

9th VieVS User Workshop, Vienna, September 11 – 12, 2018

VIE_LSM 3.1

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Outline

1. Introduction
2. Estimated parameters in `vie_lsm`
3. Piece-wise linear offset (PWLO) functions
4. Partial derivatives of the PWLO functions
5. Least-Squares adjustment in `vie_lsm`
6. Correcting large clock errors and clock breaks in a first least-squares solution
7. Main parameterisation of least-squares adjustment in VieVS
8. Conclusions

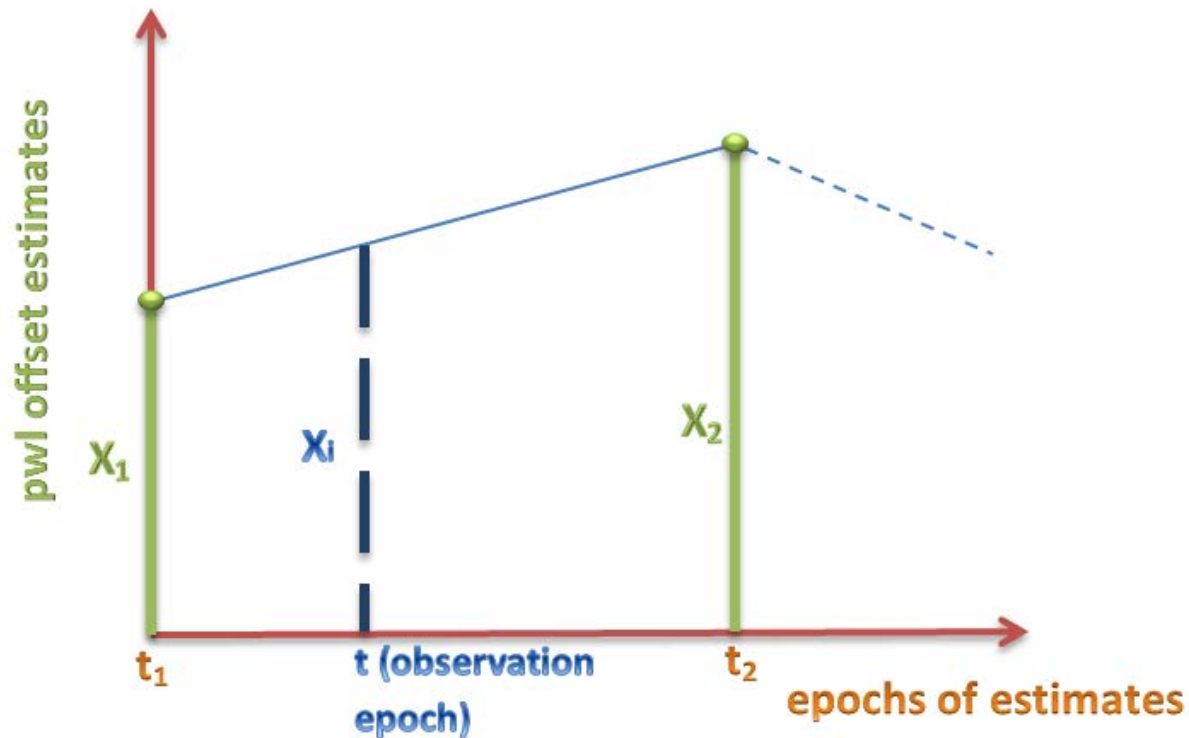
1. Introduction

- “vie_lsm” is a module of “VieVS”, which estimates geodetic parameters with Gauss Markov least squares adjustment from VLBI observations.
- All the parameters can be estimated as piece-wise linear offsets (PWLO) in sub-daily and daily temporal resolution.
- Station- and source-wise parameterisation allows to change station- and source-specific parameters for each station and source independently.

2. Estimated parameters in vie_lsm

- Clock errors: offset (cm) + rate (cm/day) + quadratic term (cm/day²) + PWLO (cm),
- Zenith wet delays (cm) as PWLO,
- Troposphere gradients (cm) as PWLO,
- EOP (mas and ms) as PWLO,
- Antenna coordinates in TRF (cm) as one offset per session or as PWLO,
- Source coordinates in CRF (declinations in mas and right ascensions in ms) as one offset per session or as PWLO.

3. Piece-wise linear offset (PWLO) functions



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

4. Partial derivatives of the PWLO functions


$$\frac{\partial \tau(t)}{\partial x_1} = \frac{\partial \tau(t)}{\partial x_i} \cdot \frac{\partial x_i}{\partial x_1} \longrightarrow \frac{\partial x_i}{\partial x_1} = 1 - \frac{t - t_j}{t_{j+1} - t_j}$$

$$\frac{\partial \tau(t)}{\partial x_2} = \frac{\partial \tau(t)}{\partial x_i} \cdot \frac{\partial x_i}{\partial x_2} \longrightarrow \frac{\partial x_i}{\partial x_2} = \frac{t - t_j}{t_{j+1} - t_j}$$


$$t_j < t < t_{j+1}$$

5. Least-squares adjustment in vie_lsm

$A = [A(1).sm \quad \dots \quad A(15).sm]$  design matrix of real observation equations

$H = \begin{bmatrix} H(1).sm & \dots & 0 \\ \vdots & \ddots & \vdots \\ 0 & \dots & H(15).sm \end{bmatrix}$  design matrix of pseudo-observation equations (constraints)

$N = \begin{bmatrix} A^T P A + H^T P_H H & C^T \\ C & 0 \end{bmatrix}$ $b = \begin{bmatrix} A^T P o c + H^T P_H o c h \\ b_c \end{bmatrix}$ b_c is a zero vector (due to NNT and NNR conditions)

$x = N^{-1} b$  parameter vector (estimates)

$$m_0 = (v^T P v + v_H^T P_H v_H) / (n_{obs} + n_{constr} - n_{unk})$$

$K_x = m_0 N^{-1}$  variance-covariance matrix of the estimates

6. Correcting large clock errors and clock breaks in a first least-squares solution

The screenshot shows the 'VieVS estimation settings' window. The 'First solution' section is highlighted with a red box, containing the following options:

- Run first solution (only following clock function)
- one offset per clock
- one offset & one rate per clock
- one offset, one rate & one quadratic term per clock

The 'Main solution' section is also highlighted with a red box, containing the following options:

- Run main solution (parameter estimation)
- Simple outlier test ($c * m0$)
- Normal outlier test ($c * m0 * \text{sqrt}(qvv)$)
- Apply baseline dependent weights (only vie_ism)

Other settings include:

- Estimate parameters (otherwise: only N matrix created)
- Write all parameters to ASCII file (Save as...)
- Allow for stationwise and sourcewise parameterization for each session
- Add constant noise to observations [cm]: 1
- Introduce elevation dependent noise (only vie_ism)

