

SEI HPE LPR
“DONBASS STATE TECHNICAL UNIVERSITY”



Hardware and software complex (HSC) for
implementing the geoecological monitoring of
the earth's surface and rock mass shifts

Authors:

PhD student Kuzmin G.O.

(training course 05.06.01 «Earth Sciences»)

Undergraduate student Kusayko A.S.

(specialization «Mine-surveying»)

The long-term goal is the implementation of systematic integrated environmental monitoring within the territory of the Lugansk People's Republic.

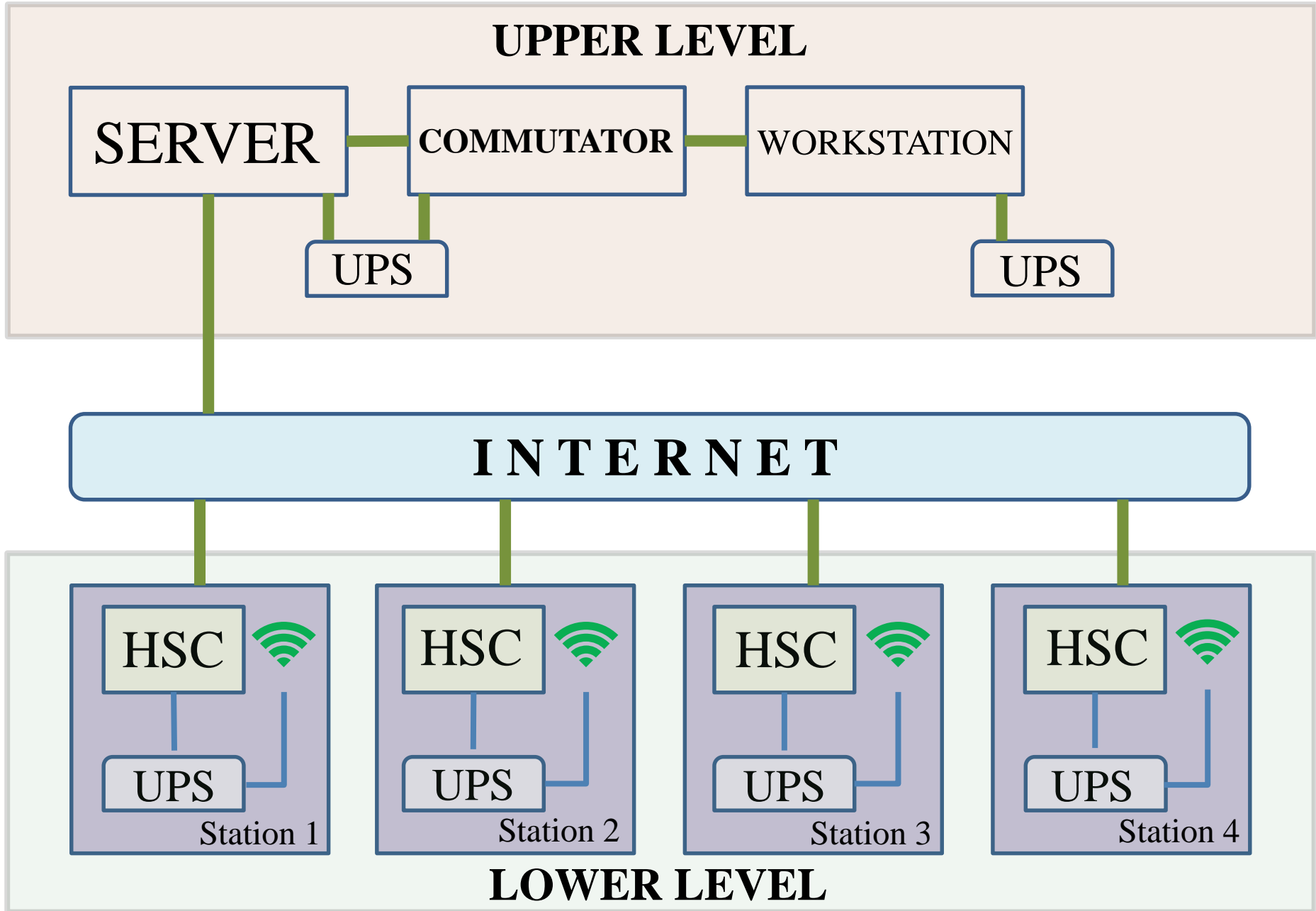
The aim of the first stage of work is the implementation of a monitoring system for shifts of the earth's surface and rock mass.

