

Vienna VLBI Software

Current release and plans for the future

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EVGA Meeting
March 7th 2013

Introduction

Vienna VLBI
Software

Matthias
Madzak

Introduction

Overview

Graphical
User Interface

Plot residuals
Plot parameters
Plot session info

Possibilities

Single session
analysis
Scheduling
Global solution
Simulation
VLBI to space
probes

Future plans

User
workshop

Vienna VLBI Software (VieVS)

- VLBI data analysis software
- Developed since 2008
- Version 2.1 (release in March 2013)
- Written in Matlab
 - Easy to understand/use/modify
 - Many built-in functions
 - Relatively slow
 - Expensive (→ Octave)
- Graphical User Interface
- Freely available to registered users



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- Single session analysis
- Scheduling
- Simulation
- Global solution

In one common Graphical User Interface

Graphical User Interface

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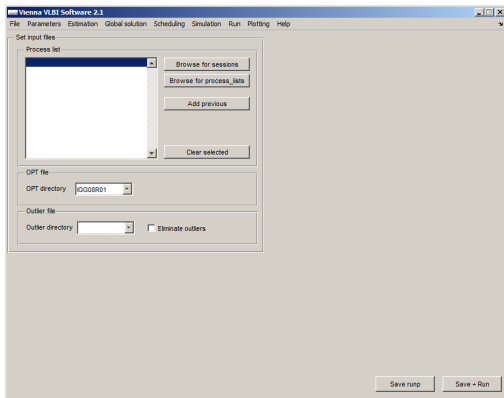
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User
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Combines all modules in one graphical interface

- Matlab GUIDE
- Set input files
- Change processing settings
- Define output options



Plotting tool

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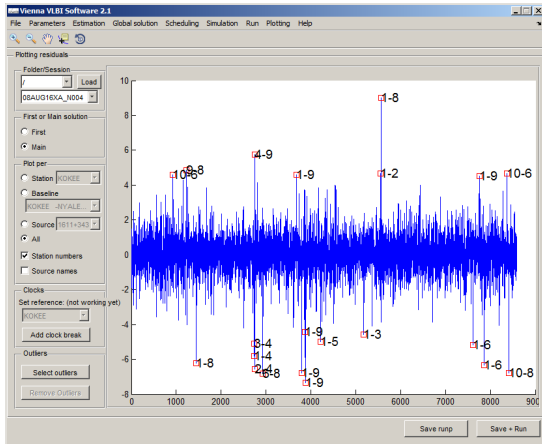
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Allows user to plot

- Residuals
- Parameters
- Session overview
- Zoom
- Pan
- Get values



Plotting tool - Residuals

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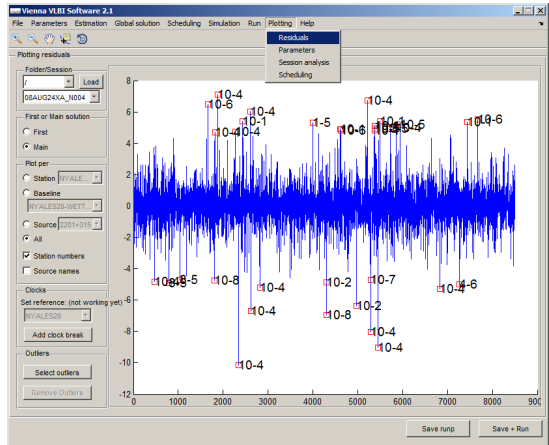
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Detect bad
stations, sources or
baselines



Plotting tool - Residuals

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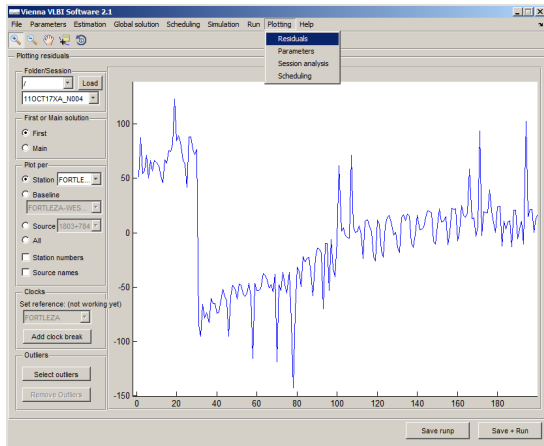
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Find and remove
clock breaks
interactively