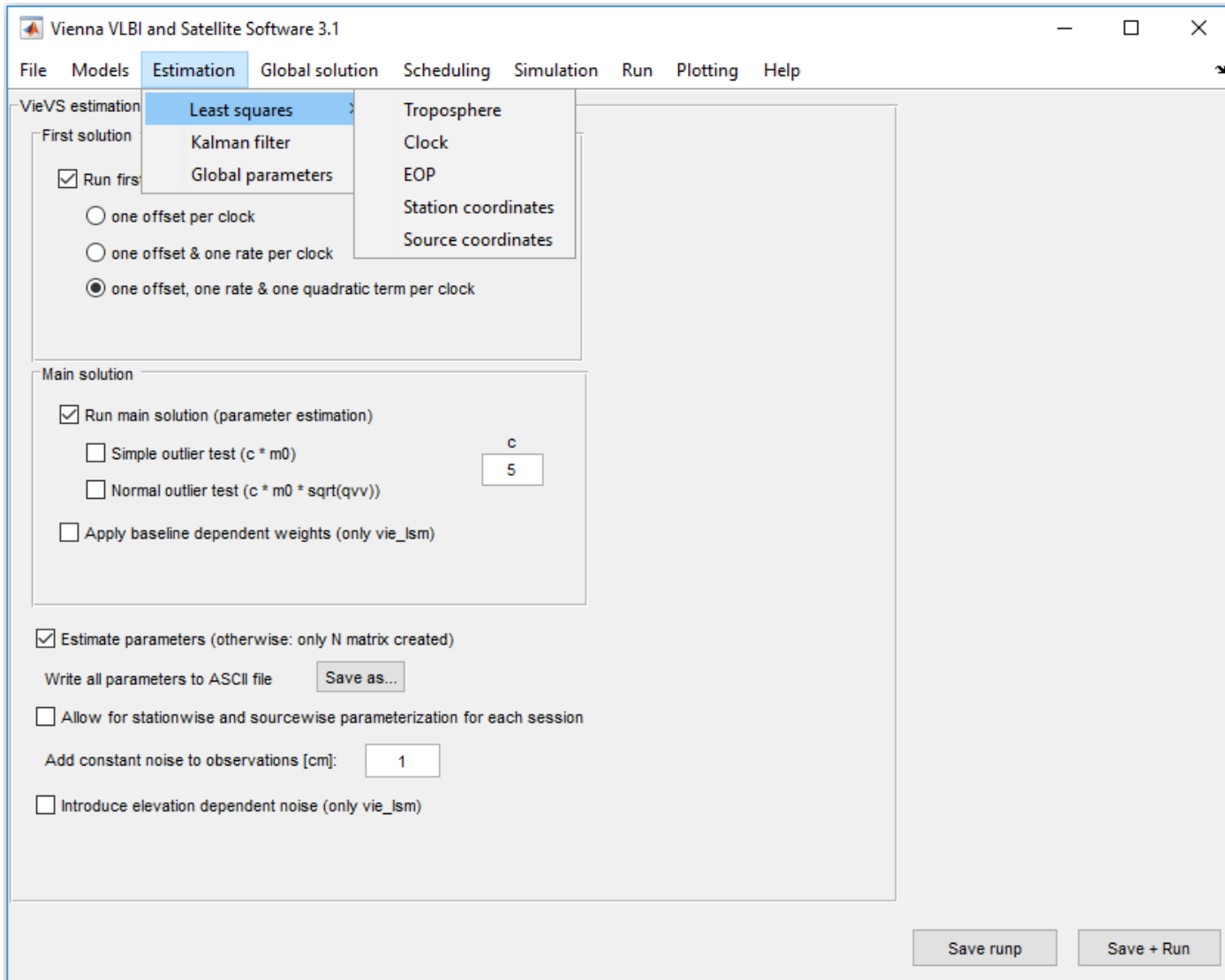
The plot shows clock error (Clc) over Time. It features a blue line representing the clock error, which is piecewise linear. The segments are labeled: 'First clock break', 'Second clock break', and 'Third clock break'. The segments are labeled with polynomial orders: 'p0', 'Second clock polynomial', and 'Third clock polynomial'. The plot is bounded by 'Beginning of the session', 'First clock break', 'Second clock break', and 'End of the session'.

Station	Source	Value
KOKEE	MATERA	56457.213020833333
KOKEE	WETTZELL	56457.141226851854
KOKEE	MATERA	56457.383483796293
FORTLEZA	MATERA	56457.416435185187
KOKEE	MATERA	56457.653912037036
HOBART12	TIGOCONC	56456.884803240740
KOKEE	NYALES20	56457.141226851854

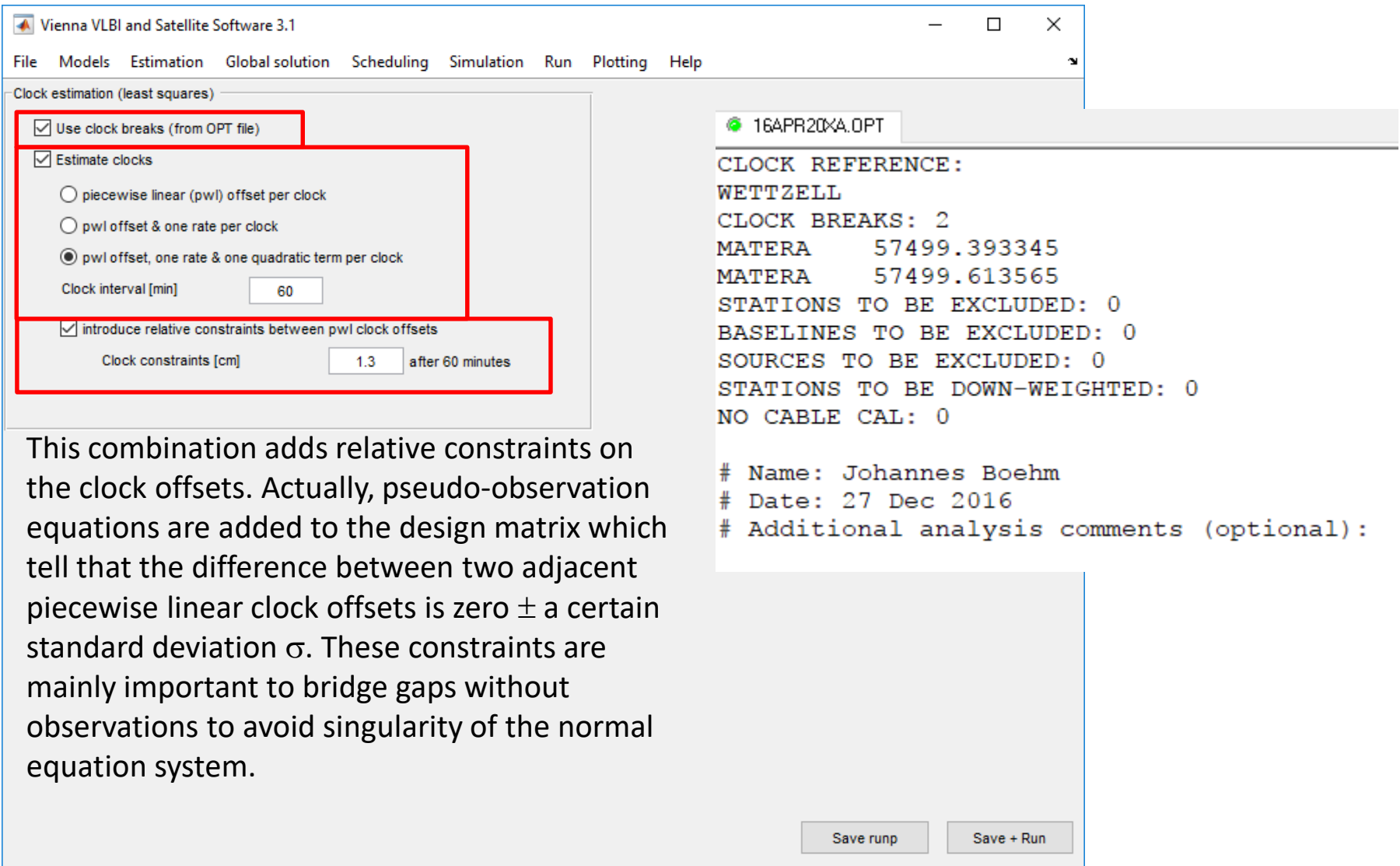
A first LS solution is done for reducing large clock errors from the observations and for fixing clock breaks.