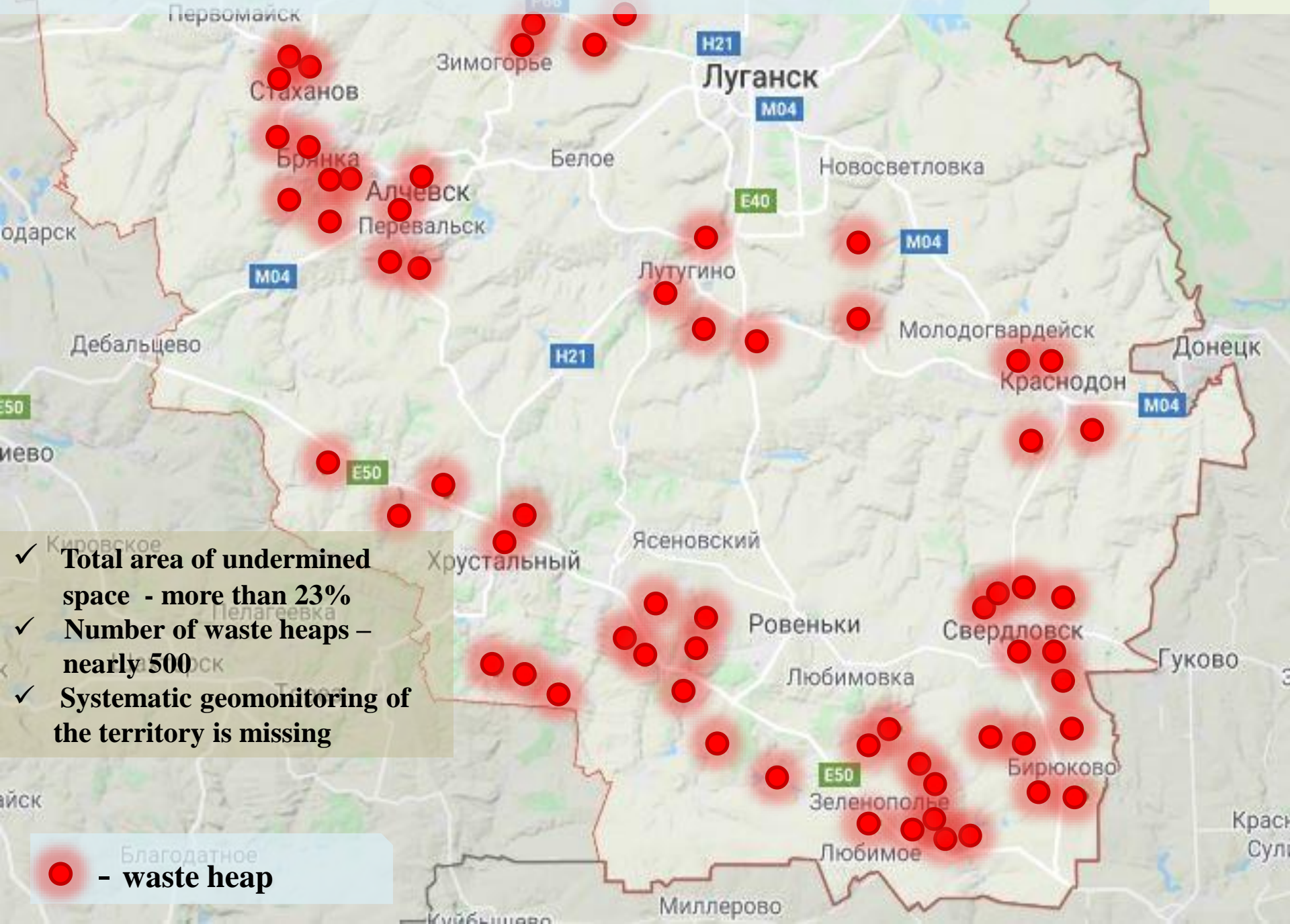
The task is to develop a hardware-software complex (HSC) for geoecological monitoring.

HSC requirements:

- ✓ observation recording automation;
- ✓ remote transfer of results;
- ✓ simplicity and reliability of the design;
- ✓ configuration flexibility and autonomy.

