

Improvement of the monitoring methods of the surfaces movements, situated in the mining zones

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Abstract: *The movement and deformation phenomenon of the land surface continues to be a big interest through its implications in the problems of the environment protection and constructions protection existing on the surface. The researches effectuated in this meaning lead to the conclusion that on the observations effectuated in the zones affected by the underground exploitations can be realized for casts on short, medium and long period regarding the phenomenon analyses.*

These for casts have a special importance, meaning that there can be done studies of future for a lasting development of the zones affected by the underground exploitations.

During the existence period of a mining exploitation the topography represents an important component. The application of the topo-geodesic modern methods at the study of the pursuance methods of the land surface movement in the mining zones represents an essential condition for making evident in time of the phenomenon.

Keywords: *land surface movement, mine, deformation*

1. Introduction

The mining underground exploitation has as effect the movement and deformation of the land from the exploitation area. The study of the influence of the underground exploitation it is necessary for underling the movement phenomenon and taking the protection measurements of the objectives performed on the surface and even of the surface itself.

The difficulty to treat the movement process from the exploitation space to the surface persists even today. Therefore, appeared the necessity to find some procedures of abstract or analytical calculation, which are simply to apply for the deformations from the surface, without using a mechanical pattern.

It is more evident the fact that the classical topographical systems of pursuance of the surface from the mining area, are responding hardly to the present requirements, because of the resolving period of this phenomenon.

The progress registered on the last years on the field of the geodesy and topography, through the implementation of the modern technologies of the surveys had putted rapidly an impact in all topo-geodesic activities.

2. Researches and results obtained through satellite surveys regarding the surface movement in the Maleia-E.M.Livezeni zone from the mining area Jiu Valey

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It is more and more evident the fact that the classical topographical systems of persuance of the surfaces from the mining basin, are hardly answering to the present needs, because of the time of solveing this phenomenon.

The doctor's thesis with the title" Improvement of the monitoring methods of the surfaces movements, situated in the mining zones", it was elaborated for the necessity of development and modernisation of the topographical networks of support, using the technology of positioning GPS, for the persuance in real time of the terrestrial surface, of the constructions existing on the surface from the mining basins.



Fig 1 Constructions affected by the mining exploitation from Maleia zone

A first examination that I done within the thesis, it is referring at the correlation and unitary treatment of the theoretical problems from the mining exploitation field, by studying a wide specialty bibliographical material.

The theoretical study, but even the practical reality points out the fact that the applications of the topo-geodesic methods at the persuance of the surface movement phenomenon in the mining zones it is realised through the interdependence of more fields of terrestrial measurements, as well as the connection of these with other engieneer sciences.

The elaboration of the papier was accomplished parallel with the practical implementation of the theoretical solutions presented into the thesis (chaptors I-IV) through the case study effectuated in the mining zone Maleia -E.M. Livezeni from the mining Basin Jiului Valey Jiului. Thus was effectuated two cycles of measurements in the period: may 2007 – ZERO measurement and october 2007 – Cycle I.

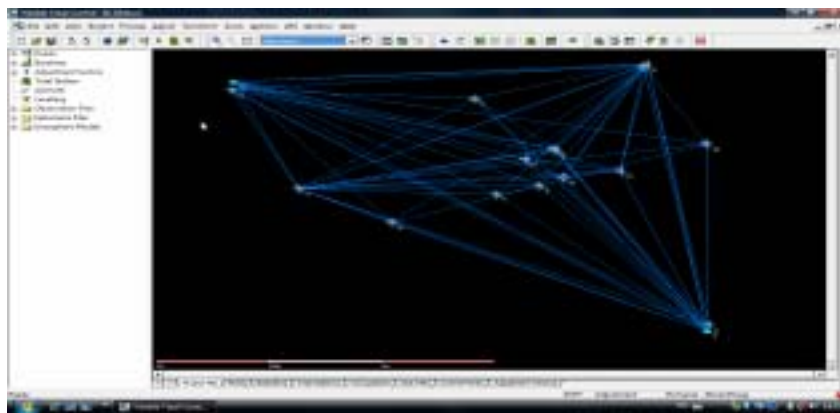


Fig 2 ZERO measurement in May 2007

On the basis of the effectuated study and of the concret results obtained in the two stages of measurements, I found that the proper selection of a method and of a technology represents the accurate interpretation of the measured values and the ulterior processing on the basis of the calculation technologies supported on the processing concepts of the satellite observations. Another decisive factor for the real values expression of the movement of these surfaces, it is even the materialization way of the observation points which forms the monitoring network, as well as the preservation assurance of these benchmarks on the entire periode of the persuance program, aspect followed up even on the case of the objective studied.

