



Unification of world height system at one centimeter level using ultra-high precise time-frequency signal links between a satellite and two ground datum stations

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A unified world height system (WHS) plays a key role in geoscience and various applications. In this study we first introduce an approach for determining the gravitational potential between a GNSS-type satellite and a ground station using the ultra-high precise frequency signal transmission links, which is referred to as the satellite frequency signal transmission (SFST) approach. Based on the SFST approach, by observing the frequency shifts among a satellite and a pair of ground datum stations, we may determine the geopotential difference between these two ground stations which are located on two continents separated by sea. By this way, we may realize a WHS unification (WHSU), which an open problem to be solved in conventional framework. Simulation experiments are provided, which show that the unified WHS may achieve an accuracy level of 1 cm, if the atomic clocks used on board a satellite and on ground stations have the accuracy and stability level of 1×10^{-18} . This study is supported by National 973 Project China (grant No. 2013CB733301 and 2013CB733305) and NSFCs (grant Nos. 41174011, 41429401, 41210006, 41128003, 41021061)