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# VIE\_LSM

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# Introduction

- ▶ vie\_lsm is a module of VieVS, which estimates geodetic parameters with least squares adjustment from VLBI observations.
- ▶ Estimated parameters are:
  - ✓ quadratic polynomial coefficients of clocks (offset in cm, rate in cm/day, and quadratic term in cm/day<sup>2</sup>) plus continuous piecewise linear offsets (CPWLO) of clocks in cm,
  - ✓ zenith wet delay (ZWD) CPWLO in cm,
  - ✓ troposphere north and east gradients CPWLO in cm,
  - ✓ Earth orientation parameters (EOP) CPWLO in mas and ms,
  - ✓ TRF coordinates of antennas in cm (CPWLO or one offset per session),
  - ✓ CRF coordinates of sources as CPWLO in mas.
- ▶ Since, the standard deviations of observations are so small, 1 cm added before weights are formed. Weight matrix of observations is diagonal (units are in 1/cm<sup>2</sup>). Currently, no down weighting is applied due to elevation angles of the observations.

# Introduction

- estimates constrained (relative or absolute) to zero with a large or a small standard deviation (loose or tight). This is due to connect the parameters which have no observation in the corresponding estimation interval.
- Realistic standard deviations should be assigned to the constraints. If not then outlier observations in small number in an estimation interval will cause unrealistic estimates.

$\text{offset}(t+1) - \text{offset}(t) = 0 \pm m_{c\_rel} \rightarrow \text{relative constraints}$

Example:

$m_{c\_rel} = 30 \text{ mas/day} \rightarrow X_{pol} \text{ CPWLO relative constraints are loose.}$

$m_{c\_rel} = 0.001 \text{ mas/day} \rightarrow X_{pol} \text{ CPWLO relative constraints are tight.}$

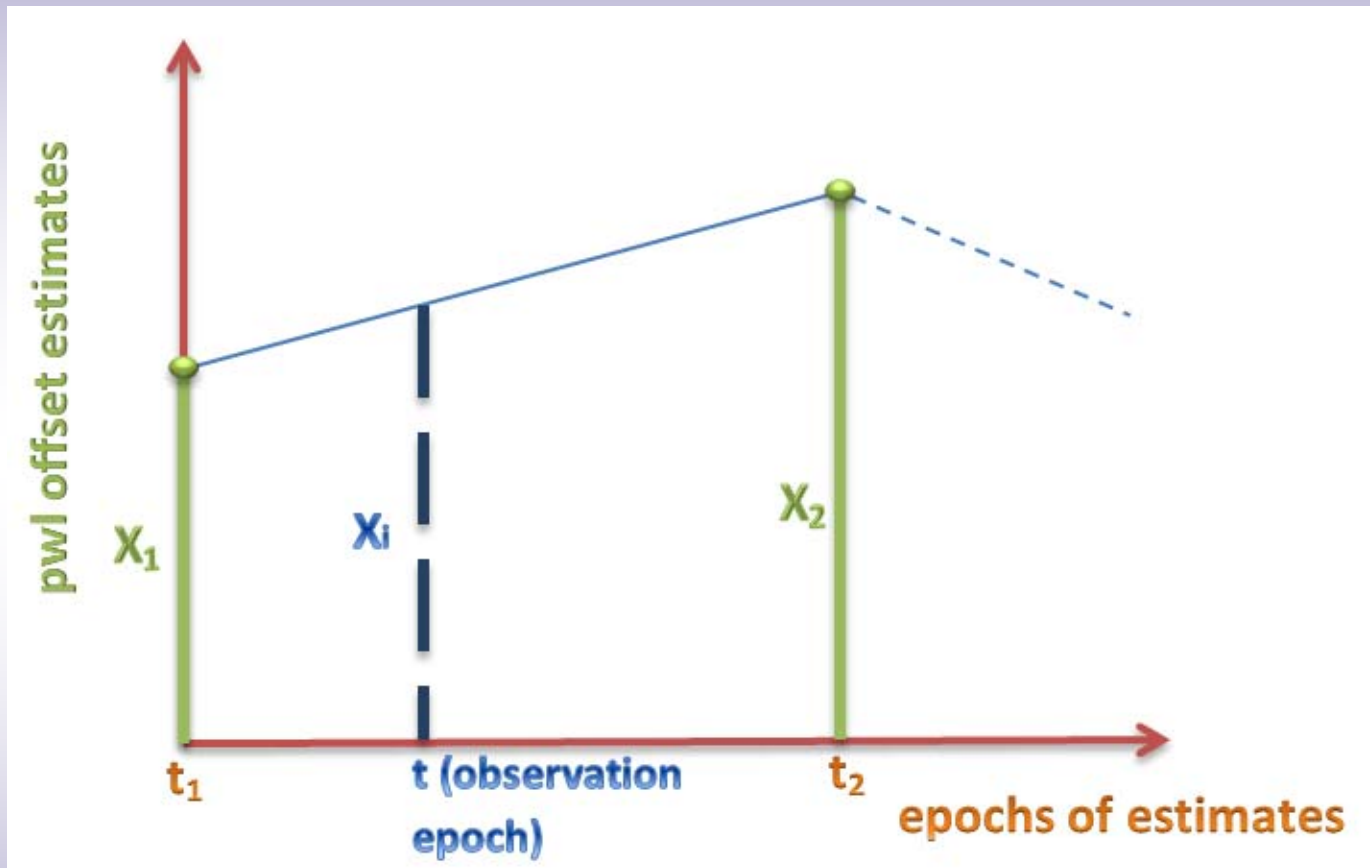
$\text{offset}(t) = 0 \pm m_{c\_abs} \rightarrow \text{absolute constraints}$

