A NEW INSIGHT INTO MULTI-RING STRUCTURE OF THE MOSCOVIENSE BASIN. Cheng Cheng[1], Jianping Chen[1] ,The Institute of High and New Techniques Applied to Land Resources, China University of Geosciences (Beijing), 29 Xueyuan Road, Beijing, 100083, China (3s@cugb.edu.cn).

Introduction: The Moscoviense Basin was one of the large multi-ring structure impact basins located in the northwest of the far side of the moon. It was formed 3.85-3.92 Ga years ago[1]. Unlike other basins on the Moon, the inner ring of Moscoviense Basin is of only half-ring structure, and the inner and outer rings are not concentric annular structures with a circular offset. Due to the special multi-ring system in the Moscoviense Basin the number of rings and the boundary of the annular structures have been controversial[2-5]. The elevation of the LOLA presented that the northeast of Moscoviense Mare was higher than southwest. The high-resolution lunar gravity data has provided a new opportunity for the study of the deep structure of the multi-ring basin. This study analyzed the characteristics of deep structure of the basin from a insight of bouguer gravity anomaly and revealed the features of deep structures of the Moscoviense basin.

Methods: The Gravity Recovery and Interior Laboratory (GRAIL) is a spacecraft-tospacecraft tracking mission that was developed to map the structure of the lunar interior by producing a detailed map of the gravity field[6]. We used a degree 660, spherical-harmonic bouguer anomaly gravity model for the moon. The data based on GRGM1200A model[7]. They can be downloaded from PDS. In order to highlight the lunar deep structural features of basin scale, we resampled the bouguer anomaly raster to 18.95km/ pixel.On the basis of that, bouguer gravity anomaly was analyzed by the Tilt Derivative (*TDR*). Miller and Singh[8] first proposed the concept and method of *TDR*, and it was applied to gravimetry. *TDR* represents the normalization of the Horizontal Deviation (*THDR*) and the Vertical Derivative (*VDR*).

$$TDR = tan^{-1}\left(\frac{VDR}{THDR}\right) = tan^{-1}\frac{(\partial G/\partial Z)}{(\partial G/\partial H)}$$

Where *G* represents gravitational field, and the study bases on grid data, so $\partial G/\partial H$ is as follow.

$$\partial G/\partial H = \sqrt{(\partial G/\partial X)^2 + (\partial G/\partial Y)^2}$$

Normally, *TDR* takes a positive a position above the geological body and takes a zero value at the boundary of the geological body, and a negative value on the outside.The gradient is the most dramatic part of the spatial variation of gravity field, which can manifestation the boundary position of the structural geological body, and it has certain advantages for the determination of the deep structure boundary during the geological interpretation of regional gravity anomalies.

Results: Based on the analysis of *TDR*, there were two high value zone in the basin region. One near the center of bouguer gravity anomaly (147.9°E,26.6°N) , and another peak area near the Titov impact crater in the Moscoviense Mare. Howerver, the *TDR* is not obvious in the Komarvov crater geological unit where the fractures show a crossover distribution.

The trend of *TDR* in the Moscoviense Basin has shown the annular structure characteristics which indicated below the basin might be existed annular tectonic features, but there were minor differences between lunar topography and deep tectonic boundary reflected by *TDR*. The ideal middle ring of basin and the gravity anomaly gradient below moon existed a NE-SW deviation in spatial position.There might be a tilt migration channel of NE-SW in the basin, which is influenced by the volcanism in the later stage of the formation. The deep magma is spewed out of the surface along the channel forming the effusion of the northeast of the Moscoviense Mare.

Modeling and Future Work: Analysis under the way to compare the result of different gravimetric methods. Tectonic structures below the basin can be presented by a three dimensional model which auxiliary interpretation the evolution history for multi-ring basin.

Acknowledgments: Thank you for the bouguer anomaly data provided by GRAIL. And this research is supported by the National Natural Science Foundation of China (41490634).

