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Geophysical exploration studies of additional structures of Asaluyeh

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ABSTRACT

Geology studies is a multi-stage activity that is began in a small scale and is became to large scale. With combining the results of each phase, study area gets smaller and eventually sites is selected as target for drilling, in order to achieve mineral deposits. Data resulting from studies of topography, geology, geochemistry, geophysics and drilling will achieve a tremendous amount of information that when they to be organized properly, reliable and useful results will presented. With regard to achieved progresses in the field of Geographic Information System(GIS), significant development occurred in the earth sciences, including obtaining, saving, retrieving, processing, displaying, using and sharing information of reference location. This paper investigates and analyzes appropriate sites of area exploration in Asaluyeh with using geophysical and satellite imagery as well as combining data.

Keywords:- Satellite Imagery, Airborne Geophysics, Exploration Geophysics, Area Exploration.

INTRODUCTION

Analysis of most of exploration techniques is based on possibility of results obtaining from it. In classical statistical, distributions of desired quantities are examined in one or more of the community, regardless of their spatial positions relative to one another. The most important part of exploratory work is use of airborne geophysical data in determination of anomalies. First, using classical statistical method and using determination of statistical parameters on collected geophysical data in Asaluyeh, anomaly separation is performed and then frequency distribution table of the uranium and thorium elements as well as frequency distribution histograms these elements are drawn. After drawing frequency distribution histograms, statistical parameters of uranium and thorium are calculated and finally the separation of anomaly communities has been performed based on dispersion around the mean. outcrops which exist in this region, due from such igneous sources in Bidkhan area.

STUDY AREA

Asaluyeh located on the shore of the Persian Gulf some 270km SE of the provincial capital of Bushehr, it is best known as the site for the land based facilities of the huge Pars Special Energy Economic Zone(PSEEZ) project. Study area is mountainous and it has difficult passage in the winter and snowy weather and it is moderate in the summer. Asaluyeh is a city in Bushehr Province, Iran. At the 2006

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census, its population was 4,746, in 875 families. Asalouyeh was chosen as the site of the PSEEZ facilities due to it being the closest land point to the largest natural gas field in the world, the South Pars / North Dome Gas-Condensate field. In addition, an existing airport and direct access to international waters via a deep water port were already present.The area northern part has been composed of gneiss metamorphic, marble, and amphibolite. Its southern part has been composed of marl sediments and miocene sandstone.

Fig 1. Google Earth image of the study area

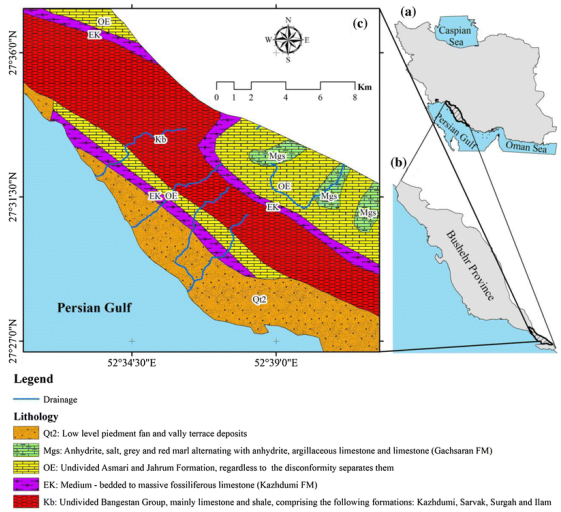

Fig 2. The geological map of the study area and the path of access to the area

GEOLOGY OF THE STUDY AREA

This area has been composed of metamorphic rocks of schist, marble, gneiss and amphibolite. These rocks have been covered directly by the deposition of oligomiocene as incompatible. It appears metamorphic rocks have formed highland heights from the second period onwards, and no sedimentation has been done on them or due to uplift and erosion it has removed. Generally, strata row of rocks in the study area from bottom to top is consists of precambrian metamorphic rocks, sedimentary rocks of late precambrian and cambrian-ordovician, paleozoic metamorphic rocks, diorite intrusions, granodioriti, granite, sedimentary and volcanic rocks of oligomiocene and pliocene and quaternary younger deposits, respectively.

DATA PREPARATION (GEOSTATISTICAL DATA)

In order to sort airborne geophysical exploration data, which has a wide range, data classification should make up in a specified category to achieve a significant frequency distribution. In this context, domain of the smallest to the largest measured amount for each category of radiometric data information, including Uranium, Thorium was determined and classes were divided into equal intervals. Domain of each category was selected based on the sturge rule and integer number was selected for category domain. Data number in each category indicates absolute frequency of desired category. The relative frequency of each category is determined by dividing the absolute frequency to total frequency that is expressed as a percentage. The cumulative frequency is obtained of data summation in each category. Data frequency distribution has been specified in the following tables.