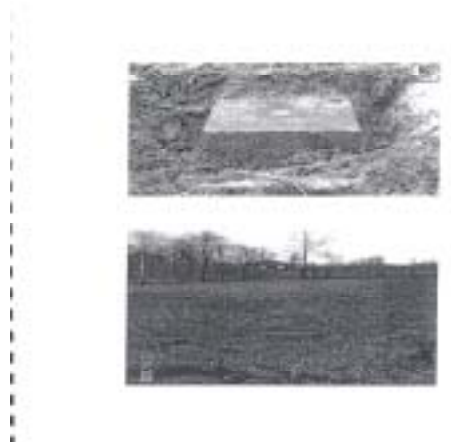


Fig 3 Points monitoring in Maleia zone

Another objective followed up into the doctor's thesis it refers to the accurate projection from geodezic point of view of the persuance netwoek, as well as the planification, and the satellite measurements offers the following advantages:

- Decrease of the time necessary for the performance of the land measurements;
- Easy and fast access tot the persuance points;
- The development of a working session, whcih starts and ends on the same day.

3. Conclusions and proposals

The elaborated doctor's thesis pleads for the following problems:

- Implementation of this modern technology into the monitoring of the land surface from the mining exploitation zones;
- Application of the satellite measurements as well as the using of the geo-3D modelling, under the form of a permanent control system which to monitor the conduct in time of the surface movement from the mining basin, with the efficient notification in real time of any modification that can lead to damages to the existing contractions and to the enviroment.
- Realization of programs of research and development of the mining exploitation geological data correlated with the persuance topographical study.

The movement and deformation phenomenon of the land surface continues to be a big interest through its implications in the problems of the environment protection and constructions protection existing on the surface. The researches effectuated in this meaning lead to the conclusion that on the observations effectuated in the zones affected by the

underground exploitations can be realized forecasts on short, medium and long period regarding the phenomenon analysed.

Therefore the determination of the real forecast in time of this movement phenomenon of the land surface can make that the investments in these zones to be realized constantly and with maximum efficiency. These forecasts have a special importance, meaning that there can be done studies of future for a lasting development of the zones affected by the underground exploitations.

4. References

1. ACKROYD, N., LORIMER, R. – *Global navigation-a GPS user's guide*, Lloyd's of London, 1990;
2. DIMA, N., HERBEI, O., PADURE, I., – *Topografie minieră*, Ed. Corvinul, Deva, 1996;
3. GRECEA, C. – *Teză de doctorat*, Universitatea Tehnică din București, 1998;
4. GRECEA, C. – *Introducere în geodezia satelitară*, Ed. Mirton, Timișoara, 1999;
5. NEUNER, J. – *Sisteme de poziționare globală*, Matrix Rom, București, 2000;
6. BĂLĂ, A. C. – *Studiul privind fenomenul de deformare și deplasare a suprafeței sub influența exploatării subterane*, Referat doctorat, Universitatea din Petroșani, 2003;
7. BĂLĂ, A. C. – *Metode topografice de determinare a parametrilor de deplasare și deformare a suprafeței terenurilor sub influența spațiului subteran exploatat*, Referat doctorat, Universitatea din Petroșani, 2004;
8. BĂLĂ, A. C. – *Cauzele și consecințele mișcării suprafețelor situate în zonele miniere*, Referat doctorat, Universitatea din Petroșani, 2005;
9. BĂLĂ, A. C. – *Tehnologii moderne utilizate la metodele de urmărire a mișcării suprafeței situate în zonele miniere*, Simpozion Științific de Cadastru, RevCAD, Alba Iulia, 2005;
10. BĂLĂ, A. C. – *The GPS reference station solution to the future*, Buletinul Științific al Universității Politehnica din Timișoara, 2006;
11. BĂLĂ, A. C. – *Considerații privind metodele de măsurare particularizate la studiul deformării și deplasării terenului și construcțiilor de la suprafața exploatării miniere E.M.Petrila*, Simpozion Științific de Cadastru, RevCAD, Alba Iulia, 2007;
12. BĂLĂ, A. C. – *Perfecționarea metodelor de urmărire a mișcării suprafețelor situate în zonele miniere*, Teză de doctorat, Universitatea din Petroșani, 2008;
13. * * * – www.leica.com.
14. * * * – www.c-tech.com