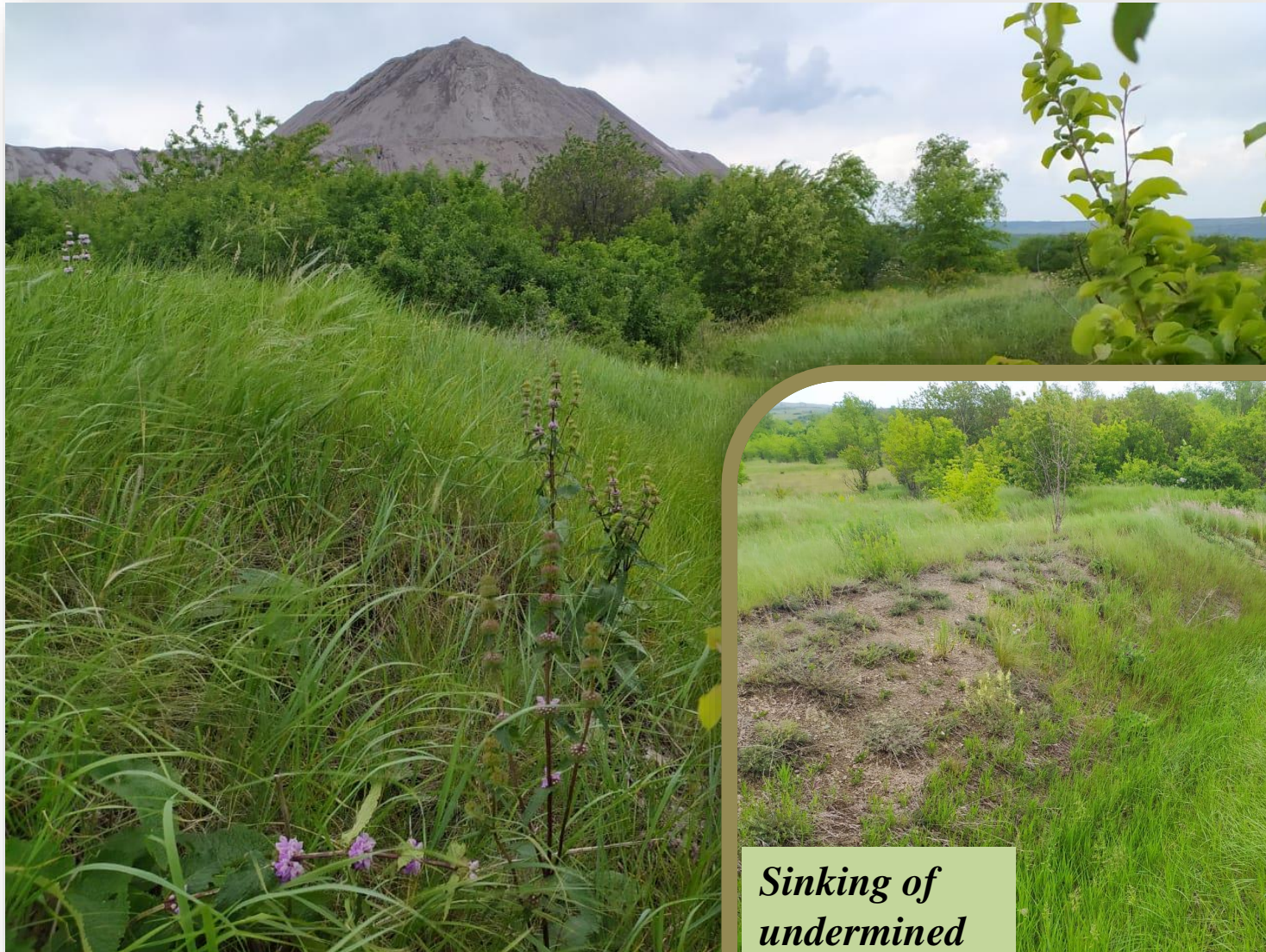
TWO-LEVEL MONITORING SYSTEM





- ✓ Total area of undermined space - more than 23%
- ✓ Number of waste heaps – nearly 500
- ✓ Systematic geomonitoring of the territory is missing