Tabel 1. Uranium data frequency distribution and its histogram

Statistical Analysis Uranium	
The Number of Valid Data	222592
Average	1.6840
Standard Error of the Mean	0.00158
Median	1.6200
Expand	1.39
Standard Deviation	0.74367
Variance	0.553
Skewness	0.604
Standard Error of the Coefficient of Skewness	0.005
Elongation	0.925

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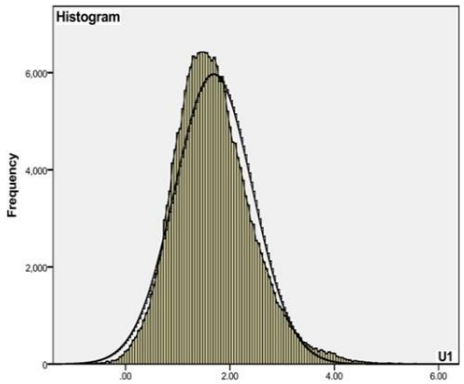
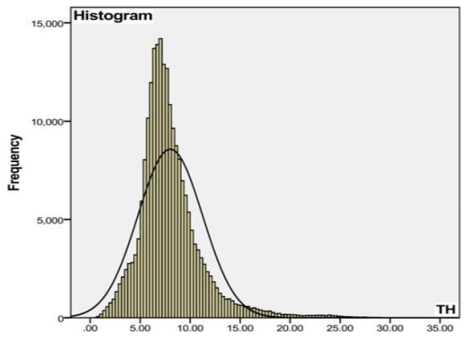
Standard Error of Elongation Factor	0.010
Range	6.60
The Minimum Data	-0.80
The Maximum Data	5.80
Total Data	374853.10



Tabel 2. Thorium data frequency distribution and its histogram

Statistical Analysis Thorium	
The Number of Valid Data	222592
Average	8.0047
Standard Error of the Mean	0.00686
Median	7.4281
Expand	7.03
Standard Deviation	3.23653
Variance	10.475
Skewness	1.818
Standard Error of the Coefficient of Skewness	0.005
Elongation	6.238
Standard Error of Elongation Factor	0.010
Range	31.97
The Minimum Data	0.51
The Maximum Data	32.48
Total Data	1781791.86



In Asaluyeh, according to the results obtained for the separation of anomalous communities, it is recommended to continue exploration processes in areas that are most likely to the radioactive elements. These areas can be determined using these WireFirme. Combining satellite data can be performed based on index overlay model based on weighting of the information different layers. This weighting is performed based on the accuracy and validity of the various layers. After determining factor weights and appropriate classes for every factor, with applying these weights to information layers, weighted maps is produced and finally final map is determined by using weight of each pixel in the index overlap model.

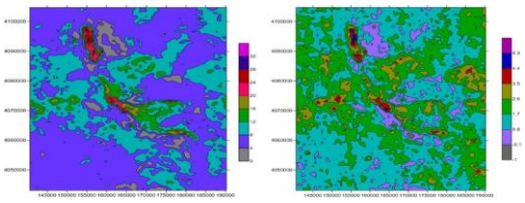


Fig 3. Two-dimensional map obtained using surface software for Thorium(Left) and Uranium(Right), respectively

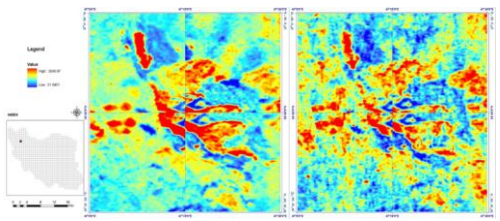


Fig 4. The obtained maps using ArcGIS software for Thorium(Left) and Uranium(Right), respectively

COMBINING DATA USING SOFTWARE

The accuracy of input information and verification of the raw and initial data, correct selection of markers, and selection of the appropriate model for layers integration are three phases that can be used in the mining exploration operations.

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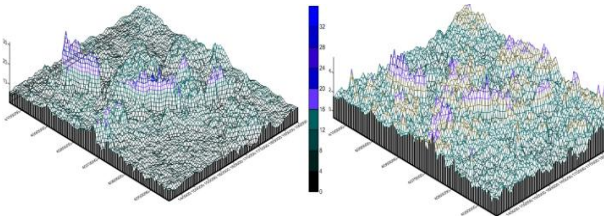

Fig5. WireFrame map for Thorium(Left) and Uranium(Right), respectively

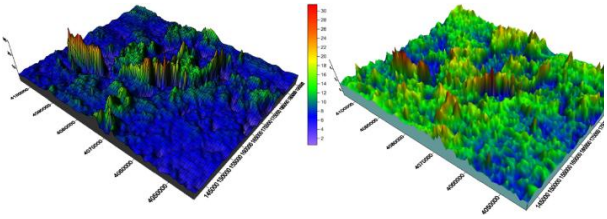

Fig6. Three-dimensional map produced using surface software for Thorium(Left) and Uranium(Right), respectively

RESULT

With combining the above map is achieved the following results:

Amphibole rocks with layers made of marble and metamorphosed ophiolite rocks.

Lava of andesitic and basaltic and basaltic andesite.

Andesitic breccia volcanic with volcanic conglomerate.

Marl-Sandstone-Siltstone and mudstone.

According to deposits formed environment of Uranium and Thorium and the potassic zone, appropriate sites can be investigated for sampling. As can be seen, the entire map display a particular process in relation to area mineralization zone that it is the first layer of information. To obtain exact results, studies in other fields are required. As can be seen, the greatest anomaly is related in the north west region and type of area anomalies are mostly gneiss, amphibolite and marble as well as in some areas are sandstone and shale.

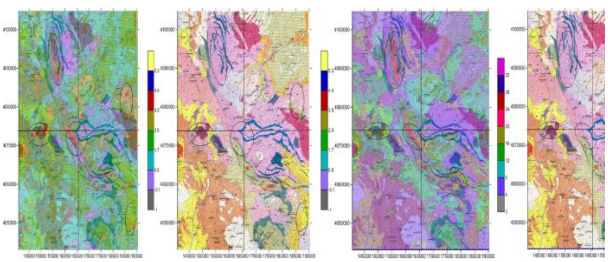

Fig 7. Geological maps promising areas

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