

## **DSN Measurement Model Development for Interplanetary Navigation**

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DSN(Deep Space Network) measurement model for interplanetary navigations which is essential for precise orbit determination has been developed. The DSN measurement model produces the real DSN observables such as range, doppler, angular data containing the potential observational errors in geometric data obtained from orbit propagator. So the important parts of this research are to model observational errors in DSN observation and to characterize the errors. The modeled observational errors includes the range delay effect caused by troposphere, ionosphere, antenna offset, and angular refraction effect caused by troposphere. The Hopfield, Modified Hopfield, Saastamonien, Neill, Chao, and D. L. Cani model are used for calculating the tropospheric range delay, and the two IRI(International Reference Ionosphere) models are used for the ionospheric range delay. The Lanyi and D. L. cani model are used for calculating the tropospheric refraction effect. Non-modeled errors are justified as the solved-for parameters. All of these results from error models show about 10% errors compared to the JPL's reference results, that is remained in acceptable error range.