● - waste heap

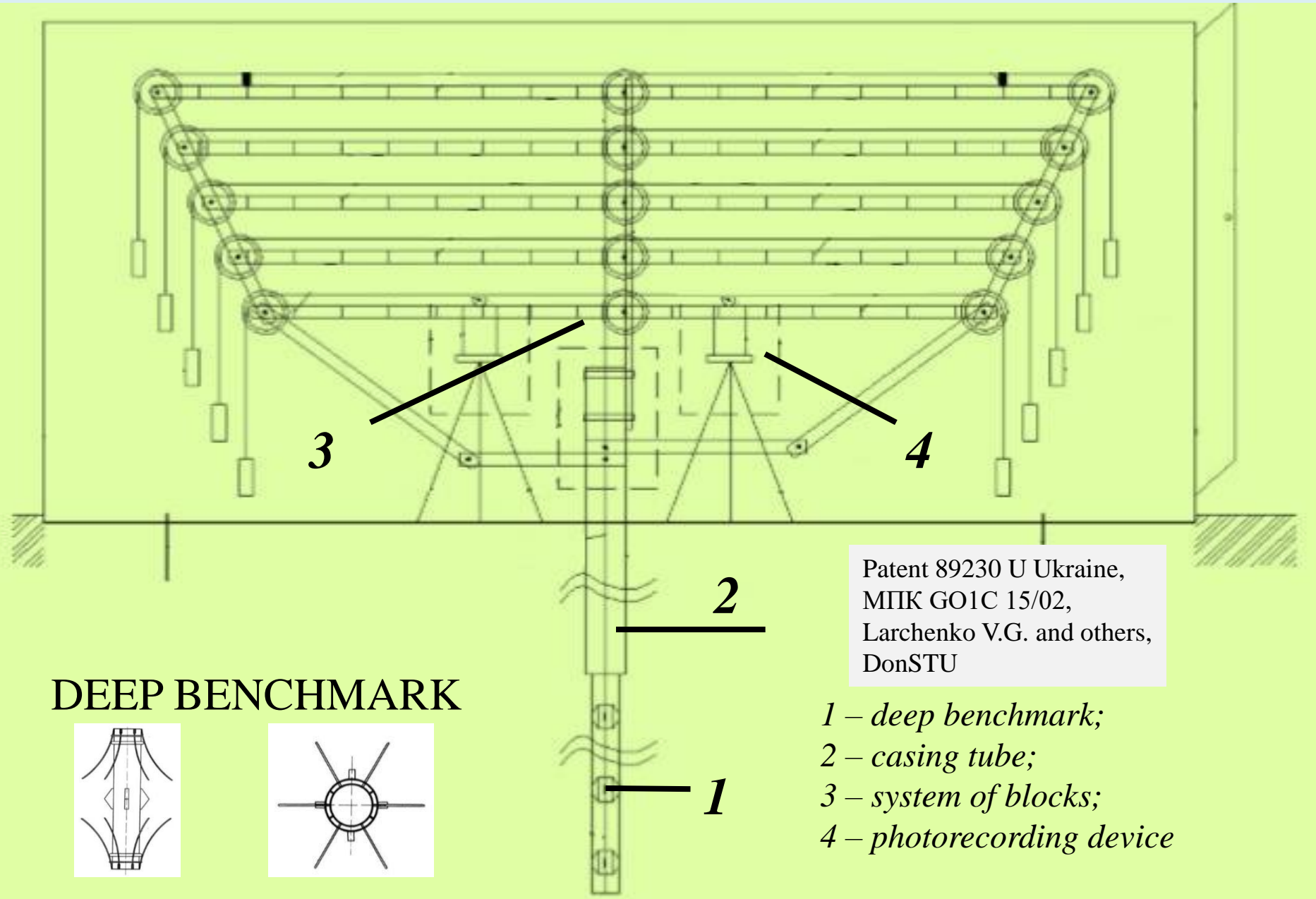


Slag heap of a metallurgical plant within the territory of Kadievskaya mine Alchevsk, 2020



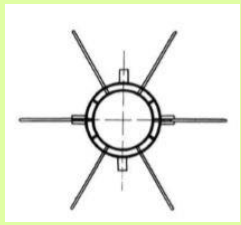
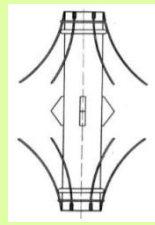
Sinking of undermined surface

