AOGS 2005

Gravity field error analysis from satellite gravity gradiometry

ZHICAI LUO

School of Geodesy and Geomatics, Wuhan University, 129 Luoyu Road, Wuhan 430079, P.R.China
The Key laboratory of Geospace Environment and Geodesy, Ministry of Education, P.R.ChinaEmail: zhcluo@sgg.whu.edu.cn

The concept of a Global Positioning System (GPS) receiver as a tracking facility and a gradiometer as a separate instrument on a low orbiting platform, i.e. satellite gravity gradiometry (SGG, such as GOCE mission), can offer a unique tool to map the global Earth's gravitational field with unprecedented accuracies. The former technique allows determination of the satellite's ephemeris at any epoch to within 3-10cm; the latter permits the measurement of the tensor of second-order derivatives of the gravity field to within 10^{-2}-10^{-4}E depending on the type of gradiometer. An analytical technique and a numerical simulation method are described and applied for the error analysis of gravity field parameters from satellite gravity gradiometry in the paper. And then the relationships between the parameters of SGG (such as satellite's altitude, sampling rate and accuracy of gradiometer, and etc.) and the accuracies of gravity field mapping from satellite gravity gradiometry are also discussed for the configuration of satellite gravity gradiometry mission. Finally, some conclusions and suggestions drawn from test results are given in the paper.

Keywords: Earth's gravity field; satellite gravity gradiometry; analytical technique; numerical simulation method.

Acknowledgements: This study is funded by National Natural Science Foundation of China (40374006), and also sponsored in parts by the Scientific Research Foundation for the Returned Overseas Chinese Scholars ,State Education Ministry, and also supported in parts by the Key Laboratory of Geo-information Engineering, National Bureau of Surveying and Mapping.