福爾摩沙衛星三號定軌：精度及問題分析

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摘要

本論文以福衛三號衛星作為研究主題，研究其影響定軌之因素和定軌之內部精度，如：高取樣率 GPS 時錶改正。吾人利用 Bernese 5.0 進行計算，採用零次差分(zero-difference)觀測量進行高取樣率 GPS 時錶改正之求解，其精度與 CODE 發布的同為 0.01ns；本文又進行福衛三號之相位中心偏差改正之實驗，求出 L1 及 L2 之相位中心偏差。最後本文以真實資料計算福衛三號之減動力軌道及動態軌道，由於福衛三號無加裝 SLR 故無法評估其外部精度，只能用重疊軌道之實驗進行內部精度分析，其利用 2006 年第 138 天的 FM1、第 146 天的 FM2、第 150 天的 FM3、第 112 天的 FM4、第 156 天的 FM5、第 138 天的 FM6 進行分析，其減動力軌道內部精度為 FM1：軌道坐標三方向的平均值為 0.108 m；FM2：軌道坐標三方向的平均值為 0.066 m；FM3：軌道坐標三方向的平均值為 0.150 m ；FM4：軌道坐標三方向的平均值為 0.104 m；FM5：軌道坐標三方向的平均值為 0.302 m；FM6：軌道坐標三方向的平均值為 0.190 m。

Orbit Determination of FORMOSAT-3 / COSMIC : analysis of accuracy and problems

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Abstract

This research, studying the case of the FORMOSAT-3, analyzes the factors, which affect the orbit determination, along with the accuracy. To determine the high-rate clock, the zero-difference observations were proposed for the computation (by Bernese 5.0). The outcome turns out to be as accurate as 0.01ns, which is on a par with the accuracy claimed by CODE. In the second part, an experiment is conducted to determine the phase center offset of FORMOSAT-3 in the bands of L1 and L2. In the last part of this research, GPS observations were provided to determine the reduced-dynamic orbits and the kinematic orbits of FORMOSAT-3. Since the external accuracy could not be evaluated due to the lack of any SLR onboard FORMOSAT-3, the internal accuracy is evaluated by the experiment of orbital overlap alternatively. The orbital data of the day 138 in 2006 designated as FM1, the day 146 designated as FM2,[…], and the day 138 designated as FM6 were analyzed. The average values of accuracy of reduced-dynamic orbits in three directions of orbital coordinate system are 0.108 m in FM1, 0.066 m in FM2, 0.150 m in FM3, 0.104 m in FM4, 0.302 in FM 5 and 0.190 in FM6, respectively.