

Orbit determination of the Chang' E-5 Test 1 and a new gravity field model

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We introduce the recently Chang' E 5-Test 1 (CE-5T1) mission overall and its orbit characteristic and present the results on precision orbit determination from the radio science investigation of the CE-5T1 spacecraft. We describe the data, modeling and methods used to achieve position knowledge several times better than the required demand (in total position) for most of arcs, over the period from 10 March 2014 to 28 December 2018. In addition to we try to use the near-continuous radiometric tracking data of CE-5T1 to develop a new lunar gravity field up to degree and order 100, which is solved independently using about four years tracking data. The accuracy of the gravity field model is assessed by multi means, such as gravity spectrum, observational residuals after precision orbit determination, lunar surface gravity anomaly character, admittance/coherence with topography model, and the corresponding physical feature and effect are analyzed. We also make a comparison between this model and the previously models we ever solved, CEGM-01 and CEGM-02. The results indicate the effectiveness and reasonability of this solution process. On the basis of current work, with the Chang' E 5, 6, and 7 under implementing and planning, the prospect of future development of Chinese lunar gravity field detection is presented.

Keywords: Lunar, Chang'E 5T1, precise orbit determination, gravity field model