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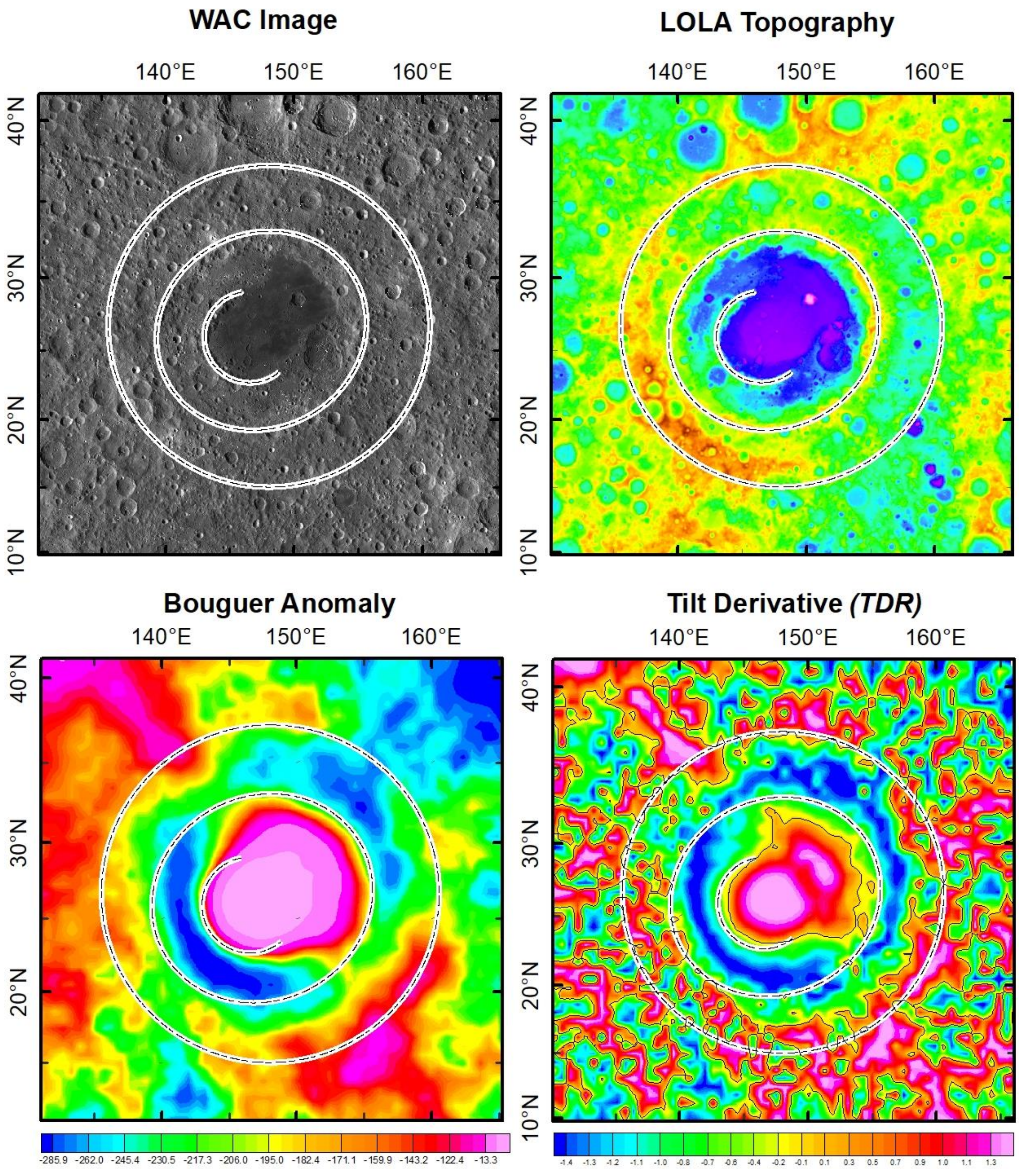

Fig1 Representative WAC image ,LOLA topography, GRAIL bouguer anomaly and Tilt Derivative (*TDR*) Maps of Moscoviense basin. Dashed circles is the outline of ideal rings of the basin. The black solid circular outline indicates the zero value in the *TDR* map.