New outlier observations are detected and written to text files VieVS/VLBI/DATA/OUTLIER/YOURDIR/YEAR/SESSNAME.OUT

7. Main parameterisation of least-squares adjustment in VieVS



7.1. Synchronisation errors between clocks



The screenshot shows the 'Clock estimation (least squares)' dialog box in the Vienna VLBI and Satellite Software 3.1. The 'Use clock breaks (from OPT file)' checkbox is checked. Under 'Estimate clocks', the 'pwl offset, one rate & one quadratic term per clock' radio button is selected. The 'Clock interval [min]' is set to 60. The 'introduce relative constraints between pwl clock offsets' checkbox is checked, with 'Clock constraints [cm]' set to 1.3 after 60 minutes. The output window shows the following text:

```
16APR20XA.OPT
CLOCK REFERENCE:
WETTZELL
CLOCK BREAKS: 2
MATERA      57499.393345
MATERA      57499.613565
STATIONS TO BE EXCLUDED: 0
BASELINES TO BE EXCLUDED: 0
SOURCES TO BE EXCLUDED: 0
STATIONS TO BE DOWN-WEIGHTED: 0
NO CABLE CAL: 0

# Name: Johannes Boehm
# Date: 27 Dec 2016
# Additional analysis comments (optional):
```

Buttons for 'Save runp' and 'Save + Run' are visible at the bottom right of the dialog.

This combination adds relative constraints on the clock offsets. Actually, pseudo-observation equations are added to the design matrix which tell that the difference between two adjacent piecewise linear clock offsets is zero \pm a certain standard deviation σ . These constraints are mainly important to bridge gaps without observations to avoid singularity of the normal equation system.

7.2. Troposphere delays (ZWD and gradients)

Vienna VLBI and Satellite Software 3.1

File Models Estimation Global solution Scheduling Simulation Run Plotting Help

Troposphere estimation (least squares)

Zenith wet delays

- Estimate zenith wet delays
 - ZWD interval [min]
- introduce relative constraints between pwl zenith wet delay offsets
 - ZWD constraints [cm] after 60 minutes

Gradients

- Estimate north gradients
 - NGR interval [min]
 - introduce relative constraints between pwl NGR offsets
 - NGR constraints [cm] after 360 minutes
 - introduce absolute constraints between pwl NGR offsets
 - NGR abs. constr. [cm]
- Estimate east gradients
 - EGR interval [min]
 - introduce relative constraints between pwl EGR offsets
 - EGR constraints [cm] after 360 minutes
 - introduce absolute constraints between pwl EGR offsets
 - EGR abs. constr. [cm]

reduced from observations a priori to the adjustment

estimated

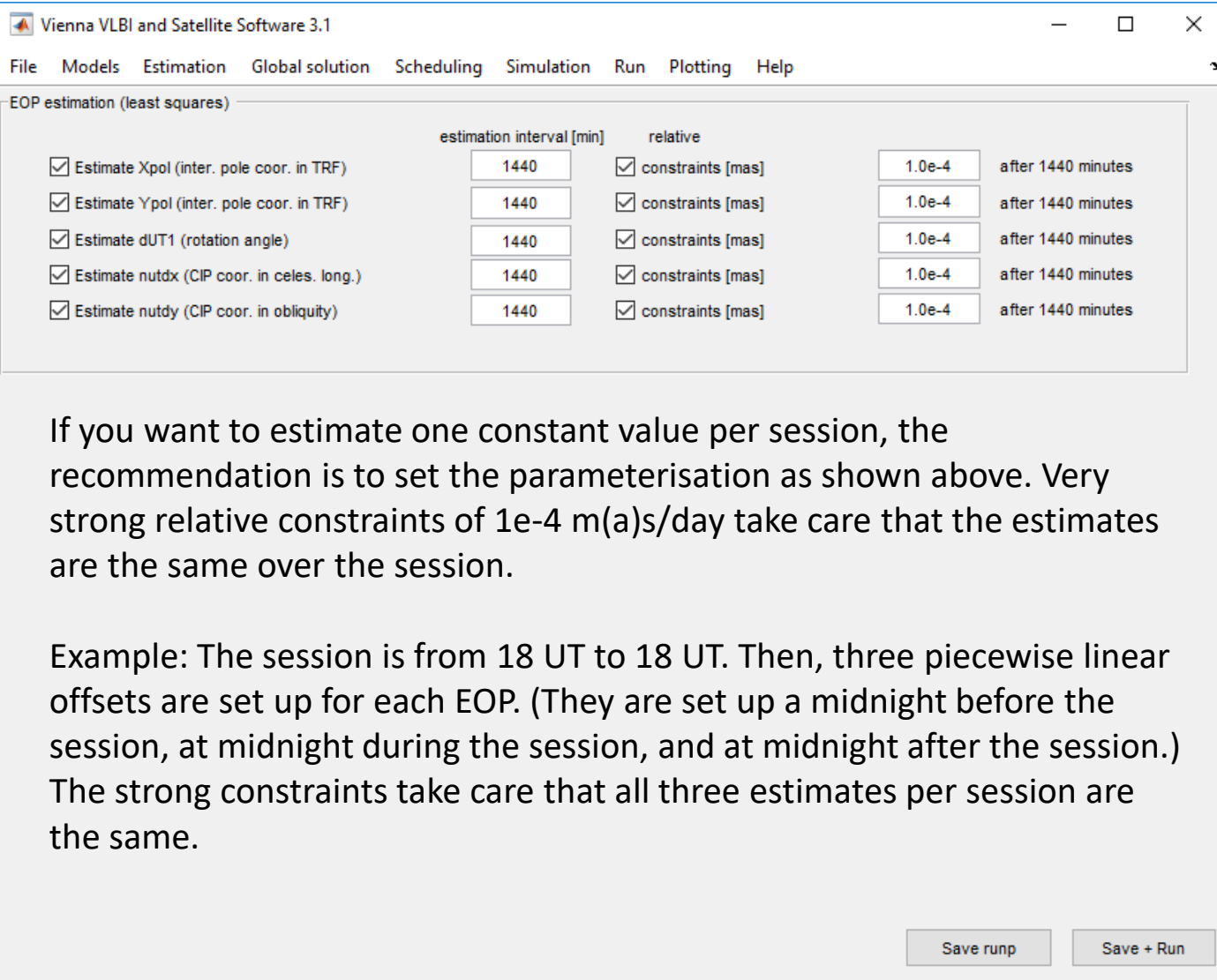
$$\Delta \tau_{trop}(\alpha, \varepsilon) = ZHD m_h(\varepsilon) + ZWD m_w(\varepsilon) + m_w(\varepsilon) \cot(\varepsilon) [G_n \cos(\alpha) + G_e \sin(\alpha)]$$

