TU WIEN VieVS
Vienna VLBI and Satellite Software

Introduction to VieVS

VieVS Days 2026 @ TU Wien

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VieVS
Vienna VLBI and Satellite Software

What is VieVS?

- Since 2018, umbrella for **all** software developments at the research unit Higher Geodesy (GEO Department). https://www.tuwien.at/en/mg/geo/hg
- Public modules: **VLBI**, **VieSched++**, VieRDS, RADIATE, raPPPid
- Available soon: VieCompy, VieSOFT
- See Poster from EGU 2026 in folder “SB” at https://tucloud.tuwien.ac.at/index.php/s/Mo4nCRtzJnaJsXi

Public VieVS modules not treated in this WS

VieRDS

- MATLAB-based software to simulate raw telescope data for VLBI.
- Simulated data can be correlated and fringe-fitted.

RADIATE

- Ray-tracing software written in Fortran.
- Ray-traced delays: observations in microwave/optical frequency range.
- Contributes to calculation of VMF3 mapping function coefficients.

raPPPid

Vienna VLBI and Satellite Software

- MATLAB-based software package for Precise Point Positioning (PPP).
- Process single- to triple-frequency GNSS observations.
- Suitable for data from geodetic receivers, low-cost receivers, smartphones …

VieVS modules available soon

VieCompy

Vienna VLBI and Satellite Software

- Stand-alone Python program for combination of Normal Equation (NEQ) systems from SINEX files.
- Currently for VLBI global solutions.
- Demonstration by Helene on Wednesday.

VieSOFT

- Collection of software tools (Python and C) to model and remove the effect of source structure in VLBI Level-1 data.

- Soon available on GitHub!

VieVS VLBI module

- State-of-the-art VLBI analysis software for geodesy and astrometry
- Developed at the research unit Higher Geodesy since 2008.
- Scripts, functions, and Graphical User Interface (GUI) are written in MATLAB
- Current reference:

J. Böhm, S. Böhm, J. Boisits, A. Girdiuk, J. Gruber, A. Hellerschmied, H. Krasna, D. Landskron, M. Madzak, D. Mayer, J. McCallum, L. McCallum, M. Schartner, K. Teke: Vienna VLBI and Satellite Software (VieVS) for Geodesy and Astrometry, Publications of the Astronomical Society of the Pacific, Vol. 130(986), 044503 (2018). http://iopscience.iop.org/article/10.1088/1538-3873/aaa22b/meta

System requirements

- Rather recent MATLAB Version (Release ≥R2016b); we currently do not recommend R2025a or later, since the GUI may look distorted.
- MATLAB Toolboxes are not necessary, unless you want to use the following functionalities:
  - Parallel processing (Parallel Computing Toolbox)
  - „Plot network“ option in *Plotting → Session analysis;* network plot in the global solution (Mapping Toolbox)
- Disk space
  - VLBI/COMMON modules: 900 MB
  - vgosDB 1979 to today: 82 GB
  - VMF3 1980 to today: 1.3 GB
  - Large amounts of data can be created by your processing in LEVEL# folders!

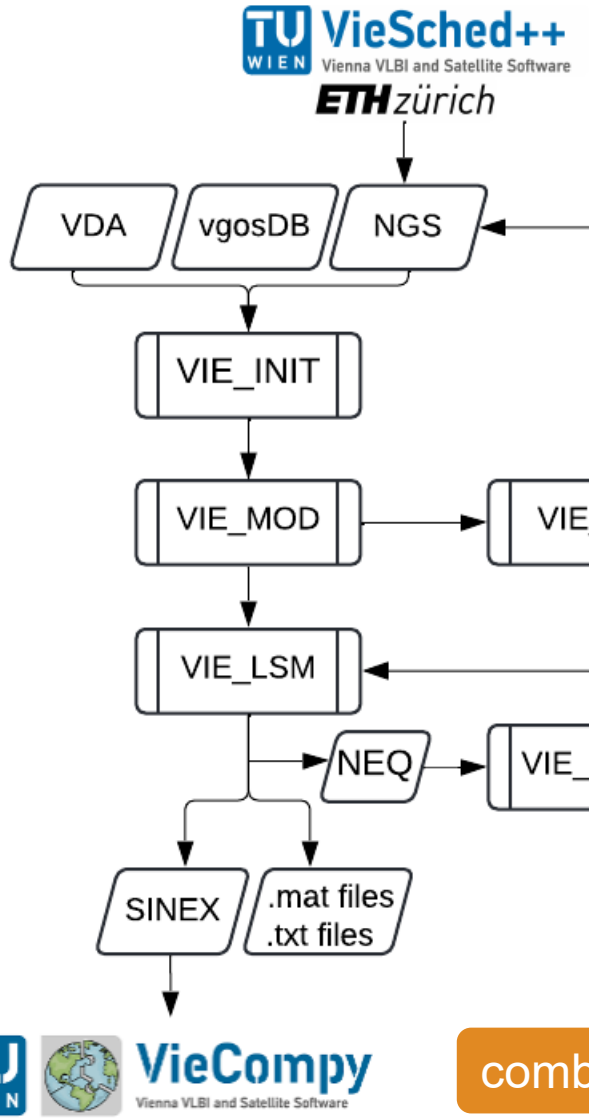
What can you do with VieVS VLBI?

