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Status and future plans for the Vienna VLBI Software VieVS

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- The Vienna VLBI Software (VieVS) has been developed since 2008.
- Written in Matlab.
- Implements the most recent IERS Conventions.
- Easy to use through a Graphical User Interface (GUI).

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• Easy to add new models etc.



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Why Matlab?

Advantages of Matlab:

- Easy to use.
- Matlab available for several different operating systems.
- Source code easy to understand and to modify.
- Matlab has a lot of useful tools, e.g. for plotting.
- Disadvantages:
 - Matlab is probably slower than e.g. Fortran. Currently not a major problem.
 - Matlab is a commercial software. VieVS works on the free counterpart GNU Octave (except for the GUI).



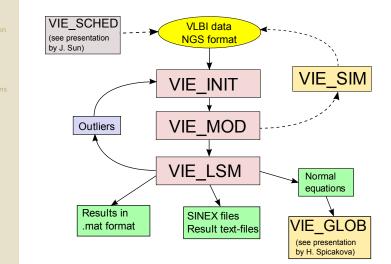
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VieVS

Structure

Structure of VieVS



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VIE_SETUP: the graphical user interface

Tobias Nilsson et al.

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vie_ism	single session	station	coordin	ates]				
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	YEBES4(M				8	30	360	
Jone offset per session	TIGOCONC				8	100		
	MATERA					100		
	NOWZE					100		
	WETT2BLL					100		
	HOBART12				8	50	240	
(# pwl offsets per session	HOBART26					100	360	
I# Fix some stations								
Enroduce relative constraints between pwi coordinate offsets								

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Main parts of VieVS

- - Reads in the VLBI data.
 - Presently supports NGS-format. Will support new data format specified by IVS WG4.
 - Possible to exclude stations, sources, outliers, \ldots

• VIE_MOD

- Calculates theoretical delays and partial derivatives.
- Implements the most recent IERS Conventions.

VIE_LSM

- Calculates the solution using the classical Least Squares method.
- Unknown parameters modelled as piece-wise linear offsets at integer hours (or integer fraction of hours).



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Additional parts of VieVS

VIE_SCHED

- Scheduling software.
- See separate presentation by Jing Sun.

• VIE_SIM

- Simulation tools.

• VIE_GLOB

- Global solution tool. Combine many sessions for estimating TRF, CRF, ...

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- See separate presentation by Hana Spicakova.



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VIE_SIM: the simulation tools

- Can be used to create simulated VLBI observations.
- The simulated observations are saved in NGS data files. Can then be analysed by VieVS or by other VLBI softwares.
- The most important error sources can be simulated:
 - Tropospheric delays (using the method of *Nilsson and Haas,* 2010).
 - Clock errors.
 - Measurement noise.

	sim_gui	_ X
what to simulate	turbulence parameters from parameter ✓ specify now	
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	OK	

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Selected results obtained with VieVS

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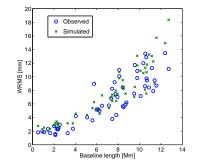
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Simulation results

- Baseline length repeatabilities for CONT08 from simulations and observed data.
- Simulation parameters:
 - Troposphere: $C_n = 2 \cdot 10^{-7} \text{ m}^{-1/3},$ H=2 km.
 - Clocks: ASD 10⁻¹⁴ @ 50 min.

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- White noise: 30 ps.



Time-series of zenith wet delays

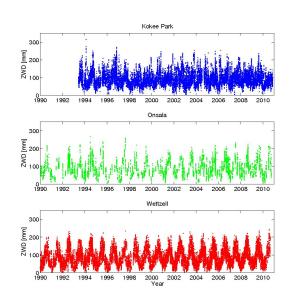


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Trends:

-0.11 mm/year

0.36 mm/year

0.51 mm/year

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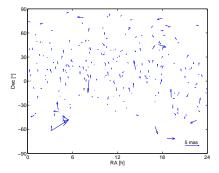
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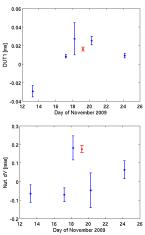
The IYA09 supersession

- 18–19 Novemeber, 2009.
- 32 stations.
- Goal: observe all defining ICRF2 sources.

Source Coordinates



EOP





Results

-40 -60 -80

-20

0

0 20 Up disp. [cm]

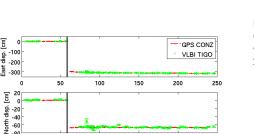
50

50

100

100

Day of year 2010



150

150

200

200

250

250

Displacement of TIGO Concepcion

Displacement of the TIGO Concepcion antenna due to the Earthquake on 27 February, 2010.



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Automatic data processing

- Every night the VieVS server at TU Vienna automatically downloads the latest sessions (+ files for atmospheric loading, EOP, ...).
- The downloaded sessions are then automatically processed.
- 24-hour VLBI sessions:
 - Simple processing is made to detect outliers.
 - For each session, a simple report is sent to a responsible analyst.
 - Analyst can determine if the session is ok or if there are problems (e.g. clock breaks).

Intensives:

- Sessions are analysed in order to estimate DUT1.
- Plot of DUT1 from the latest intensives is produced and put on the VieVS homepage: http://vievs.hg.tuwien.ac.at/dut1.png

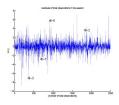
Example of a report:

Session: 11JAN20XE_N004

Result of automatic processing

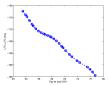
February 4, 2011

Lar of statione: YIEBS0M, ZELENCHK, NYALES3), HOBART26, MAT-ERA, THOCONC, WEITZELL, KOKEE . Reference clock: YZEIS30M Number of scans: 415 Number of scans: 415 chi-squared of main solution: 1.09146 chi-squared of main solution: 1.09146



DUT1 form Intensives:

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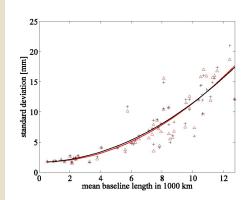
Ongoing and planned developments of VieVS



External tropospheric delays



Summary



- Black: baseline length repeatabilities for CONT08 using tropospheric delays obtained from raytracing.
- Red: baseline length repeatabilities from normal solution.

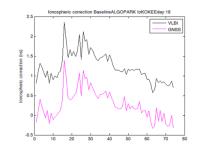


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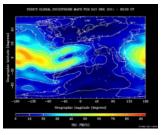
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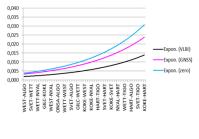


For further details, see poster by Claudia Tierno Ros





Baseline repeatability



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Other planned developments

- Kalman filter solution
 - Alternative to the Least Squares solution.
- Cover earlier steps in the data analysis chain
 - Group (and phase?) delay integer ambiguity resolution

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- lonospheric corrections
- Spacecraft tracking

- ...

- Presentation by Lucia Plank.
- Source structure?
- ...



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- VieVS is a new state-of-the-art VLBI analysis software written in Matlab.
- Results of the same quality as from other VLBI softwares.

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- VieVS is available free of charge to registered users.
- For more information, see the VieVS homepage: http://vievs.hg.tuwien.ac.at



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VieVS User Workshops

- The first VieVS user Workshop was held September 7-9, 2010, at TU Vienna.
- The next VieVS User Workshop will be on September 14-16, 2011 (week before "Journées 2011"). Everybody is welcome to participate.



Participants in the first VieVS User Workshop

http://vievs.hg.tuwien.ac.at/ws2011/