estimated

estimated

Save runp Save + Run

7.3. Earth Orientation Parameters



Vienna VLBI and Satellite Software 3.1

File Models Estimation Global solution Scheduling Simulation Run Plotting Help

EOP estimation (least squares)

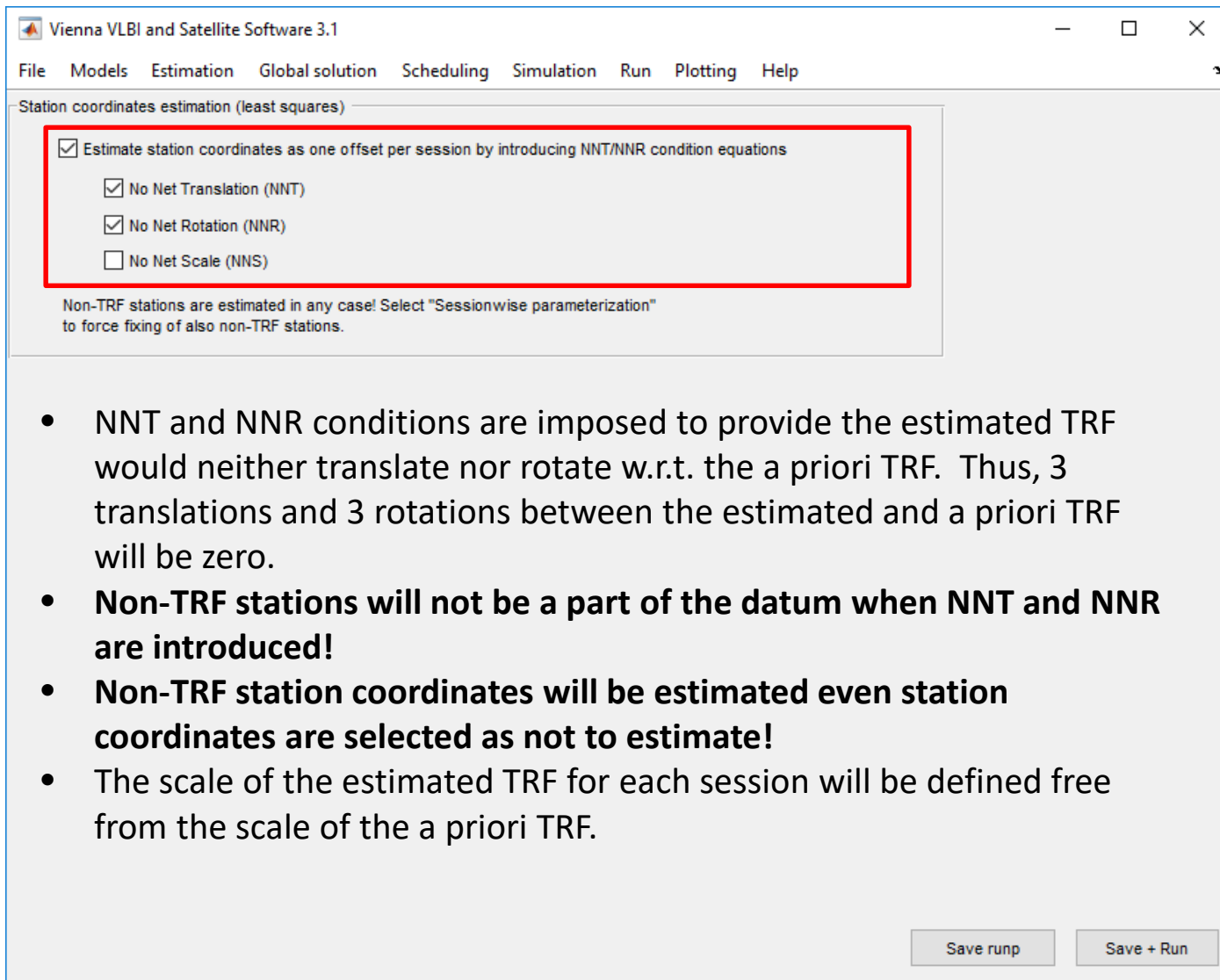
	estimation interval [min]	relative		
<input checked="" type="checkbox"/> Estimate Xpol (inter. pole coord. in TRF)	1440	<input checked="" type="checkbox"/> constraints [mas]	1.0e-4	after 1440 minutes
<input checked="" type="checkbox"/> Estimate Ypol (inter. pole coord. in TRF)	1440	<input checked="" type="checkbox"/> constraints [mas]	1.0e-4	after 1440 minutes
<input checked="" type="checkbox"/> Estimate dUT1 (rotation angle)	1440	<input checked="" type="checkbox"/> constraints [mas]	1.0e-4	after 1440 minutes
<input checked="" type="checkbox"/> Estimate nutdx (CIP coord. in celes. long.)	1440	<input checked="" type="checkbox"/> constraints [mas]	1.0e-4	after 1440 minutes
<input checked="" type="checkbox"/> Estimate nutdy (CIP coord. in obliquity)	1440	<input checked="" type="checkbox"/> constraints [mas]	1.0e-4	after 1440 minutes

If you want to estimate one constant value per session, the recommendation is to set the parameterisation as shown above. Very strong relative constraints of $1e-4$ m(a)s/day take care that the estimates are the same over the session.

