EVALUATION OF THE GEOTHERMAL PROSPECTS OF THE HOT GRANITES OF WEST LITHUANIA

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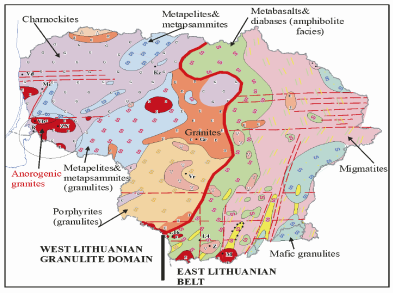
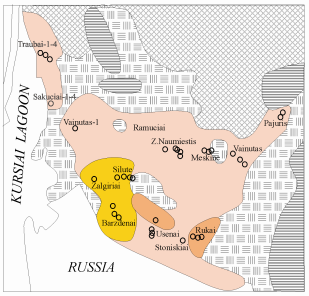
GEOLOGY



GEOLOGICAL MAP OF CRYSTALLINE BASEMENT OF LITHUANIA
(after G.Motuza, 2005)

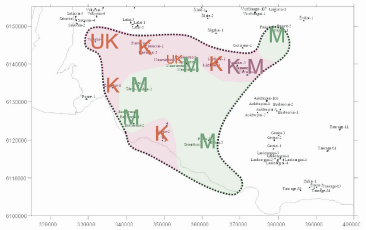
The crystalline basement of Lithuania are buried by sediments of 200-2300 m thick. It is composed of Palaeoproterozoic igneous and high-grade metamorphic rocks. The Middle Proterozoic anorogenic granitoid intrusions are defined. The largest is represented by Zemaiciu Naumiestis massif in SW Lithuania, it is overlain by 2000 m thick sedimentary pile.



GEOLOGICAL MAP OF SAKUCIAI ANDS ZEMAICIU NAUMIESTIS INTRUSIONS AND HOSTING ROCKS

Lithologies: 1-moncogranites, 2-syenogranites, 3-quartz moncodiorites, 4-metasedimentary granulites, 5- migmatites, 6-charnockitoids

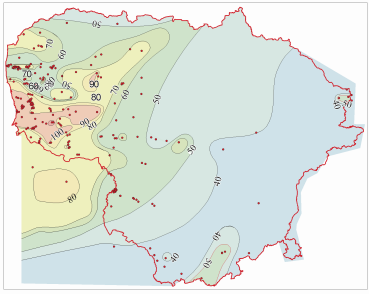
PHOTOGRAPH OF CRATONIC GRANITOIDS
High-fractured intervals are mopped, the fractures are oriented subhorizontally.



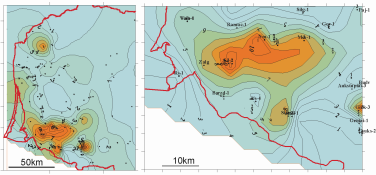
STRUCTURES IDENTIFIED IN ANOROGENIC GRANITOIDS
UK - ultracataclasis, K - cataclasis, M - massive. Subhorizontal cataclasis is more common for the northern part of the intrusion.

RESERVOIRS

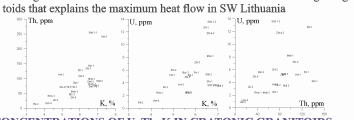
GEOTHERMAL FIELD



HEAT FLOW MAP OF LITHUANIA (mW/m2)
The maximum heat flow of 80-100 mW/m2 is related to cratonic intrusions in west Lithuania



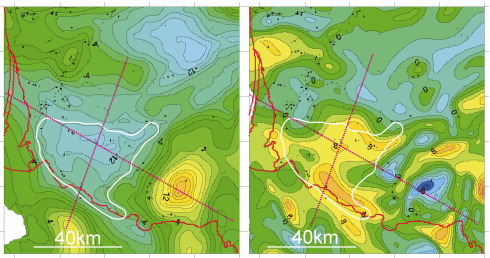
HEAT GENERATION (mkW/m3) OF CRYUSTALLINE ROCKS OF WEST LITHAUNIA (A DETAIL OF SW LITHUANIA ON THE RIGHT)
The highest heat flow 4-18 mkW/m3 is documented for the anorogenic granitoids that explains the maximum heat flow in SW Lithuania



