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DETECTION OF WATER MASS CHANGING PATTERN IN JHARKHAND USING GRAVITY REMOTE SENSING TECHNIQUES

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ABSTRACT

Every region has its own structure, strength and weakness. Water is a greater resource whose presence , contamination and levels can be traced by satellites through remote image sensing. The gravity recovery and climate experiment (GRACE) satellite has been placed in the space for mapping the earth's gravity field every month. The gravity of earth mainly depends on its mass. The change in mass at any location on and inside the earth can be indicated by change in gravity at that location. The chance in water mass, or change in earth "s material due to techtonic activity can be depicted by regular measurement of gravity. North eastern zone of Jharkhand has been identified as high mass changing area mainly due to high drawdown of water and mining activity which is possibly due to high rate of recharge of aquifer with rainfall and flooding in the river Ganga in the north Jharkhand and high discharge may be possible due to over drawdown of water from open cast mining of basalt. Study of Rajmahal area shows that discharge area has turned into recharge area.

KEYWORDS: 2-6 Keywords are required (10pt Times New Roman, Justified).

INTRODUCTION

The gravity recovery and climate experiment (GRACE) satellite has been placed in the space for mapping the earth's gravity field every month. The gravity of earth mainly depends on its mass. The change in mass at any location on and inside the earth can be indicated by change in gravity at that location. The chance in water mass, or change in earth "s material due to techtonic activity can be depicted by regular measurement of gravity. The GRACE is the satellite designed to capture the spatial changes in gravity of earth**.** The GRACE satellite mission was launched in 2002 as a collaboration between American and German scientists. The GRACE mission consists of twin satellites placed roughly 200 km apart and track to one another with an accuracy of better than 10 m. At approximately monthly intervals, global high-resolution models of the earth's gravity field have been provided since 2002 [1].The data of this satellite provides a new means of studying hydrological, climatic and tectonic processes that redistribute mass, producing temporal gravity changes Recent developments in space technology provide information about total water variations through satellite gravimetry .The Gravity Recovery and Climate Experiment (GRACE) satellite mission, sponsored by NASA and German counterpart DLR, has been collecting gravimetric observations. GRACE is considered as an extremely valuable tool to monitor mass redistribution within the Earth's system with a spatial resolution of ~300 km (half wavelength) and monthly temporal [2]

OBJECTIVE

Following are the main objective

a) To asses the seasional mass variability in the area of Jharkhand
b) Delineation of zone of mass variability in Jharkhsand

THE STUDY AREA

Jharkhand is the mineral rich state of India. There are large number of mines producing coal, iron ores, bauxite,etc. in this state. The geographic coordinates of this state are 22 degree north latitude to 25 degree latitude and 84 degree east longitude to 87 degree east longitude . Physiographically, landmass of Jharkhand constitutes Plateau which is configured as highland. There are three types seasons in Jharkhand. Cold season

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starts in the month in the month of December an last in February. The hot-weather season lasts from March to mid-June. May, the hottest month, is characterized by daily high temperatures .Maximum rainfall takes place during the months from July to September that accounts for more than 90% of total rainfall in the state.

Geologically, this state is underlain by variety of rock formations from Pre-Cambrian to recent age. A major part of the state is underlain by formations comprising of granites, granite gneisses, meta- sedimentaries and a variety of volcanic rocks. The volcanic formation represented by Rajmahal traps are exposed as patches in a linear fashion in the north-eastern part. The sediments belonging to Vindhayan system are seen exposed in the north- western part of the state. The lateritic capping is invariably seen in the south western part. Recent alluvial formations are mostly confined to the valleys along major rivers of the state. [3]

MATERIAL AND METHODOLOGY

The GRACE data of may 2016 and july 2016 was downloaded from the site Grace tellus website. Monthly solutions of GRACE data are routinely processed at CSR (Centre for Space Research, University of Texas, USA) and GFZ (Potsdam, Germany). The research groups at these two institutes provide spherical harmonic (Stokes)

The GRACE data sets for area of Jharkhand have been down loaded in ASCII format. These data then were converted to occupy the place X, Y, Z column of excel sheet. Thereafter each set of data were multiplied with corresponding scaling factor as given data directory of CSR [4]

The scaling grid is a set of scaling coefficients, one for each 1 degree bin of the land grids, and are intended to restore much of the energy removed by the destriping, Gaussian, and degree 60 filters to the land grids. All the rectified data in X,Y,Z format of excel have been used as input to process with surfer software.. The resulted contour map has been superimposed on geological map of Jharkhand in order to know the cause of mass variation at specific location.

RESULT AND DISCUSSION

Most of the monthly variability in the gravity field is caused by redistribution of mass within the atmosphere, oceans, and water/snow stored on land. If all gravity changes were caused by mass variations within a thin layer at the Earth's surface, and by the deformation of the solid Earth in response to those mass variations, the mass variability could be estimated from the GRACE [2] . GRACE provides to construct a new map of Earth's gravity field every month.