Example: The session is from 18 UT to 18 UT. Then, three piecewise linear offsets are set up for each EOP. (They are set up a midnight before the session, at midnight during the session, and at midnight after the session.) The strong constraints take care that all three estimates per session are the same.

Save runp Save + Run

7.4. Antenna TRF coordinates



Vienna VLBI and Satellite Software 3.1

File Models Estimation Global solution Scheduling Simulation Run Plotting Help

Station coordinates estimation (least squares)

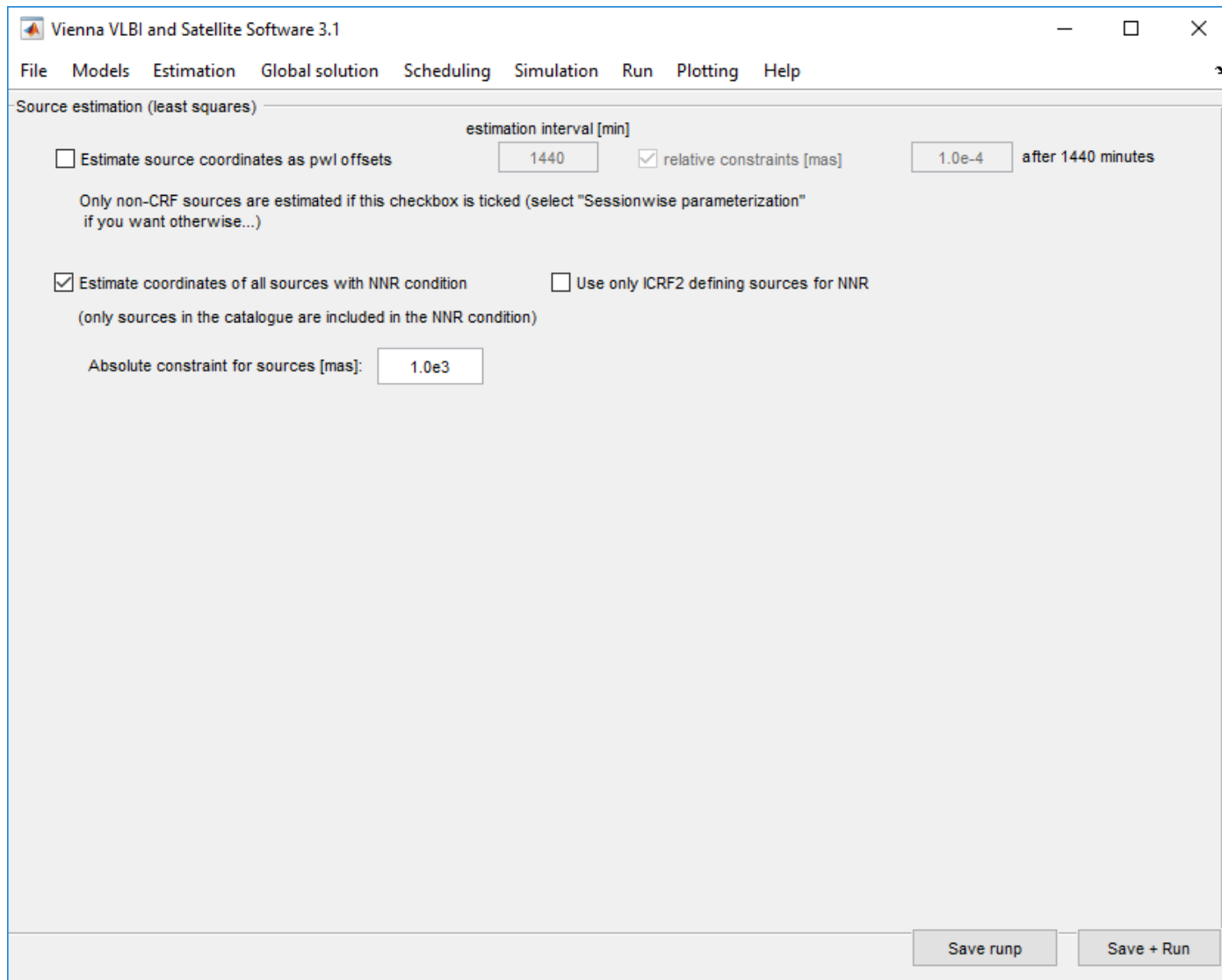
- Estimate station coordinates as one offset per session by introducing NNT/NNR condition equations
 - No Net Translation (NNT)
 - No Net Rotation (NNR)
 - No Net Scale (NNS)

Non-TRF stations are estimated in any case! Select "Sessionwise parameterization" to force fixing of also non-TRF stations.