Example:

$m_{c\_abs} = 2 \text{ mm} \rightarrow \text{Troposphere east gradients absolute constraints are loose.}$

$m_{c\_abs} = 0.01 \text{ mm} \rightarrow \text{Troposphere east gradients absolute constraints are tight.}$

# Continuous piece-wise linear offset functions (CPWLO)



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

Partial derivatives of the delay model w.r.t. a sub-daily parameter to be estimated at consecutive epochs

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

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

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

$x_{1,2}$  are the estimated offsets of a parameter at epochs  $t_j$  and  $t_{j+1}$   
 e.g.  **$\Delta\text{UT1}$**  is the estimated parameter at epochs **15:00** and **16:00 UTC**

# LS Adjustment

$$A = \begin{bmatrix} A(1).sm & \cdots & A(15).sm \end{bmatrix}$$



design matrix of real observation equations

$$H = \begin{bmatrix} H(1).sm & \cdots & 0 \\ \vdots & \ddots & \vdots \\ 0 & \cdots & H(15).sm \end{bmatrix}$$



design matrix of pseudo-observation equations (constraints)

$$N = \begin{bmatrix} A^T P A + H^T P_H H & C^T \\ C & 0 \end{bmatrix}$$

$$b = \begin{bmatrix} A^T P o c + H^T P_H o c h \\ b_c \end{bmatrix}$$

$bc$  is a zero vector  
(due to NNT and NNR conditions)

parameter vector  
(estimates)

$$x = N^{-1} b \quad m_0 = (v^T P v + v_H^T P_H v_H) / (n_{obs} + n_{constr} - n_{unk})$$