Grace data Monthly solutions of GRACE RL 5 data processed at CSR (Centre for Space Research, University of Texas, USA) and GFZ (Potsdam, Germany).has been used in present study. The current surface mass changes data are based on RL05 spherical harmonics from CSR,JPL,GFZ having maximum degree 60. A 300km wide Gaussian filter has also been applied to the data

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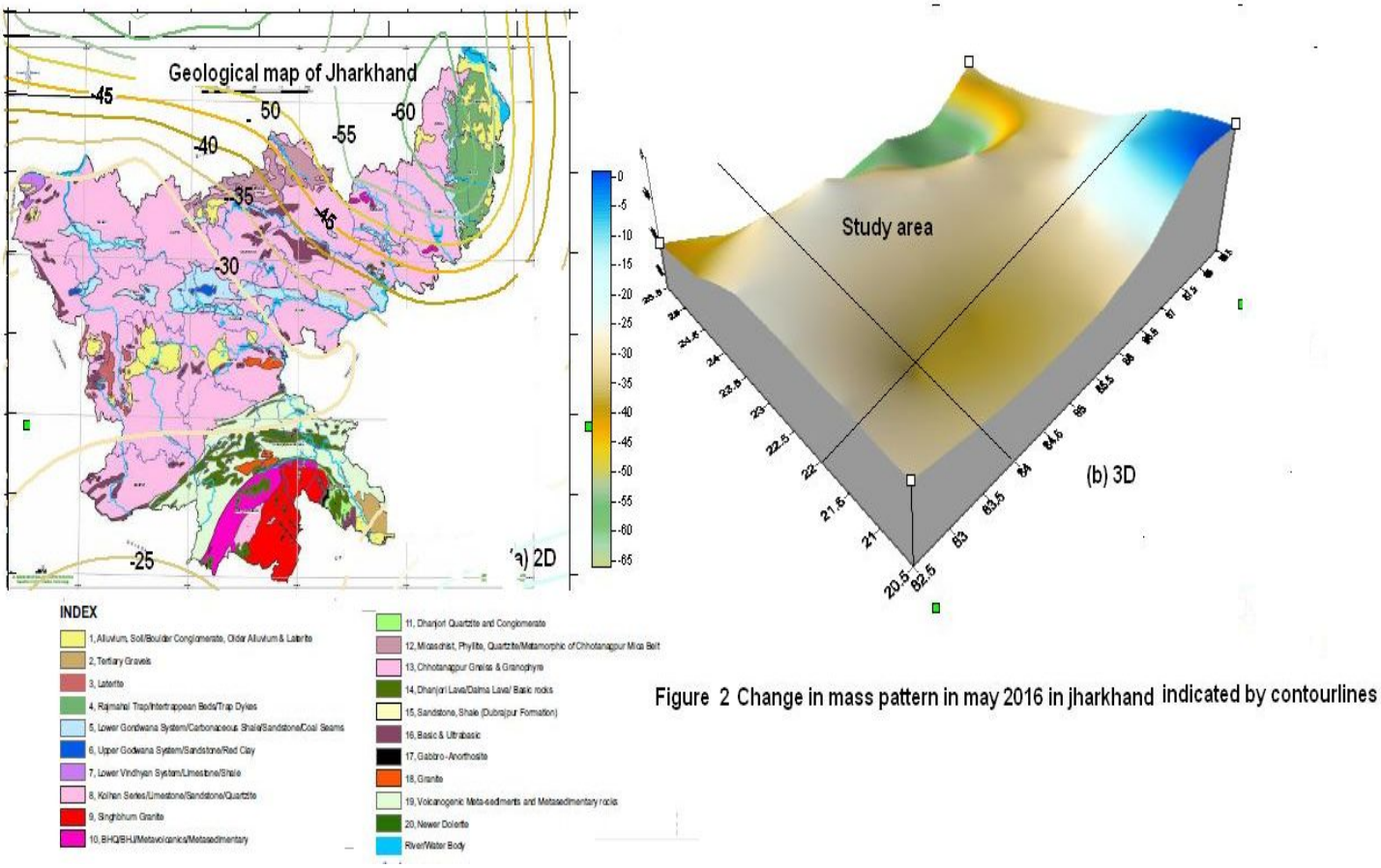

Figure 2 Change in mass pattern in may 2016 in jharkhand indicated by contourlines

Present study reveals that change in mass is greater in north eastern portion of Jharkhand. Mass deficiency is high in pre monsoon period in this zone Grace data of may 2016 and July 2016 has been selected in order to identify the zone of mass variation.. The area of mass deficiency has been identified in adjacent to Rajmahal hill using grace data of may 2016, where mining activity may be responsible for huge drawdown of water in pre monsoon period(figure 2, 2a,2b).The trenchug or pit formed by mining of basalt rock are depressed area which may accumulate huge volume of water mass. Physiographically this area mostly act as discharge zone due high relief particular in summer (pre monsoon) and recharge zone in monsoon. The grace data has revealed that mass deficit area changed into mass surplus area during monsoon. This deficit and surplus mass in a specific area may be resulted due to sequential repletion of discharge and recharge in that area

