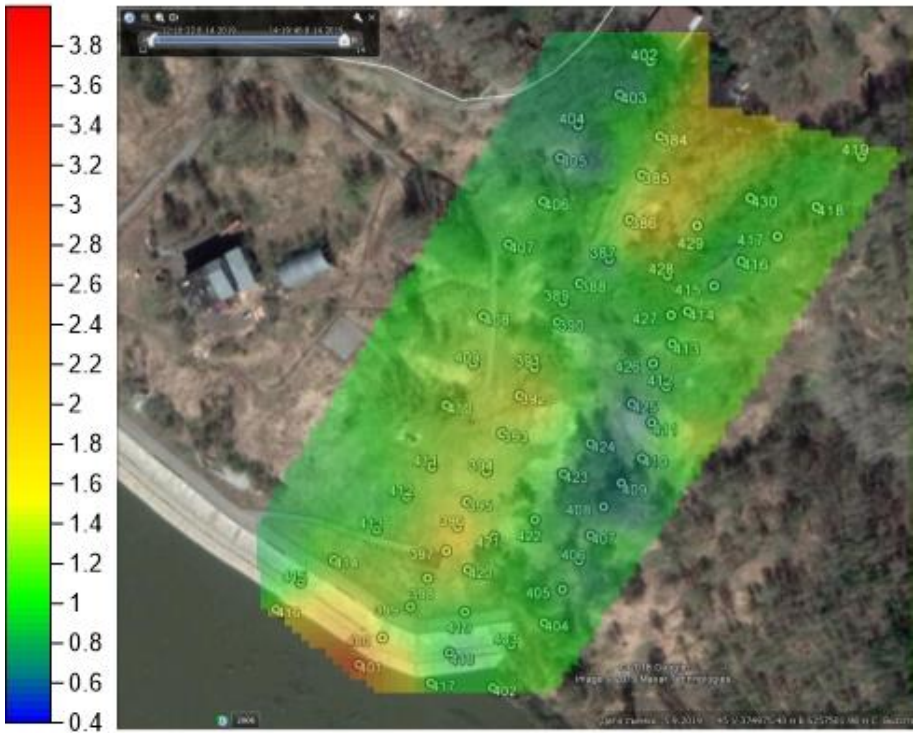
b)



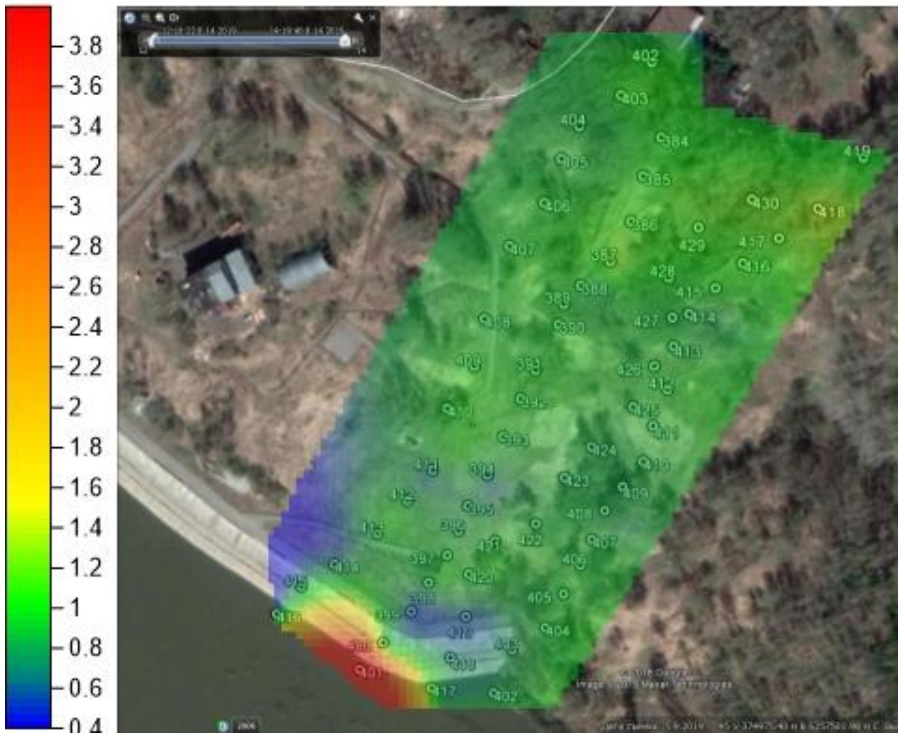
Survey demonstrated that large part of the slope is in a compression stress state, while riverfront zone is in tension stress state

ENPEMF anomaly map 7.08.2019: a – channel N-S; b – channel W-E.

a)



b)



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Integrated ENPEMF anomaly map

This work presents the results of the field research carried out on the site, prone to intensive landslide process development, ravine erosion and rain-wash, using Earth's natural pulsed electromagnetic field (ENPEMF) method.

Field research and survey on the slope have demonstrated that exogenic slope processes can develop rapidly and occasional surveys are not enough to protect infrastructure objects. It is necessary to establish permanent online monitoring of stress-strain state of the rock formation. ENPEMF method allows to estimate stress-strain state instrumentally in real-time and could be recommended as a continuous monitoring method for ground state.


Thanks for your attentio