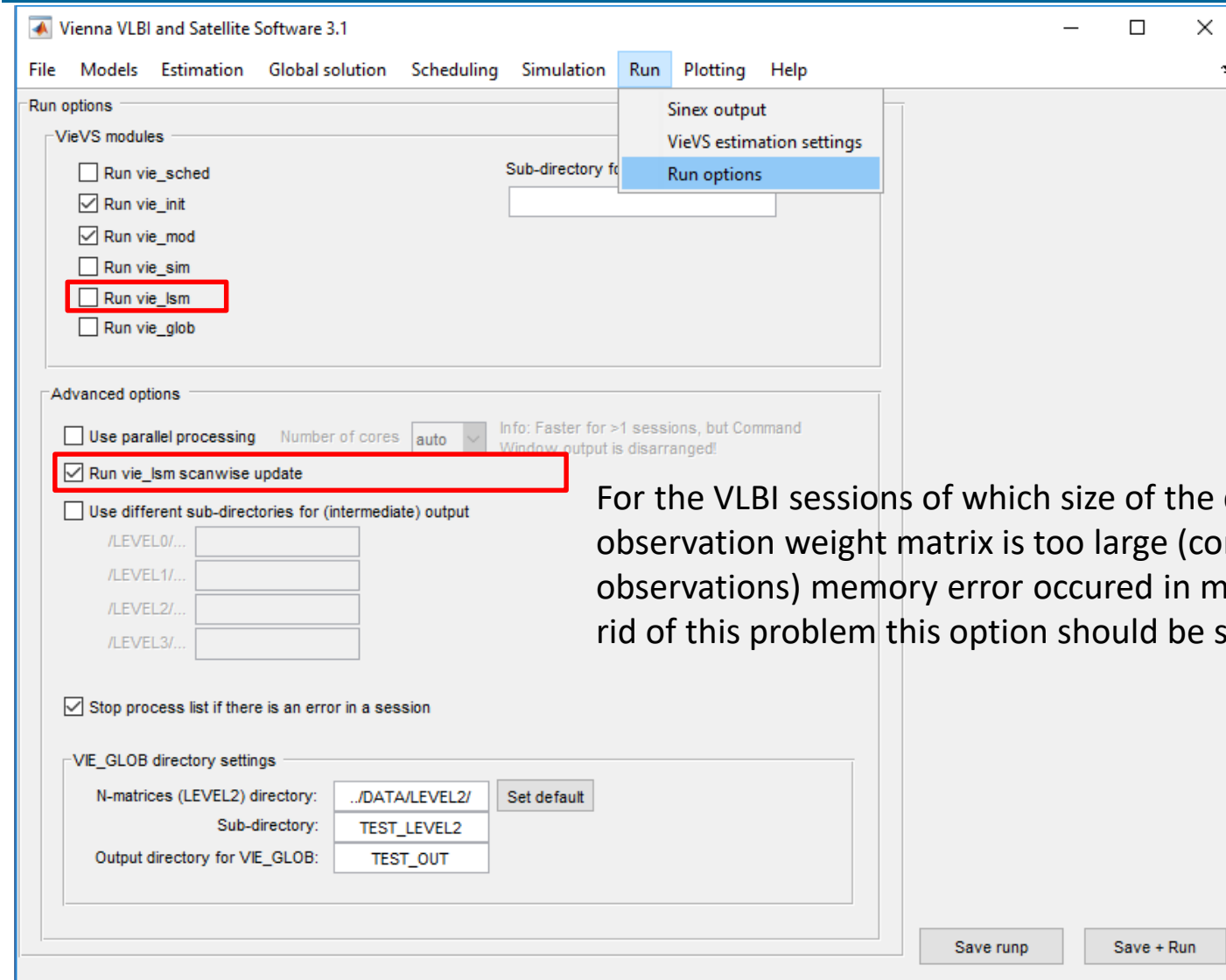
Save runp Save + Run

- NNT and NNR conditions are imposed to provide the estimated TRF would neither translate nor rotate w.r.t. the a priori TRF. Thus, 3 translations and 3 rotations between the estimated and a priori TRF will be zero.
- **Non-TRF stations will not be a part of the datum when NNT and NNR are introduced!**
- **Non-TRF station coordinates will be estimated even station coordinates are selected as not to estimate!**
- The scale of the estimated TRF for each session will be defined free from the scale of the a priori TRF.

7.5. Source CRF coordinates



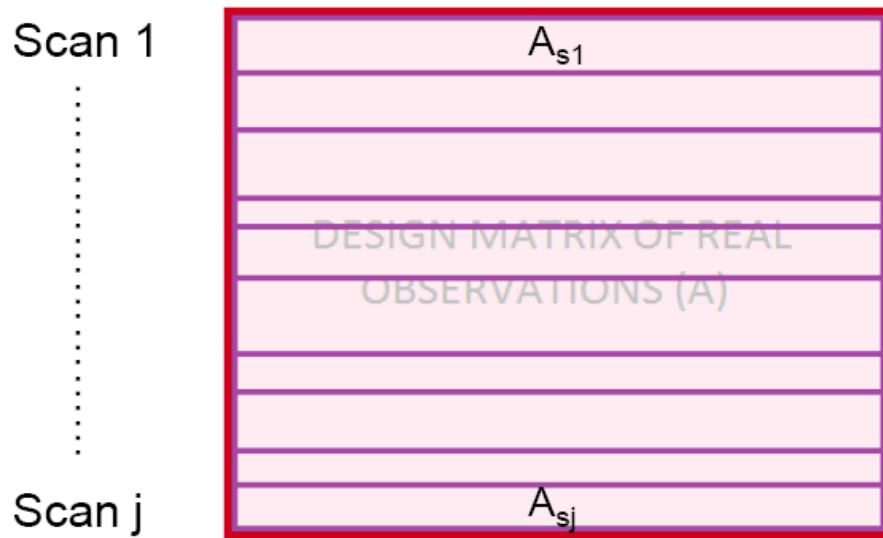
7.6. vie_lsm scan-wise update



The screenshot shows the 'Run options' dialog box in the Vienna VLBI and Satellite Software 3.1 application. The 'Run' menu is open, and the 'Run options' option is selected. In the 'Run options' section, the 'Run vie_lsm' checkbox is highlighted with a red box. In the 'Advanced options' section, the 'Run vie_lsm scanwise update' checkbox is also highlighted with a red box. The 'Use parallel processing' checkbox is unchecked, and the 'Number of cores' is set to 'auto'. The 'Use different sub-directories for (intermediate) output' checkbox is unchecked, and the 'Stop process list if there is an error in a session' checkbox is checked. The 'VIE_GLOB directory settings' section shows the 'N-matrices (LEVEL2) directory' set to './DATA/LEVEL2/', the 'Sub-directory' set to 'TEST_LEVEL2', and the 'Output directory for VIE_GLOB' set to 'TEST_OUT'. The 'Save runp' and 'Save + Run' buttons are visible at the bottom right of the dialog box.

For the VLBI sessions of which size of the design matrix and observation weight matrix is too large (consists too many observations) memory error occurred in matlab. In order to get rid of this problem this option should be selected!

7.7. Scan-wise update of normal equations



$$N_{s1} = A_{s1}^T \cdot P_{s1} \cdot A_{s1}$$

$$N_A = N_{s1} + N_{s2} + \dots + N_{sj}$$

$$b_{s1} = A_{s1}^T \cdot P_{s1} \cdot oc_{s1}$$

$$b_A = b_{s1} + b_{s2} + \dots + b_{sj}$$

j : number of scans in the session

Claudia Tierno Ros, Third VieVS user workshop, 11-13 September, 2012

8. Conclusions

- `vie_lsm` corrects clock breaks and detects outlier observations.
- `vie_lsm` provides SINEX input and datum free normal equations for global solutions.
- PWLO estimates of VieVS are in a good agreement with those derived from other space geodetic techniques.
- Scan-wise update of normal equation system ensures a successful process of the future sessions with lots of observations.
- Station-wise and source-wise parameterisation allows to investigate on several site- and source-specific features.

