Expected Performance of the NetLander Geodesy Experiment

W. M. Folkner, C. F. Yoder, R. A. Preston, S. C. Wu, L. J. Romans
Jet Propulsion Laboratory, California Institute of Technology
4800 Oak Grove Dr. Pasadena, CA 91109, USA

J.-P. Barriot
Observatoire Midi-Pyrénées
14, Av E. Belin, 31400 Toulouse, France

V. Dehant
Observatoire Royal de Belgique
Av. Circulaire, 3, B-1180 Bruxelles, Belgique

The geodesy goals of the NEtlander Ionosphere and Geodesy Experiment (NEIGE) are to determine the mineralogy and temperature of the deep interior of Mars and provide new information about the interactions of the Martian surface and atmosphere (e.g., the seasonal cycling of CO_2). These will be derived from regular determinations of the orientation of the surface of Mars with respect to inertial space. The observed precession and nutation will enable determination of the size and physical state of the Martian core while variations in length-of-day will provide information on the seasonal change in the polar ice caps. The orientation of the surface will be determined by measuring the Doppler shifts of radio signals between the NetLanders and a a data relay orbiter. The position of the orbiter in inertial space will be determined by tracking the Doppler shift of the orbiter's radio signal with tracking stations on Earth.

A series of analyses has been performed to determine the accuracy with which the Martian rotation parameters can be estimated using the expected data set. Analyses have been performed for two possible orbits for the data relay orbiter with representative uncertainties assumed for the measurement accuracy and orbiter force models, especially the Martian gravity field. The resulting estimates should result in a factor of 3-10 improvement over current knowledge of the Martian rotation parameters, assuming that the NetLander lifetime is longer than half a Martian year. Results will be presented that show the expected accuracy for various mission lifetimes, choice of orbiter, and number of active landers.