Precise CHAMP Orbit Determination with GPS Tracking

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ABSTRACT

Since CHAMP was launched into orbit in July, 2000, the onboard GPS receiver developed by the Jet Propulsion Laboratory (JPL) has been successfully collecting GPS tracking information to support the precise orbit determination activities on the ground. Using the dual-frequency GPS data tracked by the Blackjack receiver, we have been able to determine the CHAMP orbit to better than 10 cm accuracy at JPL. An automated process has been producing the precise CHAMP orbit solution everyday using the software GIPSY/OASIS II. In this paper we will describe in detail our strategy for CHAMP POD using the precise GPS measurements, our process of fine tuning the reduced-dynamic model for the 400-km low Earth orbit, and our orbit results evaluated by various methods. These methods include comparison of overlapping orbit sessions, and independent satellite laser ranging (SLR) measurement residuals test. We will also compare orbit solutions obtained with different strategies and dynamic models, and discuss the possible remaining error sources and ways to further improve the orbit solutions.