$$K_x = m_0 N^{-1}$$



variance-covariance matrix of the estimates

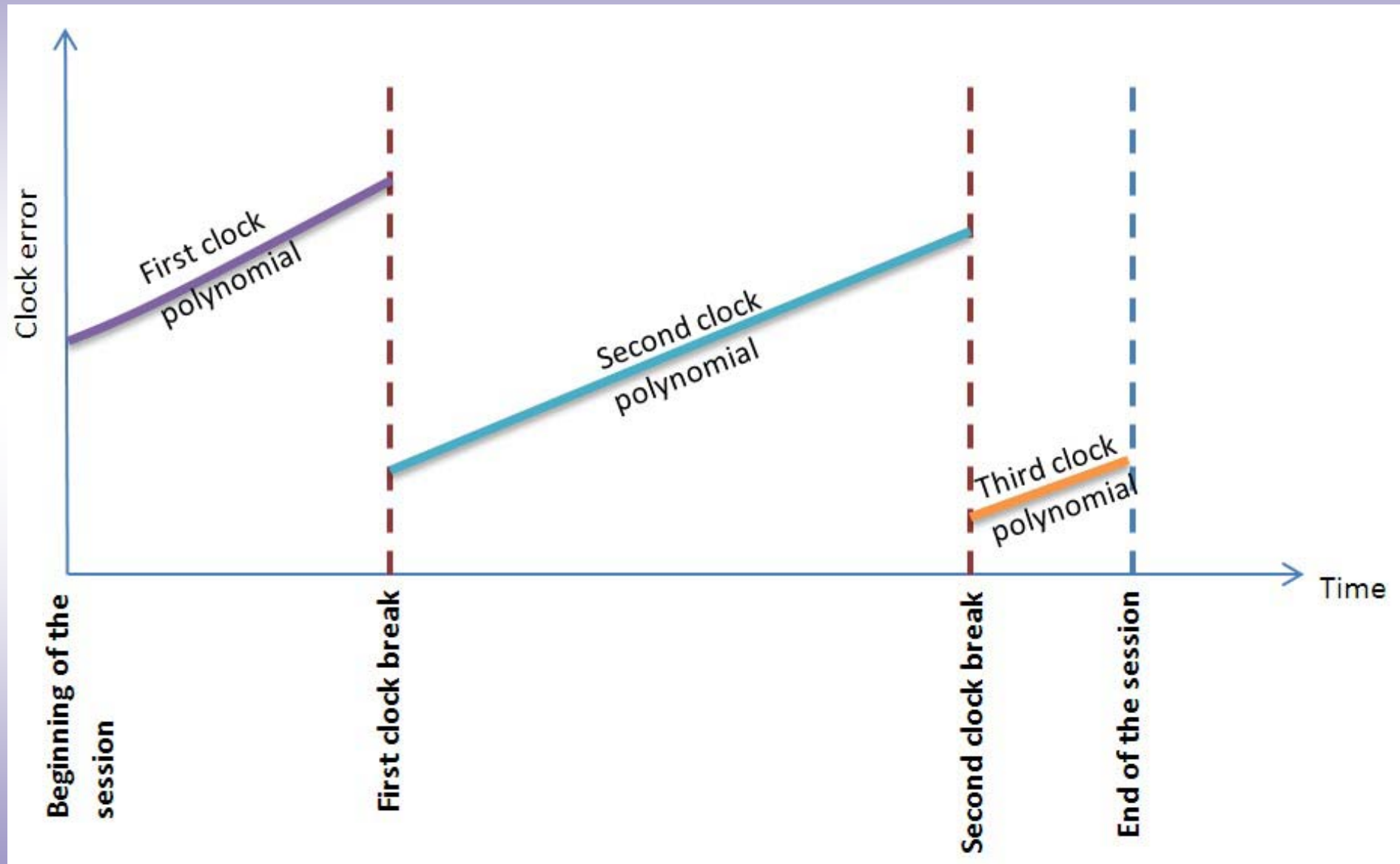
# VLBI clock error

$$\Delta\tau_{clk}^{poly}(t) = \beta_0 + \beta_1(t - t_0) + \beta_2(t - t_0)^2 \rightarrow \text{quadratic polynomial for each clock}$$

$$\Delta\tau_{clk}^{CPWLO}(t) = x_1 + \frac{t - t_1}{t_2 - t_1}(x_2 - x_1) \rightarrow \text{CPWLO for each clock e.g. at each UTC integer hour (t}_1 \text{ and t}_2)$$

$$\Delta\tau_{clk}(t) = \Delta\tau_{clk}^{poly}(t) + \Delta\tau_{clk}^{CPWLO}(t) \rightarrow \text{total clock error at epoch t}$$

# Modeling clock breaks





$$\Delta \tau_{trop} = 10^{-6} \int_0^{H_{trop}} [N_h(s) + N_w(s)] ds$$

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

reduced from  
observations a  
priori to the  
adjustment

estimated

estimated

estimated

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

WETTZELL

TSUKUB32

WETTZELL

SVETLOE

ZELENCHK

ONSALA60

NYALES20

HARTRAO

KOKEE

WESTFORD

MEDICINA

TIGOCONC

main solution

☒ apply main solution

coefficient

5

☒ simple outlier test [ coefficient \* mo ]