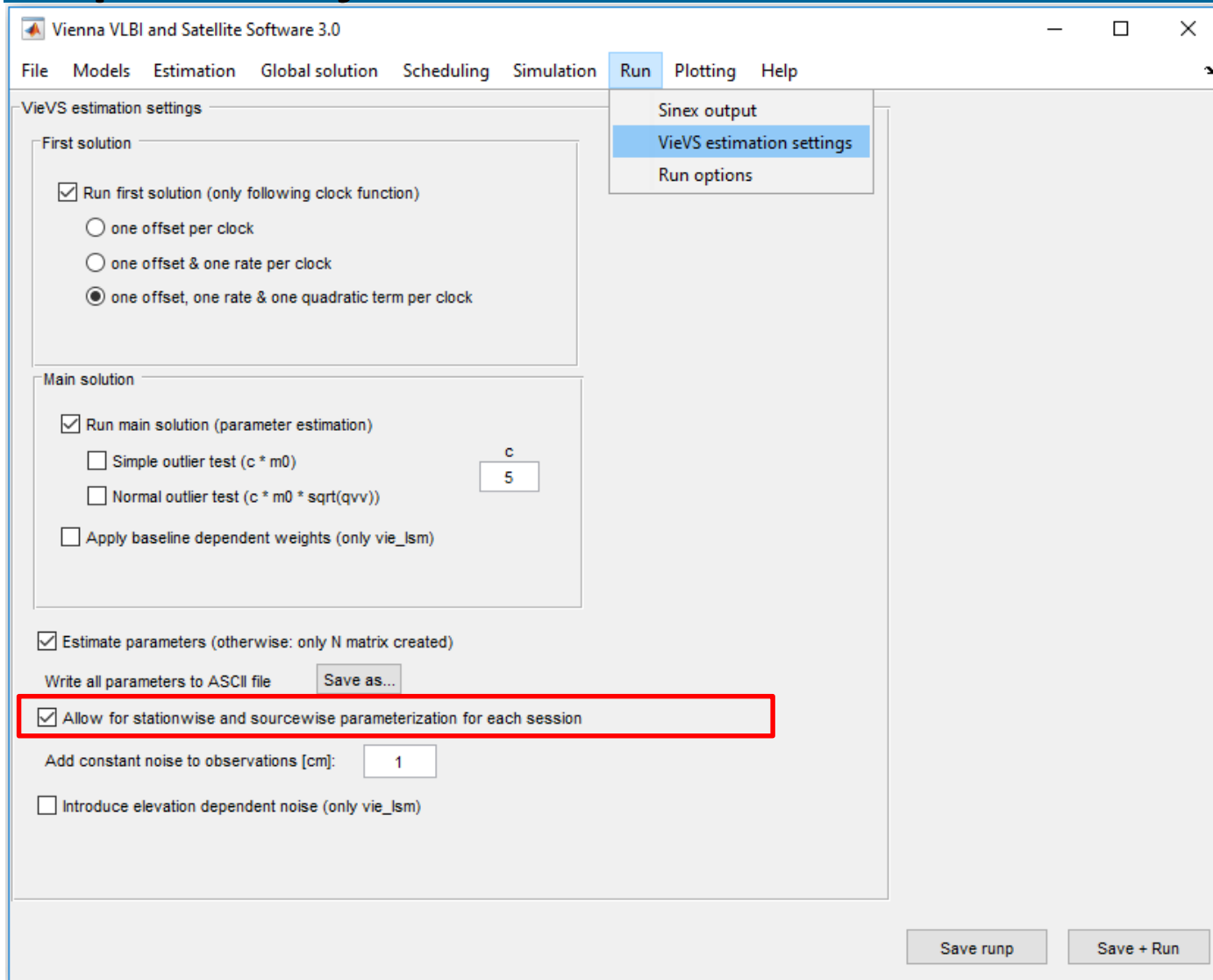
Vie_LSM 3.1

Thanks for your attention!

Appendices

(Station- and source-wise parameterisation of least-squares adjustment in VieVS)

A.1. Station- and source-wise parameterisation of least-squares adjustment in VieVS



A.1.1. Clock-wise parameterisation

Untitled

vie_lsm [single session first solution]

parameterization for removing large clock errors

- apply first basic solution (only with clock function)
 - one offset per clock
 - one offset & one rate per clock
 - one offset, one rate, & one quadratic term per clock
- use clock breaks (From OPT file)

reference clock for the first solution

FORTLEZA

FORTLEZA

MATERA

HART15M

NYALES20

TSUKUB32

WETTZ13N

WETTZELL

SEJONG

KOKEE

main solution

- apply main solution
- simple outlier test [coefficient * mo] coefficient: 5
- basic outlier test [coefficient * mo *sqrt(qw)]

clock/s that have breaks in the session

No clock breaks information!

Next

A.1.1. Clock-wise parameterisation

The screenshot shows a software window titled 'vie_lsm_gui_clock' with a sub-header 'vie_lsm [single session clocks]'. The window is divided into several sections:

- parameterization for clocks:** A group box containing four options:
 - estimate clocks
 - piecewise linear (pwl) offsets per clock
 - pwl offsets & one rate per clock
 - pwl offsets, one rate, & one quadratic term per clock
 - introduce relative constraints between pwl clock offsets
- Instructions:**
 - Default reference clock has not any clock break.
 - Reference clock is the first clock in the NGS file
 - OR if any OPT file of the session exists fixed clock is from OPT file
 - Unit of clock estimation intervals is minutes.
 - Unit of clock constraints is centimeters
 - E.g. 1.3 cm after 1 hour is relatively loose.
- Table:** A table with 5 columns: clock name, clock constraints, clock interval, and reference clock. The 'reference clock' column contains checkboxes.

	clock constraints	clock interval	reference clock
FORTLEZA	1.3000	60	<input checked="" type="checkbox"/>
MATERA	1.3000	60	<input type="checkbox"/>
HART15M	1.3000	60	<input type="checkbox"/>
NYALES20	1.3000	60	<input type="checkbox"/>
TSUKUB32	1.3000	60	<input type="checkbox"/>
WETZ13N	1.3000	60	<input type="checkbox"/>
WETZELL	1.3000	60	<input type="checkbox"/>
SEJONG	1.3000	60	<input type="checkbox"/>
KOKEE	1.3000	60	<input type="checkbox"/>
- Navigation:** 'Back' and 'Next' buttons at the bottom right.