- Single session analysis
  - Station coordinates
  - Source coordinates (single)
  - Earth orientation parameters (EOP): $x_\mathrm{p}, y_\mathrm{p}, \mathrm{UT1} - \mathrm{UTC}, dX, dY$
  - Troposphere: Zenith wet delays, north/east gradients
  - Clocks: station clocks, baseline-dependent clock offsets
  - Satellites: positions, orbital elements
- Global solution
  - Station coordinates and velocities (TRF)
  - Source coordinates (CRF)
  - EOP
  - Special parameters: e.g., station axis offsets, station seasonal harmonic signal, tidal ERP variations, ...

What can you do with VieVS VLBI?

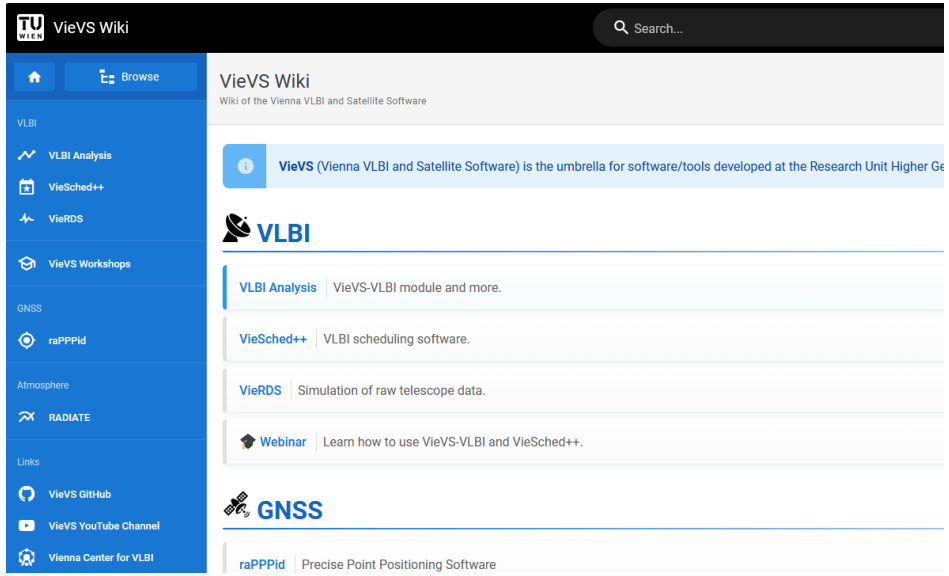
- Pre-analysis
  - Compute ionospheric correction
  - Ambiguity resolution
- Simulation (NGS files)
  - Slant wet delay
  - Station clocks
  - White noise
- Plotting/Output
  - Write SINEX files
  - Residuals: e.g., interactive outlier and ambiguity selection
  - Plot estimated parameters, write text files
  - Plot session network, baseline length repeatabilities (BSLR)
  - Write EOP in IVS-EOP format, write BSLR files

Structure


VieSched++
Vienna VLBI and Satellite Software
ETH zürich
scheduling
input files
VDA
vgosDB
NGS
initializing – data reading
VIE_INIT
modeling – theoretical delays, partial derivatives
VIE_MOD
VIE_SIM
simulation
least squares – parameter estimation
VIE_LSM
NEQ
VIE_GLOB
global solution – combination of normal equation systems
output files
SINEX
.mat files
.txt files
VieCompy
Vienna VLBI and Satellite Software
combination

