

FFI Analysis Center

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Abstract

FFI's contribution to the IVS as an analysis center will focus primarily on a combined analysis at the observation level of data from VLBI, GPS and SLR using the GEOSAT software. This report shortly summarises the current status of analyses performed with the GEOSAT software. FFI is currently Analysis Center for IVS and ILRS, Technology Development Center for IVS, and Combination Research Center for IERS.

1. Introduction

Recently, a number of colocated stations with more than one observation technique have been established. In principle, all instruments at a given colocated station move with the same velocity and it should be possible to determine one set of coordinates and velocities for each colocated site. In addition, a constant eccentricity vector from the reference point of the colocated station to each of the individual phase center of the colocated antennas is estimated using constraints in accordance with a priori information given by the ground surveys. One set of Earth orientation parameters (EOP) and geocenter coordinates can be estimated from all involved data types. The present dominating error source of VLBI is the water content of the atmosphere which must be estimated. The introduction of GPS data with a common VLBI and GPS parameterization of the zenith wet delay and atmospheric gradients will strengthen the solution for the atmospheric parameters. The inclusion of SLR data, which is independent of water vapour, gives new information which will help in the de-correlation of atmospheric and other solve-for parameters and lead to more accurate parameter estimates. These, and many more advantages with the combination of independent and complementary space geodetic data at the observation level, are fully accounted for the GEOSAT software developed by FFI during the last 22 years.

2. Staff

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3. Combination of VLBI, GPS, and SLR Observations at the Observation Level

The GEOSAT software was recently upgraded to use numerical weather models (ECMWF) and 3D raytracing for the calculation of signal delays due to the troposphere. Ten years of VLBI data were analyzed with this feature and the improvement of the results was remarkable. A lot of experimentation must be performed before final conclusions can be drawn, but it seems that the ECMWF model needs to be scaled by one or more estimated parameters in the VLBI analyses. Plots of these estimates and spectral analyses of the results reveal interesting results. The general trend is that the ECMWF model seems to perform better at low latitudes than at higher latitudes. There is a clear seasonal signal especially for the higher latitudes. The noise level of the estimated Earth orientation parameters is typically at the level of 50 microarcseconds for the angles and

2-3 microtimeseconds for UT1. The results suggest that the applied procedure can be used to investigate how well the ECMWF model is able to describe climatic changes. Of course, many more years of data must be analyzed for such applications.

The GEOSAT software is presently undergoing extensive development. Some of the changes are explained in our technical development report.