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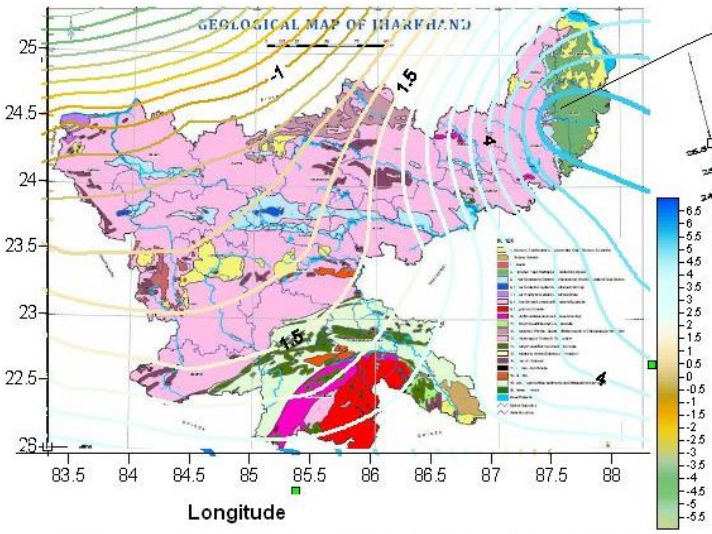

Figure 2a Pattern of Change of mass in the month of July 2016 Shown by contour lines over geological map of Jharkhand (based on GRACE data)

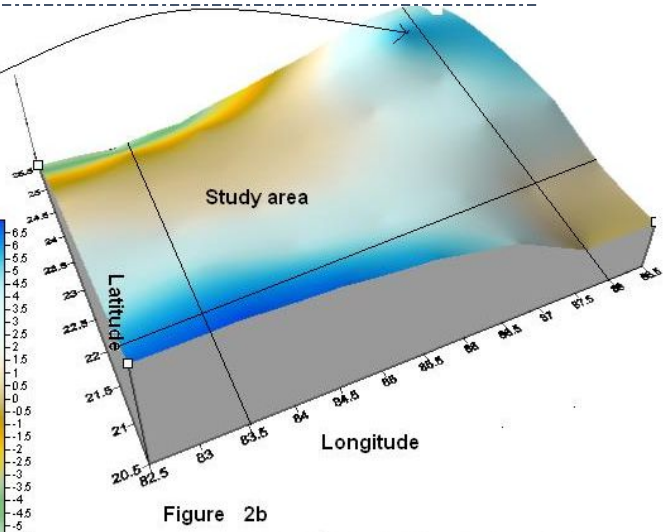

Figure 2b

3D representation of mass changing pattern in July 2016 in Jharkhand and adjacent area

Rajmahal hill is composed of basalt. Basalt is highly susceptible to weathering. It has been noticed that weathered mantle on upland quickly discharge its water through spring and drainage. The study of grace data in term of mass anomaly has revealed that during monsoon the terrain has retained high amount of water. Present study is based on mass variability within three months. Change in mass in very high in these three months. May is the month of dry in which the mass deficiencies high, where as July is the month of rainfall in which increase of mass is noticed. Jharkhand receives its all precipitation during monsoon which stats in the month of June every year.

Figure 3 Basalt rock mining activity near by Rajmahal hill

Seasonal water level fluctuation:in the area around Rajmahal hill recorded by CGWB from 0.28 to 9.15 m .. [5] Mass deficiency in western part is relatively less in comparison to other part of Jharkhand. Seasonal ground water level fluctuation in western part is also varies 2m to 5 m bgl which is less in comparison to Rajmahal area.[6]

CONCLUSION

North eastern zone of Jharkhand has been identified as high mass changing area. It may be due to high drawdown of water and mining activity. It may be also possible high rate of recharge of aquifer with rainfall and flooding in the river Ganga in the north Jharkhand and high discharge may be possible due to over drawdown of water from open cast mining of basalt. Other area of Jharkhand has least seasonal change in masses. With the commence of monsoon, discharge area has turned into recharge area in the Rajmahal hill and its surround.

REFERENCES

[1] *Tapley, B. D., Bettadpur, S. V., Ries, J. C., Thompson, P. F. and Watkins, M. M., GRACE measurements of mass variability in the earth system. Science, 2004, 305, 503–505.)*
[2] *Wahr J.,Swenson,S.,Zlotnicki,V.,and Velicogna,I., Time-variable gravity from GRACE: First results RESEARCH LETTERS, VOL. 31, L11501, doi:10.1029/2004GL019779, 2004*
[3] *http://cgwb.gov.in/gw profiles/st Jharkhand.htm)*
[4] *(http://podaac.jpl.nasa.gov/grace).*
[5] *http://www.cgwb.gov.in/District_Profile/Jharkhand/Sahebganj.pdf*
[6] *http://cgwb.gov.in/District_Profile/Jharkhand/RANCHI.pdf*