Plotting tool - Residuals

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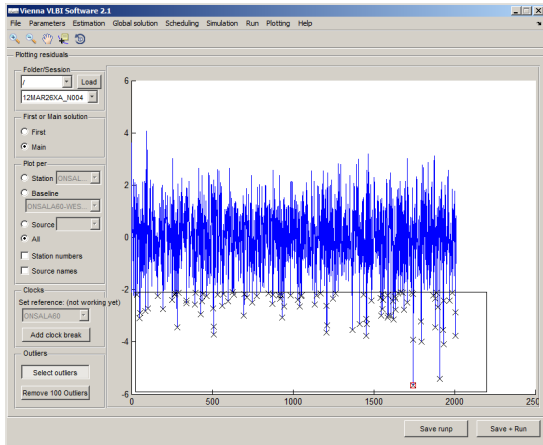
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Select outliers
interactively



Plotting tool - Parameters

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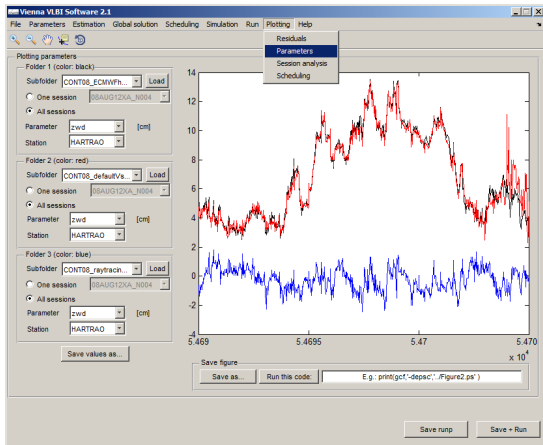
Future plans

User
workshop

Visualize estimated
parameters

Compare solutions

Output figure to
any Matlab
supported filetype



Plotting tool - Session analysis

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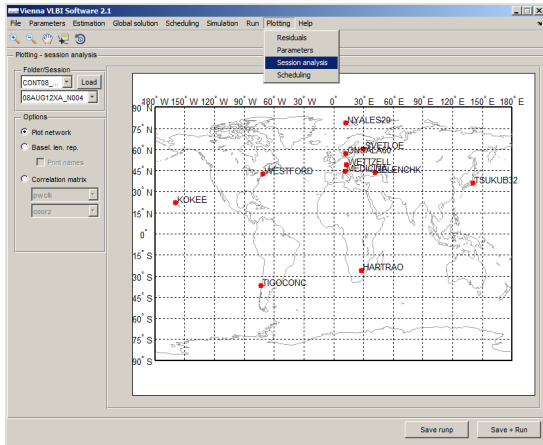
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Plot session network



Plotting tool - Session analysis

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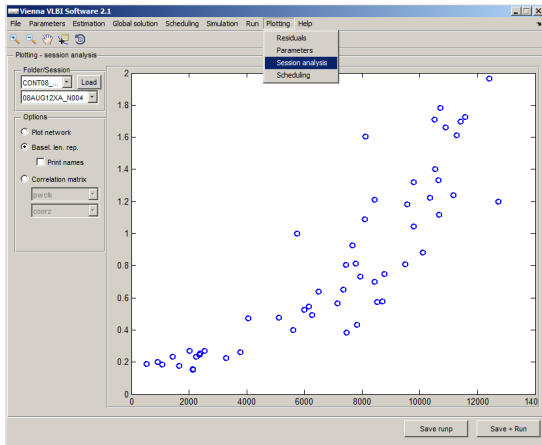
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Baseline length
repeatability



Plotting tool - Session analysis

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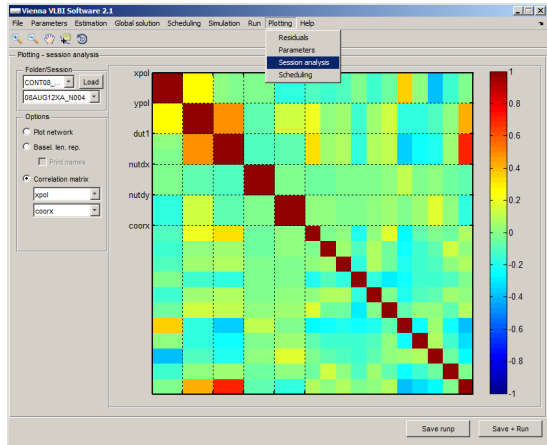
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Correlation matrix



Single session analysis

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Analyze one VLBI session and estimate parameters

