A METHOD FOR COMBINING CHANG' E 2(CE2) DEM AND LOLA DEM TO IMPROVE TOPOGRAPHY DATA QUALITY IN LUNAR POLAR REGION.

X. G. ZENG[1,2],W. ZUO[1,2],J.J.LIU[1,2],X. REN[1,2],Z.B. Zhang[1,2], and X. Y. GAO[1,2], [1]Key Laboratory of Lunar and Deep Space Exploration, National Astronomical Observatories, Chinese Academy of Sciences, Beijing 100012,China. ,[2]National Astronomical Observatories, Chinese Academy of Sciences, Beijing 100012,China.(zengxg@nao.cas.cn, zuowei@nao.cas.cn, liujj@nao.cas.cn, renx@nao.cas.cn, zhangzb@nao.cas.cn, and gaoxy@nao.cas.cn)

Introduction: Lunar polar region is one of the most popular targets for the future lunar exploration missions such as Luna 25, Chandrayaan 2 (Djachkova, 2017; Mylswamy et al, 2012) and following CE missions. High quality topographic data are essential for lunar polar exploration and related lunar scientific research. Up till the present moment, several lunar DEM products such as LOLA DEM, SELENE DEM have been produced and released, and recently CE2 DEM with a resolution of 7m has been produced. However, there are still some limitations for CE2 DEM products especially in lunar polar region, such as containing data exception or data void. To solve the problems, we have conducted the study of lunar topography characteristics, based on which, we are trying to establish an improved adaptive DEM fusion framework by combining CE2 DEM with other products such as LOLA DEM, and optimize the DEM fusion algorithm. The study would be applied in the lunar polar DEM data fusion with the most recent DEM products, in order to get a seamless lunar polar topographic data product with high resolution, which will be used in the future China Lunar Exploration Program (CLEP) and lunar polar research..

Data: During the CE2 mission, more than 600 stereographic images have been acquired by the double-line array CCD, the resolution of the original image is better than 7m, with these data, recently, a CE2 DEM data product called 'CE2_TMAP_DEM_7m' has been produced(Li et al., 2018). However, since there always are a few shadowed areas in the lunar polar region, deficiencies such as data void are still inevitably exist in the CE2 DEM data(as Fig.1 shows). To improve the data quality, more precise lunar polar data are needed.

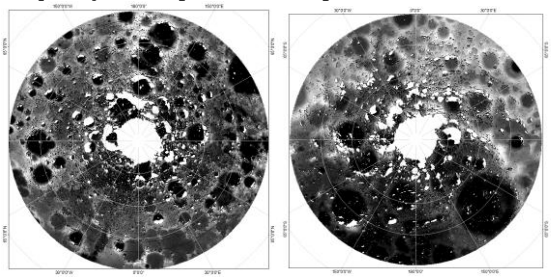

Fig. 1 Data void in CE-2 DEM in lunar polar region

LOLA DEM(LDEM) has been released by Lunar Orbital Data Explorer System(LODE). The original altitude data of LDEM are acquired by laser altimeter, the altitude data in shadowed areas can also be acquired, so that the LDEM with a general resolution of 30m in global scale is one of the best lunar topographic data, especially in the lunar polar regions, the spatial resolution can be even better than 10m.

Method: The combination of the LOLA altimetry profiles with the SELENE Terrain Camera tiled images has been conducted to produced SLDEM2015(Barker et al., 2015). The author followed a two-step approach when co-registering the TC tiles to the LOLA data by a 5-parameter coordinate transformation and a 3-dimensional (3D) offset fitting. However, the data area of SLDEM2015 are limited to the latitudes between 60 deg South and 60 deg North, the lunar polar region is not included.

In our approach, we are going to combine CE2 DEM and LOLA DEM data from in 60° S~90° S and 60° N to 90° N. The CE-2 data will also be co-registered according to the LOLA data, and data void area in CE2 DEM will be extracted and the main study will be the developing of DEM fusion algorithm considering the lunar topographic factors such as slope in different classified topographic area.

Summary: The combination of available datasets such as LOLA data, CE2 data will get higher quality data and will be helpful to the lunar exploration missions. The initial work of fusion CE2 DEM and LDEM is presented in this approach, and the study is still under progress, so as to produce a CLDEM(CE2 and LOLA DEM) product, and then studies requiring the high geodetic accuracy of the LOLA data and the excellent spatial coverage of the CE2 data will especially benefit from this work.

[1] Djachkova M.V et al.(2017), Astronomicheskii Vestnik,51(3):204–215.[2] Mylswamy A. (2012)]// Cospar Scientific Assembly. 2012.[3]Li C.L.(2018) Geom Inf Sci Wuhan Univ) 43(4):485-495. [4]Barker, M. K., (2015)Icarus, 273:346-355.