☐ basic outlier test [ coefficient \* mo \* sqrt(qw) ]

clock/s that have breaks in the session

ZELENCHK

Next

vie\_lsm\_gui\_clock

## vie\_lsm [ single session clocks ]

parameterization for clocks

- ☒ 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

- 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  $\text{picosec}^2/\text{sec}$ .

	clock constraints	clock interval	reference clock
TSUKUB32	0.5000	60	<input type="checkbox"/>
WETTZELL	0.5000	60	<input checked="" type="checkbox"/>
SVETLOE	0.5000	60	<input type="checkbox"/>
ZELENCHK	0.5000	60	<input type="checkbox"/>
ONSALA60	0.5000	60	<input type="checkbox"/>
NYALES20	0.5000	60	<input type="checkbox"/>
HARTRAO	0.5000	60	<input type="checkbox"/>
KOKEE	0.5000	60	<input type="checkbox"/>
WESTFORD	0.5000	60	<input type="checkbox"/>
MEDICINA	0.5000	60	<input type="checkbox"/>
TIGOCONC	0.5000	60	<input type="checkbox"/>

Back Next

**vie\_lsm [ single session troposphere ]**

apply relative constraints between tropospheric offset estimates

☒ introduce RELATIVE CONSTRAINTS between pwl ZENITH WET DELAY offsets

☒ introduce REALTIVE CONSTRAINTS between pwl tropo. NORTH GRADIENT offsets

☒ introduce RELATIVE CONSTRAINTS between pwl tropo. EAST GRADIENT offsets

☐ introduce ABSOLUTE CONSTRAINTS between pwl tropo. NORTH GRADIENT offsets

☐ introduce ABSOLUTE CONSTRAINTS between pwl tropo. EAST GRADIENT offsets

- unit of estimation intervals is minute.

- unit of ZWD relative constraints is  $\text{picosec}^2/\text{sec}$  e.g. 0.7  $\text{picosec}^2/\text{sec}$  relatively loose.

- unit of NGR & EGR relative constraints is millimeter/day e.g. 2 mm/day relatively loose.

- unit of NGR & EGR absolute constraints is millimeter e.g. 1 mm absolutely loose.

	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
TSUKUB32	0.7000	2	2	1	1	30	360	360	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
WETTZELL	0.7000	2	2	1	1	30	360	360	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
SVETLOE	0.7000	2	2	1	1	30	360	360	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
ZELENCHK	0.7000	2	2	1	1	30	360	360	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
ONSALA60	0.7000	2	2	1	1	30	360	360	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
NYALES20	0.7000	2	2	1	1	30	360	360	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
HARTRAO	0.7000	2	2	1	1	30	360	360	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
KOKKE	0.7000	2	2	1	1	30	360	360	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Back Next



**vie\_lsm [ single session troposphere ]**

apply relative constraints between tropospheric offset estimates

- ☒ introduce RELATIVE CONSTRAINTS between pwl ZENITH WET DELAY offsets
- ☒ introduce REALTIVE CONSTRAINTS between pwl tropo. NORTH GRADIENT offsets
- ☒ introduce RELATIVE CONSTRAINTS between pwl tropo. EAST GRADIENT offsets
- ☐ introduce ABSOLUTE CONSTRAINTS between pwl tropo. NORTH GRADIENT offsets
- ☐ introduce ABSOLUTE CONSTRAINTS between pwl tropo. EAST GRADIENT offsets

- unit of estimation intervals is minute.

- unit of ZWD relative constraints is  $\text{picosec}^2/\text{sec}$  e.g. 0.7  $\text{picosec}^2/\text{sec}$  relatively loose.

- unit of NGR & EGR relative constraints is millimeter/day e.g. 2 mm/day relatively loose.

- unit of NGR & EGR absolute constraints is millimeter e.g. 1 mm absolutely loose.