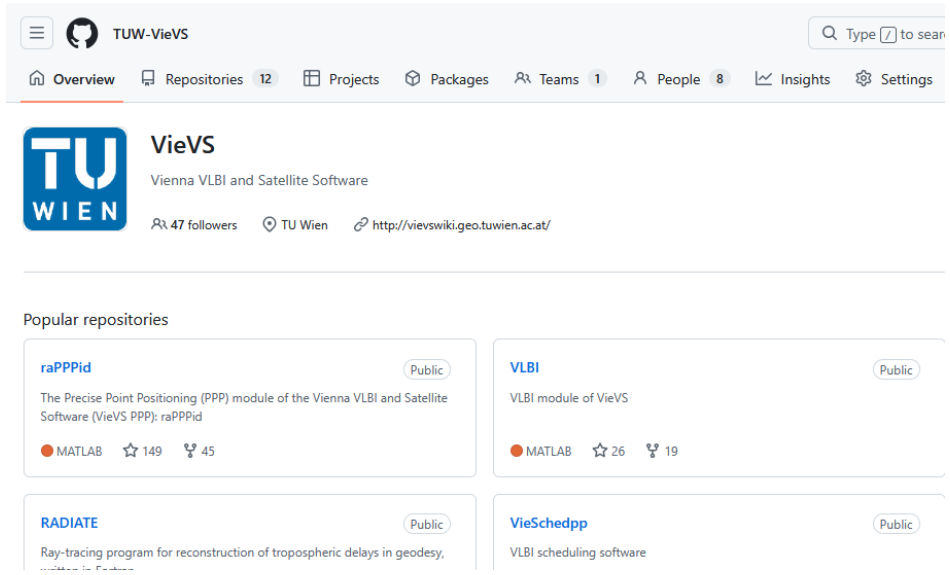
VieVS Wiki

https://vievswiki.geo.tuwien.ac.at/



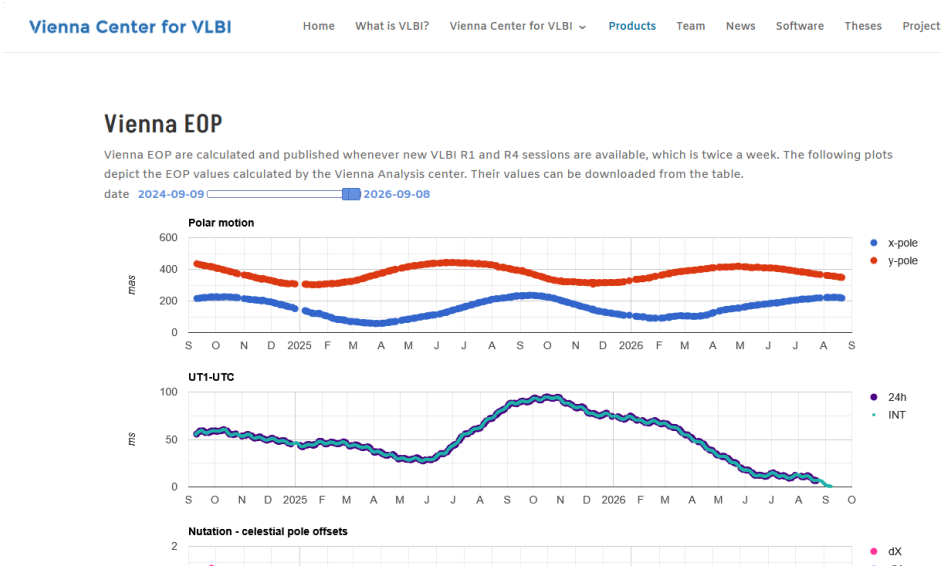
TUW-VieVS GitHub

https://github.com/TUW-VieVS



Vienna Center for VLBI

https://www.vlbi.at



VieVS channel YouTube

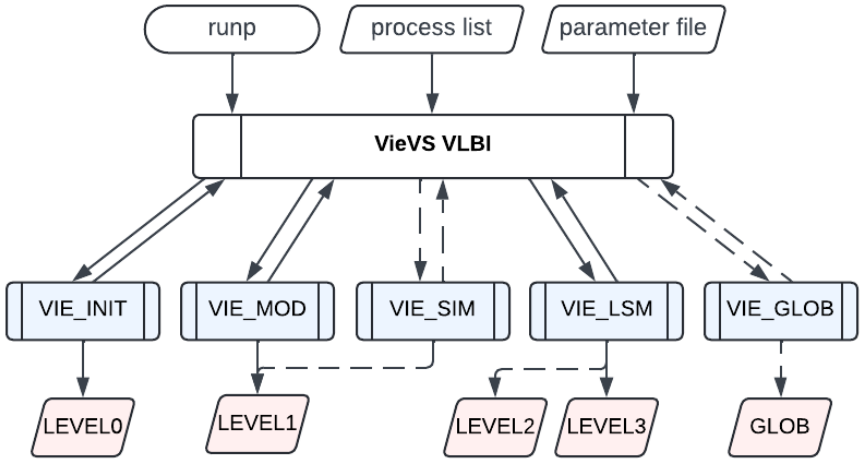
https://www.youtube.com/@vievs5981

Let’s get started!

- https://github.com/TUW-VieVS/VLBI/blob/develop/README.md
- Download the modules VLBI and COMMON
- Create year folders for observation data
- MATLAB
  - go to VLBI/WORK and type `vievs` in the command window
  - use the data download option in the welcome panel and download data for 2025-2026

You’re all set!

Batch processing



HTTPS://VIEVSWIKI.GEO.TUWIEN.AC.AT/VLBI-ANALYSIS/PROCESSING

- Inside GUI:
  - Open GUI by typing `vievs` in command window (current directory must be VLBI/WORK/).
  - Load the session data files into the panel “Process list”.
  - Set the desired processing parameters.
  - Create a runp.mat file by setting the paths and options in *Run→Run Options* and click Save runp.
  - Close GUI.
- Type `vievs('batch')` in command window.