Geophysical Research Abstracts
Vol. 18, EGU2016-8186, 2016
EGU General Assembly 2016

Simulation experiments of gravitational potential determination using clocks onboard satellite and on ground

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Here we present simulation results for determining the gravitational potential using high-frequency-stability microwave links between satellite and ground station. Two precise clocks (oscillators) are equipped onboard a satellite and at a ground station. Based on Doppler cancelling technique, the gravitational potential difference between the satellite and the ground station can be determined. In the simulations, we use multi satellites and multi observations in different periods, and results show that most offset values are in the order of 0.1 m (in equivalent height), and standard deviation is around 0.1 m. With quick development of atomic clocks, our proposed approach is prospective in the near future. This study is supported by National 973 Project China (grant No. 2013CB733301 and 2013CB733305) and NSFC (grant Nos. 41174011, 41210006, 41429401).