MEASURING STATION FOR STUDYING THE DEFORMATIONS OF UNDERMINED ROCK MASS

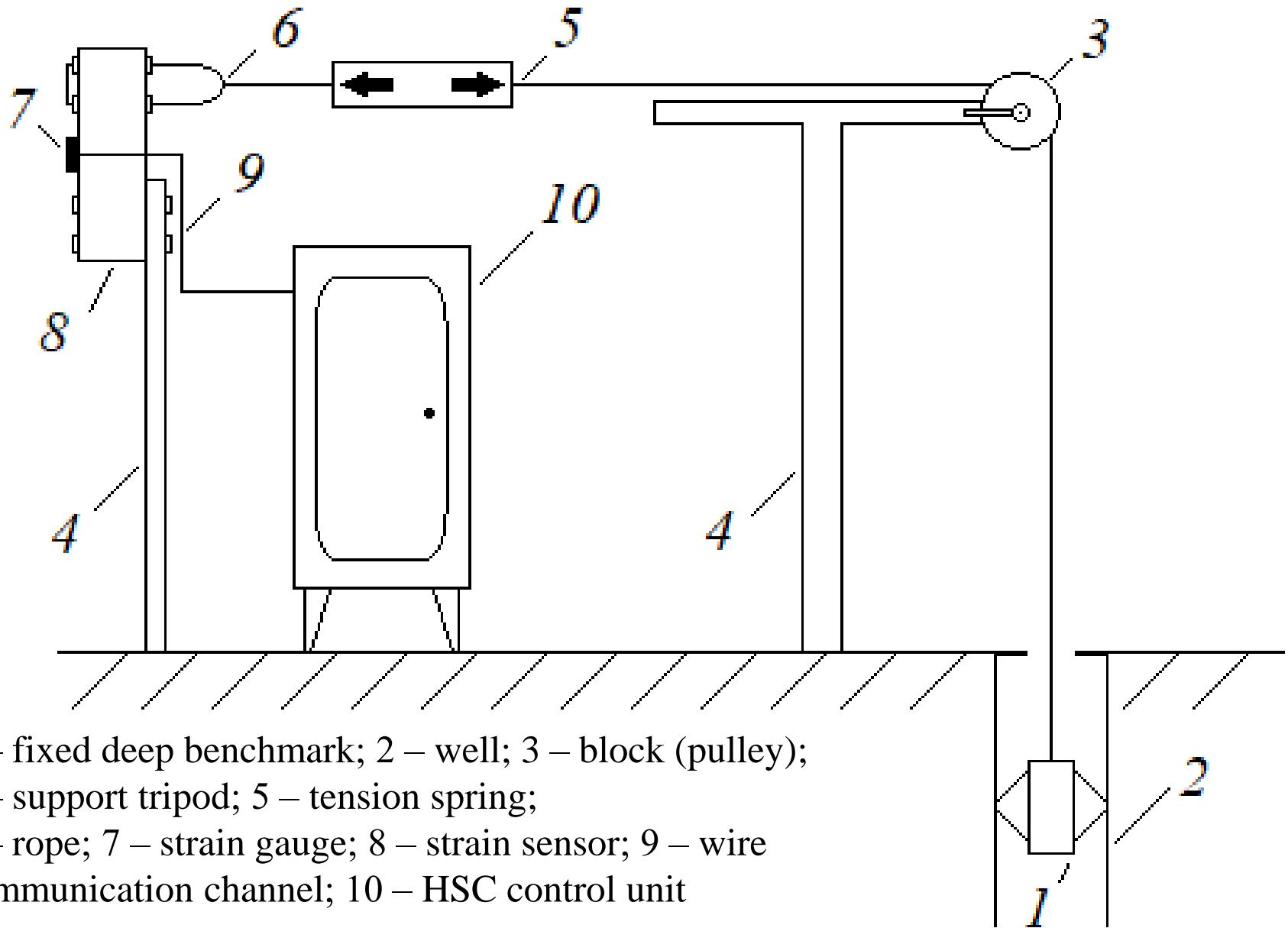


Patent 89230 U Ukraine,
MIIK GO1C 15/02,
Larchenko V.G. and others,
DonSTU

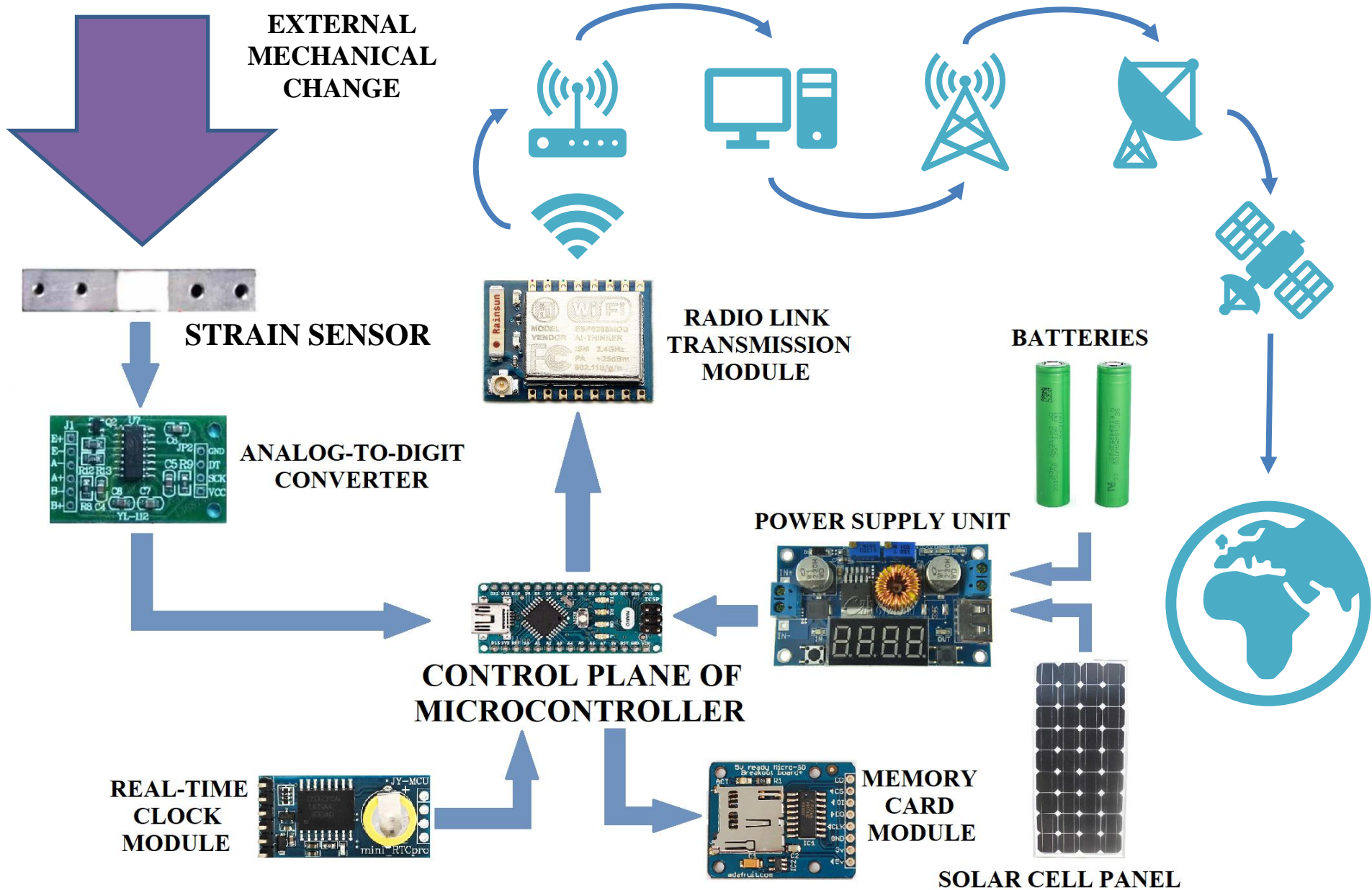
DEEP BENCHMARK



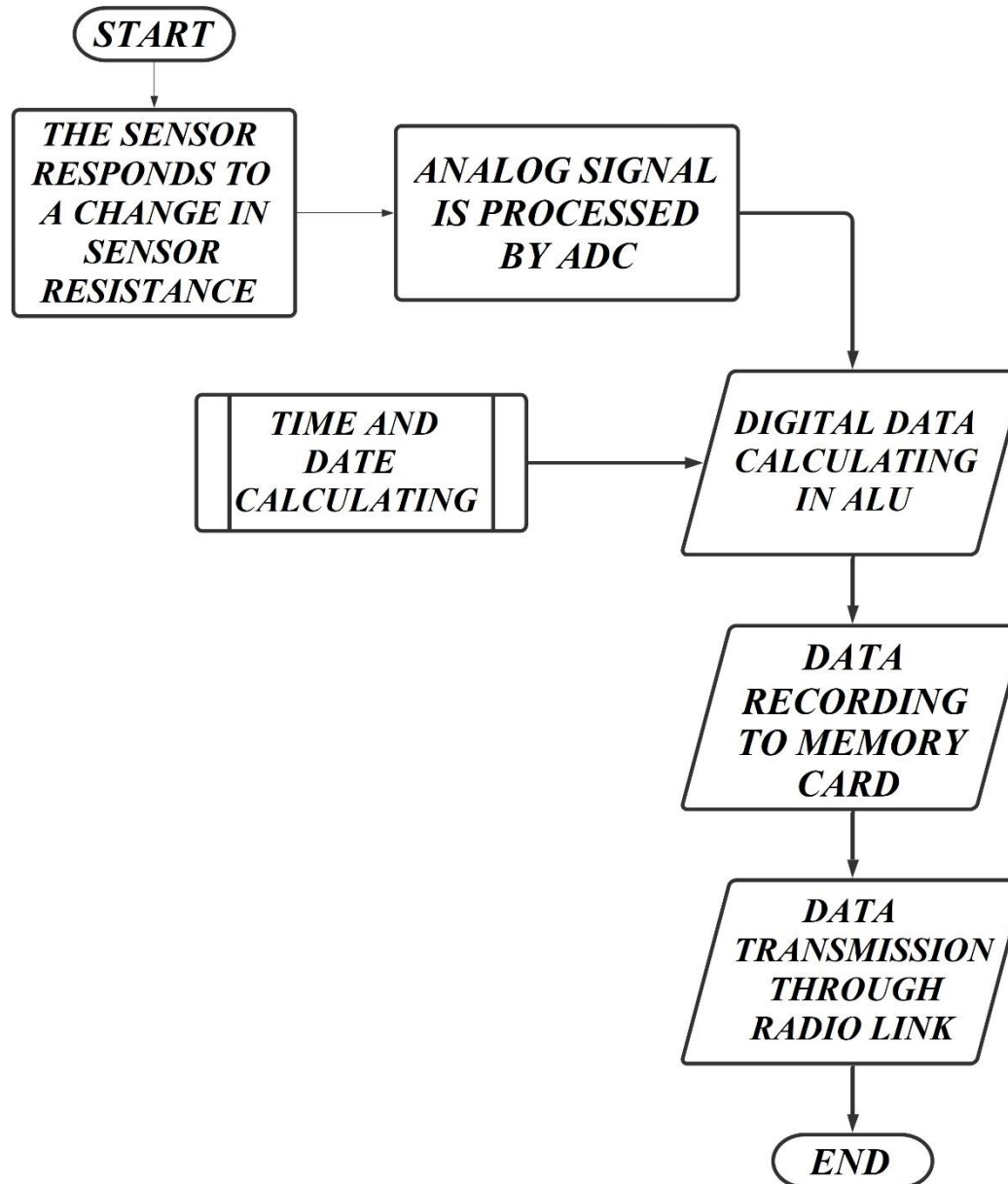
- 1 – deep benchmark;
- 2 – casing tube;
- 3 – system of blocks;
- 4 – photorecording device



1 – fixed deep benchmark; 2 – well; 3 – block (pulley);
 4 – support tripod; 5 – tension spring;
 6 – rope; 7 – strain gauge; 8 – strain sensor; 9 – wire
 communication channel; 10 – HSC control unit



FLOWCHART OF PROGRAE ALGORRYTM



CONCLUSIONS

- 1. An improved design has been proposed for measuring station used for monitoring the deformations and shifts of the earth's surface and rock mass through benchmarks system.*
- 2. An automation system for an existing measuring station has been developed with fundamental changes in the approach to measuring work automation.*
- 3. The software module of the measuring station with the provided possibility of modification and updating has been developed.*

In the future, to continue this direction, it is planned to develop a project of geocological monitoring using the described hardware-software complex to solve problems in the field of subsoil use and the region's environment based on the astronomical observatory - the ORION Center for Laser-Optical Measurements, established at DonSTU.