- Read in data
 - NGS, netCDF
 - Removes outliers
 - Exclude stations, sources, baselines (.OPT files)
- Calculate
 - Theoretical delay and partial derivatives
 - Most recent IERS conventions
- Estimation
 - Least squares
 - Piece-wise linear offsets
- Parallel computing

Piece-wise linear offsets

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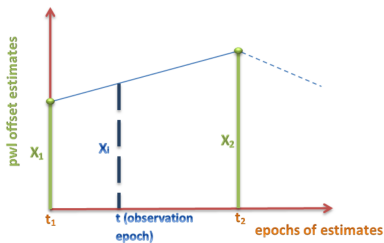
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Future plans

User
workshop

- At integer hours
- Estimation options
 - Intervals (5 minutes to 2 days)
 - Constraints
- Define in GUI



$$x_i = x_1 + \frac{t - t_1}{t_2 - t_1} (x_2 - x_1)$$

Scheduling VLBI experiments

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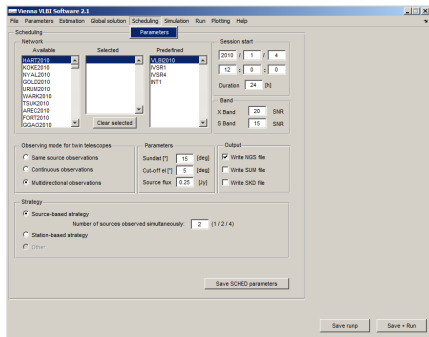
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Future plans

User
workshop

- Towards VLBI 2010
- Twins included (test version)
- 7 R&D sessions
- Source-based strategy
- Station-based strategy

→ See presentation by C.
Tierno Ros / J. Böhm



Global geodetic parameters

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Multi-session combination

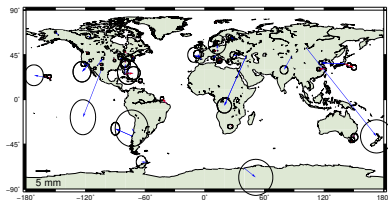
- TRF, CRF, EOP
- Stacking normal equations

Reduce parameters

Geodynamical and astronomical parameters (internal version)

- FCN period
- Love, Shida numbers
- γ -parameter

→ See presentation by H. Krásná



Horizontal position differences
(VieTRF10a, VTRF2008)

Simulation

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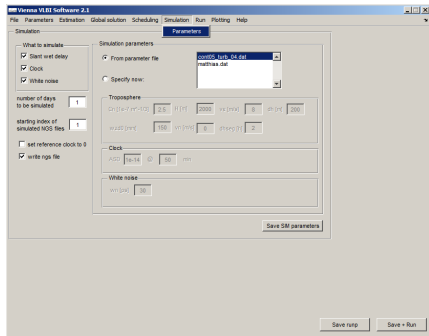
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Future plans

User
workshop

- Create simulated observations
- Write NGS files
- Simulate
 - Tropospheric delays (*Nilsson and Haas, 2010*)
 - Clock errors
 - Measurement noise



VLBI to space probes

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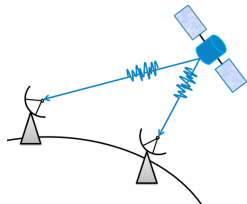
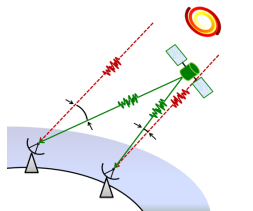
Future plans

User
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Internal version

- Processing of SELENE D-VLBI observations
 - Delay model of sources at finite distances
 - Moving target
- VLBI observations to satellites
 - Scheduling
 - Simulations
 - (Processing)
- Goals
 - Develop observing strategies
 - Frame ties

→ See presentation by L. Plank



Future plans

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Future plans

User
workshop

- Kalman filter (see Poster by M. Karbon)
- Scheduling (continue)
- Satellite observations (continue)
- Geophysical and astronomical parameter estimation (e.g. galactic rotation)
- OpenDB

User workshops

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Future plans

User
workshop

- Held every year at TU Vienna since 2010
- Next: Probably autumn 2013
- Everybody welcome!
- *views.hg.tuwien.ac.at*



Participants of the VieVS User Workshop 2012

The authors would like to thank FWF projects P24813 (SPOT), P23143 (Integrated VLBI), P21049 (SCHED2010), P24187 (VLBI-Art) and DFG project FOR 1503 (D-VLBI) for supporting this work.