A.1.2. Station-wise troposphere delay parameterisation

vie_lsm_gui_tropo

vie_lsm [single session troposphere]

apply relative constraints between tropospheric offset estimates

- introduce RELATIVE CONSTRAINTS between pwl ZENITH WET DELAY offsets
- unit of estimation intervals is minute.
- unit of ZWD relative constraints is cm e.g. 1.5 cm after 1 hour is relatively loose.
- introduce REALTIVE CONSTRAINTS between pwl tropo. NORTH GRADIENT offsets
- unit of NGR & EGR relative constraints is cm, e.g. 0.05 cm after 6 hours is relatively loose.
- introduce RELATIVE CONSTRAINTS between pwl tropo. EAST GRADIENT offsets
- unit of NGR & EGR absolute constraints is cm, e.g. 0.1 cm absolutely loose.
- introduce ABSOLUTE CONSTRAINTS between pwl tropo. NORTH GRADIENT offsets
- introduce ABSOLUTE CONSTRAINTS between pwl tropo. EAST GRADIENT offsets

	ZWD coef.	NGR rel. coef.	EGR rel. coef.	NGR abs. coef.	EGR abs. coef.	ZWD int.	NGR int.	EGR int.	est. ZWD	est. NGR	est. EGR
FORTLEZA	1.5000	0.0500	0.0500	0.1000	0.1000	60	360	360	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
MATERA	1.5000	0.0500	0.0500	0.1000	0.1000	60	360	360	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
HART15M	1.5000	0.0500	0.0500	0.1000	0.1000	60	360	360	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
NYALES20	1.5000	0.0500	0.0500	0.1000	0.1000	60	360	360	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
TSUKUB32	1.5000	0.0500	0.0500	0.1000	0.1000	60	360	360	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
WETT13N	1.5000	0.0500	0.0500	0.1000	0.1000	60	360	360	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
WETTZELL	1.5000	0.0500	0.0500	0.1000	0.1000	60	360	360	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
SEJONG	1.5000	0.0500	0.0500	0.1000	0.1000	60	360	360	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
KOKEE	1.5000	0.0500	0.0500	0.1000	0.1000	60	360	360	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Back Next

A.1.3. Selecting TRF datum stations to introduce NNT/NNR

Case 1: NNT/NNR
(one coordinate offset per session)

The screenshot shows the 'vie_lsm [single session station coordinates]' window. On the left, under 'general options for estimation of stations coordinates', the following options are visible:

- estimate station coordinates
- one offset per session
 - NNT/NNR
 - Fix some stations
- pwl offsets per session

On the right, a table lists station parameters:

	NNT	NNR	NNS	XYZ_est	constraints	coord.intervals
FORTLEZA	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	10	360
MATERA	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	10	360
HART15M	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	10	360
NYALES20	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	10	360
TSUKUB32	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	10	360
WETTZ13N	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	10	360
WETTZELL	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	10	360
SEJONG	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	10	360
KOKEE	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	10	360

Unit of TRF relative constraints is cm, e.g. 10 cm after 6 hours is relatively loose.

Buttons: Back, Next

A.1.4. Selecting TRF datum stations to fix a priori coordinates

Case 2: Fix some station coordinates
(one coordinate offset per session)

The screenshot shows the 'vie_lsm [single session station coordinates]' window. On the left, under 'general options for estimation of stations coordinates', the following options are visible:

- estimate station coordinates
- one offset per session
- NNT/NNR
- Fix some stations
- pwl offsets per session

On the right, a table lists station parameters:

	NNT	NNR	NNS	XYZ_est	constraints	coor. intervals
FORTLEZA	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	10	360
MATERA	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	10	360
HART15M	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	10	360
NYALES20	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	10	360
TSUKUB32	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	10	360
WETTZ13N	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	10	360
WETTZELL	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	10	360
SEJONG	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	10	360
KOKEE	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	10	360

Unit of TRF relative constraints is cm, e.g. 10 cm after 6 hours is relatively loose.

Buttons: Back, Next

A.1.5. Estimating sub-daily station coordinates as PWLO

Case 3: Fix some station coordinates
(estimate sub-daily TRF coordinates as CPWLO)

general options for estimation of stations coordinates

- estimate station coordinates
- one offset per session
- pwl offsets per session
- Fix some stations
- introduce relative constraints between pwl coordinate offsets

	NNT	NNR	NNS	XYZ_est	constraints	coor. intervals
FORTLEZA	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	10	360
MATERA	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	10	360
HART15M	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	10	360
NYALES20	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	10	360
TSUKUB32	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	10	360
WETTZ13N	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	20	60
WETTZELL	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	20	60
SEJONG	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	10	360
KOKEE	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	10	360

Unit of TRF relative constraints is cm, e.g. 10 cm after 6 hours is relatively loose.

Back Next

A.1.6. Source-wise parameterisation

vie_lsm_gui_sourcoord

vie_lsm [single session source coordinates]

estimate coordinates of sources as pwl offsets [all the unselected sources will be fixed to CRF]

introduce relative constraints between pwlo source coordinates

	source name	total observations	est. coord.	constraints	coord. interval
1	0202+319	374	<input checked="" type="checkbox"/>	1.0000e-04	1440
2	0716+714	589	<input type="checkbox"/>	1.0000e-04	1440
3	0821+394	126	<input type="checkbox"/>	1.0000e-04	1440
4	0420-014	119	<input type="checkbox"/>	1.0000e-04	1440
5	OJ287	196	<input type="checkbox"/>	1.0000e-04	1440
6	0347-211	16	<input type="checkbox"/>	1.0000e-04	1440
7	1147+245	40	<input type="checkbox"/>	1.0000e-04	1440
8	0920-397	6	<input type="checkbox"/>	1.0000e-04	1440
9	2227-088	84	<input type="checkbox"/>	1.0000e-04	1440
10	1324+224	34	<input type="checkbox"/>	1.0000e-04	1440
11	1030+415	267	<input type="checkbox"/>	1.0000e-04	1440
12	2318+049	69	<input type="checkbox"/>	1.0000e-04	1440
13	2052-474	10	<input type="checkbox"/>	1.0000e-04	1440
14	3C371	512	<input type="checkbox"/>	1.0000e-04	1440
15	1636+473	65	<input type="checkbox"/>	1.0000e-04	1440

- unit of constraints is mas.
- unit of coordinate estimation intervals in minutes.
- Please, fix at least one source which has more than 1 observation if you select estimate sources
- Non-CRF sources will be estimated as default.

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A.1.7. vie_lsm single session output parameterisation for global solution

vie_lsm_gui_global

vie_lsm [single session output]

Estimate parameters according to the options in previous GUIs

Prepare N_global and b_global for global solution

No parameters are reduced. (Reduction can be done in VIE_GLOB.) Constraints according to previous GUIs. Conditions on station coordinates are removed. N and b will be stored in DATA/LEVEL2/

write data into SINEX file (DATA/SNX/)

parameters	include into SINEX file	reduce from N_sinex	parameters	include into SINEX file	reduce from N_sinex
clock parameters		<input checked="" type="radio"/>	source coordinates		
zenith wet delay	<input type="radio"/>	<input checked="" type="radio"/>	station coordinates	<input checked="" type="radio"/>	
tropospheric gradients	<input type="radio"/>	<input checked="" type="radio"/>	EOP	<input checked="" type="radio"/>	<input type="radio"/>

Add extra parameters to the N matrix

source coordinates (all sources - datum free) ATTENTION! Don't estimate sources from single session if you want to store them in the N matrix!!!

Back Finish