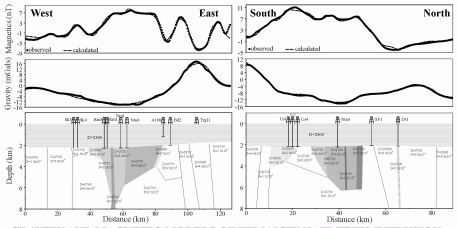
CONCENTRATIONS OF U, Th, K IN CRATONIC GRANITOIDS
The anorogenic granitoids are characterized by high concentrations of U, Th, K. Two associations, related to U and Th, are defined

Microphotographs of ZN1 granitoids illustrating apatite inclusion in sphen (left, well Zemaiciu Naumiestis-3) and allanite crystal (right, well Zemaiciu Naumiestis-5) that have different radioactive element specialization, respectively uranium and thorium. Fission-tracks are distinct around allanite crystal

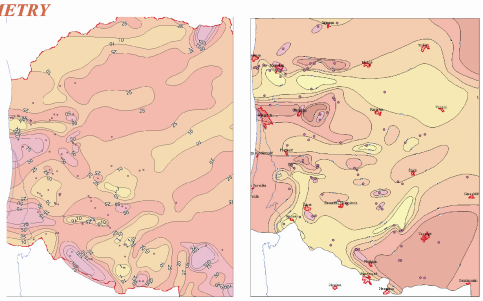
GEOMETRY



GRAVITY (LEFT) AND MAGNETIC (RIGHT) MAPS
Zemaiciu Naumiestis intrusions is well recognized in the potential field maps..



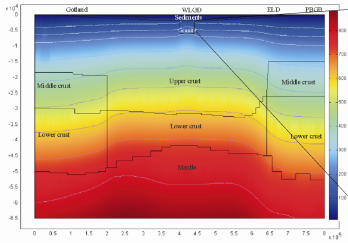
GRAVITY AND MAGNETIC MODELS OF ZEMAICIU NAUMIETIS INTRUSION
The modelling technique is applied to recognize the deep geometry and extent of intrusion



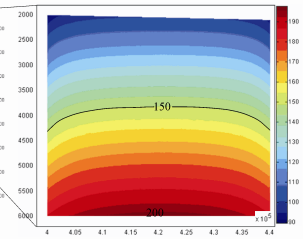
MAGNETIC SUSCEPTIBILITY (LEFT) AND DENSITY (RIGHT) OF BASEMENT ROCKS
78 samples were measured. It provides the basis for modelling of gravity and magnetic fields.

CONCLUSIONS

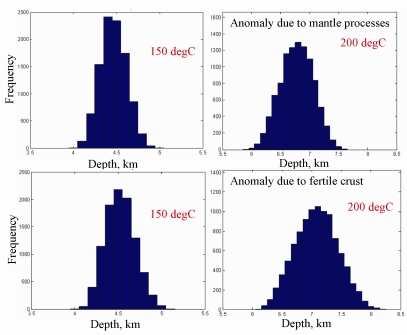
The cratonic granitoid intrusions of west Lithuania are considered as the prospective HDR objects. It is related to the high background heat flow and anomalous heat production of the granitoids. The depth of 150 degC isotherm is modelled at the depth of about 4.5 km, the depth of 200 degC isotherm is around 6.5 km. The fracturing and structural features of the granitoids are highly variable, showing different degree of tectonization that implies different reservoir conditions.



GEOTHERMAL MODEL OF THE LITHOSPHERE
The Zemaiciu Numiestis intrusion is palced in the centre of the model. The model was constructed based on EUROBRIDGE DSS data (located 25 km to the north from the intrusion)



DISTRIBUTION OF GEOTHERMS IN ZEMAICIU NAUMIETIS INTRUSION



MONTE CARLO MODEL OF DETHS OF 150 AND 200degC ISOTHERMS IN ZEMAICIU NAUMIETIS INTRUSION
Two extreme models are considered (i) the anomalous heat flow of west Lithuania produced by fertile crustal lithologies and (ii) mantle activity