EPSC Abstracts
Vol. 6, EPSC-DPS2011-484, 2011
EPSC-DPS Joint Meeting 2011

Science-technology aspects and opportunities of e/m sounding frozen rocks.

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Abstract

The main goal of the science-technology project MARSES is the adaptation space technology for reality science-technology aspects of geophysical searching frozen rocks on the Earth and during of the future space missions on Mars and Moon.

Introduction

One of the more important challenges facing natural resource managers today is how to identify, measure and monitoring the cumulative impacts of land use decisions across space and time. Understanding the multi-variable dimensions of groundwater, management can be improved through the application of innovative information technologies (application of neural networks to data analysis, optimization, pattern recognition, image identification, et cetera) and with using new generation a noninvasive technique for subsurface exploration (petroleum, mineral, geothermal and groundwater exploration).

2. Opportunities of e/m sounding frozen rocks section

Many promising oil and gas bearing areas, platinum placers and gold deposits of Russia are localized in difficulty assessable regions of West Siberia on the arctic shelf etc., where traditional methods such as prospecting drilling and prospecting drilling and seismic sounding are very expensive. In this connection there is a necessity for elaboration of methodology for the assessment of the deposits potential based on application of advanced distant methods and tools involving, also informative and involving different zones of the earth crust, but cheater.

Commercial concentrations of gas and oil and solid useful minerals, places included are localized out different depths of sedimentary basins: buried shelf, peripheral parts of the delta coastal shoals. Areas of the present day shelf include also indicated gas and oil accumulations and solid useful minerals, relict river valleys, placers. The shelves of Arctic seas, West Siberias, Russian North-East, modern river valleys of the last region, as well as Mesozoic-Cenozoic sedimentation basins of all listed regions are least studies by most promising with respect of commercial deposits. Sedimentation basins hosting hydrocarbons accumulation and solid mineral resources occur at large depths and are up to 1-2 km thick. They have distinct cycle patterns: alternation of deep water clayey facies deposited during the transgressive phase of the basin development in low-energy hydrodynamics that form regional gas and fluid screen, sandy-silt sediments of the buried shelf, coastal shoals and deltas enclosing accumulation, commercial included, of hydrocarbons and placers formed during the the regressive phase in

high-energy sedimentation transressive setting.

This operative monitoring system has abilities and advantages are defined by its multifunctional methodological application, that could be used as an operative system for water search tasks (ground water table), definition of waste level, monitoring changes in subsurface horizons, etc. Also this system could be applied to solve long-term tasks for monitoring nature subsurface ecosystem, subsurface horizons, soil salinity level, salinity grade, ground water level. All these parameters can be used to track seasonal and climatic changes in selected area.

During cooperation within the frames of space research missions devoted to Mars exploration, was developed compact , light and reliable instrument for subsurface sounding and maping for Earth's applications, and more specifically to a method to map, track, and monitoring: groundwater, groundwater channels, groundwater structures, subsurface pollution plumes, maps interconnected fracture or porous zones, map leaks in earthen dams, map leaks in drain field, monitoring changes in subsurface water flow, monitoring changes in ion concentration in groundwater, monitor in situ leaching solution, movement of subsurface oil contamination, or other groundwater contamination and related contamination of geological structures.

The project aims at obtaining a fundamental understanding of the physical and chemical processes taking place at a dynamic fresh/seawater interface through carrying out detailed studies at a small-scale study site in a coastal area. This should provide a conceptual framework for understanding the effect of these processes at a larger scale and over longer periods of time.

The goals of the MARSES Experiment based on the TDEM instrument is comparative investigation of martian and Earth cryolithozone (possible investigation of subsurface relics of martian life) and the interpretation of geophysical data of subsurface soil structure [2], including:

-the theoretical development of comparative models of subsurface frozen structure for typical rocks which formed martian cryolithozone in the mixture of poligonites and montmorillonites;

-the development of the software package for detailed analysis of subsurface martian structure - porosity, electrical resistance of liquid phase, thermal conductivity, temperature dependence, which are in agreement with the interpretation of data obtained in the field testing and laboratory supporting measurements;

-the estimation of maximum depth of sounding and resolution of the MARSES instrument in the conditions of rocks close to martian subsurface soil;

- possibility to study subsurface frozen water component using TDEM instruments and induced polarization (IP) device in several areas which are close to martian conditions - Antarctic, Iceland, Hawaii (volcanic area);

- improvements of hardware and software on the base of the field studies in order to use in the Earth conditions, including environmental and geophysical application, and future space experiments on the martian surface.

Choosing right methods and instruments for Mars' cryolitozone structure research is the present day task for future missions on Mars.

6. Summary and Conclusions

These results shows innovation opportunities of new generation space geophysical instruments for wide application on the Earth and for future space missions on Mars and Moon.

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