

Bundesamt für Eich- und Vermessungswesen

Vienna VLBI Analysis Center (VIE)

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Introduction

TU Wien operates a Special Analysis Center (VIE) of the International VLBI Service for Geodesy and Astrometry (IVS) since 2000. In this role, VIE has been involved in numerous operational and research tasks. With the Vienna VLBI and Satellite Software (VieVS), VIE contributed independent solution to various important geodetic products, such as the International Terrestrial Reference Frame (ITRF2014) and the International Celestial Reference Frame (ICRF3). Since July 2018, following the signing of a Memorandum of Understanding with the President of BEV, the Federal Office of Metrology and Surveying in Austria, VIE is run as a joint Analysis

Center between TU Wien and BEV. The aim of this joint venture is the increased participation in the operational generation of geodetic products, such as the routine determination of Earth orientation parameters (EOP).

We depict the analysis workflow at VIE based on vgosDB databases provided by the IVS and present recent contributions and products. Furthermore, we outline our joint VLBI activities, especially with respect to scheduling, correlation, and fringefitting with an independent processing pipeline based on VieVS.

1.) Vienna VLBI and Satellite Software (VieVS)

3.) Products and Contributions



The VLBI module of VieVS (Böhm et al, 2018) is the centerpiece of all analysis tasks at VIE. VieVS is a state-of-the-art VLBI analysis software developed and maintained at TU Wien. It covers various aspects of VLBI data processing, such as:



Single session analysis

- Estimation of geodetic target parameters as piece-wise linear offsets from single sessions by a least-squares adjustment
- Observation modeling according to the latest IERS conventions

Global solution

- Estimation of time insensitive parameters ("global parameters") by stacking the normal equation matrices of numerous single VLBI sessions, e.g. of the whole VLBI observation history (1979 up to now)
- > Precise station and source positions realizing the celestial and terrestrial reference frames

Scheduling and Simulations

Learn more about VieVS at <u>vievswiki.geo.tuwien.ac.at</u> and <u>github.com/TUW-VieVS</u>!

2.) Analysis Workflow at VIE

The routine analysis of VLBI observation data provided by the IVS is implemented as a semi-

Routine IVS Submissions

- Submission of SINEX files for all IVS R1 and R4 sessions to the IVS Combination Center (CCIVS)
- VIE is currently in the commissioning phase
- Input to official IVS combination products:
 - → IERS EOP time series
- → ITRF VLBI-TRF (VTRF)

Quarterly solutions

• It is planned to produce quarterly solutions for the VLBI terrestrial and a celestial reference frame starting in 2019

Recent contributions and products of VIE

- Contributions to VTRF2014 (Bachmann et al., 2016) and ITRF2014 (Altamimi et al., 2016)
- VieCRF2018a (Mayer, 2018)



Polar motion estimates w.r.t. the IERS CO4 14. R1 and R4 sessions are marked in blue and AUSTRAL sessions (smaller network) in red.

Sky plots of

KOKEE12M

GGAO12M and



VIE contributed to the realization of the ITRF2014 and the ICRF3 with its independent VLBI solutions

automated processing pipeline based on VieVS. New observation (vgosDB) and modeling data is automatically downloaded once a day from different resources. After automatic processing with VieVS, manual interaction is needed to check the results, solve problems and to create SINEX files for the submission to the IVS Combination Center (CCIVS) at BKG.



4.) Vienna VLBI Center - Overview

All VLBI activities at TU Wien and BEV are combined in the Vienna VLBI Center (VVC). The goal of the VVC is to provide an independent processing pipeline based on VieVS. Apart from observing, the VVC covers all tasks of the VLBI process chain – from observation planning to the derivation of geodetic products. The main components are depicted below.

Scheduling Center

- Sophisticated observation planning of geodetic and astrometric VLBI sessions
- Applying the **newly developed** scheduling software VieSched++ (Schartner & Böhm, 2018)
- Scheduling of IVS sessions since 2018: INT3, T2, EURR&D, OHG, EUR, AUA,

VieSched++ Vienna VLBI and Satellite Software



Correlation Center

- Processing of raw VLBI observation data on ulletthe Vienna Scientific Cluster 3 (VSC3)
- DiFX software correlator (Deller et al., 2007) ulletPost-correlation processing with HOPS/fourfit • **New VieVS post-correlation toolbox** in development Generation of vgosDB databases • Ambiguity resolution and ionospheric delay correction • Supporting legacy S/X and VGOS observation setups Raw -0.02 -0.015 -0.01 -5×10⁻³ 0 5×10⁻³ 0.01 0.015 0.02 data VSC3 hardware Fringes on baseline Wn-Yb (EINT12) Observables (multiband 78055 80 delays) are stored in **Analysis Center** vgosDB databases which Analysis of VLBI observations and serve as basis for the estimation of geodetic products analysis See Sec. 2.)



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