



## **Geoid determination with different density hypotheses in the Xinjiang and Tibetan regions**

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A  $5' \times 5'$  regional gravimetric geoid, XTG2013, has been developed for the Xinjiang and Tibetan regions ( $25^{\circ} \sim 50^{\circ}$  N,  $70^{\circ} \sim 100^{\circ}$  E). The realization of XTG2013 follows an original method, namely, the shallow-layer method (Shen, 2006), which is quite different from the classical ones (Stokes' method, Molodensky's method, etc.) and takes full advantage of the precise Earth gravity field model EGM2008, digital topographic model DTM2006.0 and global crust density model CRUST2.0. In this study, we have taken the lateral and radial density variations into account by making use of CRUST2.0. In order to investigate the effects of the density variations in the test regions, we computed another gravimetric geoid in the same region using the same reference gravity field, digital topographic model and processing procedures, but with a constant density hypothesis ( $2.67\text{g/cm}^3$  for rock,  $1.0\text{g/cm}^3$  for water and  $0.92\text{g/cm}^3$  for ice). This "Constant-density based geoid" is then referred to as XTG2013c for convenience. XTG2013, XTG2013c as well as the EGM2008 geoid (in which a constant topographic density is adopted) are compared with the GPS/leveling benchmarks (GPSBMs). The validations show that (1) the accuracy of EGM2008 geoid in the test region is  $\sim 20\text{cm}$ , (2) XTG2013c fits the GPSBMs slightly better than the EGM2008 geoid, (3) XTG2013 outperforms the other models significantly, and its accuracy is  $\sim 16\text{cm}$  in contrast to  $\sim 20\text{cm}$  for the XTG2013c and the EGM2008 geoid, (4) the differences in geoid undulations in the test region due to different density hypotheses, namely the differences between XTG2013 and the XTG2013c can reach a magnitude of  $\sim 4\text{cm}$ , which is significant and could not be negligible in the precise geoid determination with centimeter accuracy. This work was supported partly by the NSFC (grant No. 41174011), National 973 Project China (grant No. 2013CB733305), NSFC (grant No. 41210006, 41128003, 41021061, 40974015).