

FFI Analysis Center

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Abstract

FFI's contribution to the IVS as an analysis center focuses 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

A number of co-located stations with more than one observation technique have been established. In principle, all instruments at a given co-located station move with the same velocity and it should be possible to determine one set of coordinates and velocities for each co-located site. In addition, a constant eccentricity vector from the reference point of the co-located station to each of the individual phase centers of the co-located 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 with the GEOSAT software developed by FFI during the last 24 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. Twelve years of VLBI data have been analyzed with this feature and the improvement of the results is remarkable. It seems that the ECMWF model needs to be slightly scaled by 1-3 estimated parameters in the VLBI analyses per co-located station. The raytracing procedure can also be used to detect periods with rapidly changing atmospheric conditions which cannot be modelled with sufficient accuracy. This information can be used to identify and neglect such data leading to more stable values for the atmospheric scaling parameters. This strategy is expected to be especially valuable for the analysis of GPS and future Galileo tracking data due to the great redundancy of datasets provided

by the two satellite systems.

Results from analyses of CONT-series data show best-case repeatabilities around 1 mm in the horizontal plane and 2 mm in the vertical direction.

The GEOSAT software is presently undergoing extensive developments. Some of these are explained elsewhere in this publication in a short report by the FFI TDC.