	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
TSUKUB32	0.7000	2	2	1	1	30	360	360	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
WETTZELL	0.7000	2	2	1	1	30	360	360	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
SVETLOE	0.7000	2	2	1	1	30	360	360	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
ZELENCHK	0.7000	2	2	1	1	30	360	360	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
ONSALA60	0.7000	2	2	1	1	30	360	360	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
NYALES20	0.7000	2	2	1	1	30	360	360	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
HARTRAO	0.7000	2	2	1	1	30	360	360	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
KOKKE	0.7000	2	2	1	1	30	360	360	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Back Next

**vie\_lsm [ single session troposphere ]**

apply relative constraints between tropospheric offset estimates

☒ introduce RELATIVE CONSTRAINTS between pwl ZENITH WET DELAY offsets

☒ introduce REALTIVE CONSTRAINTS between pwl tropo. NORTH GRADIENT offsets

☒ introduce RELATIVE CONSTRAINTS between pwl tropo. EAST GRADIENT offsets

☐ introduce ABSOLUTE CONSTRAINTS between pwl tropo. NORTH GRADIENT offsets

☐ introduce ABSOLUTE CONSTRAINTS between pwl tropo. EAST GRADIENT offsets

- unit of estimation intervals is minute.

- unit of ZWD relative constraints is  $\text{picosec}^2/\text{sec}$  e.g. 0.7  $\text{picosec}^2/\text{sec}$  relatively loose.

- unit of NGR & EGR relative constraints is millimeter/day e.g. 2 mm/day relatively loose.

- unit of NGR & EGR absolute constraints is millimeter e.g. 1 mm absolutely loose.

	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
TSUKUB32	0.7000	2	2	1	1	30	360	360	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
WETTZELL	0.7000	2	2	1	1	30	360	360	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
SVETLOE	0.7000	2	2	1	1	30	360	360	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
ZELENCHK	0.7000	2	2	1	1	30	360	360	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
ONSALA60	0.7000	2	2	1	1	30	360	360	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
NYALES20	0.7000	2	2	1	1	30	360	360	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
HARTRAO	0.7000	2	2	1	1	30	360	360	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
KOKKE	0.7000	2	2	1	1	30	360	360	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Back Next

vie\_lsm\_gui\_statcoor

**vie\_lsm [ single session station coordinates ]**

general options for estimation of stations coordinates

☒ estimate station coordinates

☒ one offset per session

☒ NNT/NNR

☐ Fix some stations

☐ pwl offsets per session

	NNT	NNR	NNS	XYZ_est	constraints	coord. intervals
TSUKUB32	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	100	360
WETZELL	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	100	360
SVETLOE	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	100	360
ZELENCHK	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	100	360
ONSALA60	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	100	360
NYALES20	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	100	360
HARTRAO	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	100	360
KOKEE	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	100	360
WESTFORD	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	100	360
MEDICINA	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	100	360
TIGOCONG	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	100	360

Back Next

vie\_lsm\_gui\_statcoor

## vie\_lsm [ single session station coordinates ]

general options for estimation of stations coordinates

☒ estimate station coordinates

☒ one offset per session

☐ NNT/NNR

☒ Fix some stations

☐ pwl offsets per session

	NNT	NNR	NNS	XYZ_est	constraints	coord. intervals
TSUKUB32	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	100	360
WETZELL	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	100	360
SVETLOE	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	100	360
ZELENCHK	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	100	360
ONSALA60	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	100	360
NYALES20	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	100	360
HARTRAO	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	100	360
KOKEE	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	100	360
WESTFORD	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	100	360
MEDICINA	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	100	360
TIGOCONC	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	100	360

Back Next



vie\_lsm\_gui\_statcoor

## vie\_lsm [ single session station coordinates ]

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	coord. intervals
TSUKUB32	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	100	360
WETZELL	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	300	30
SVETLOE	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	100	360
ZELENCHK	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	100	360
ONSALA60	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	100	360
NYALES20	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	100	360
HARTRAO	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	100	360
KOKEE	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	100	360
WESTFORD	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	100	360
MEDICINA	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	100	360
TIGOCONC	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	100	360

Back Next

vie\_lsm\_gui\_eop

## vie\_lsm [ single session EOP ]

Earth Orientation Parameter (EOP) pwl offsets estimation options

	include model	estimation interval	use constraints	constraints
Xpol (inter. pole coord. in TRF )	<input checked="" type="checkbox"/>	1440	<input checked="" type="checkbox"/>	1.0000e-04
Ypol (inter. pole coord. in TRF )	<input checked="" type="checkbox"/>	1440	<input checked="" type="checkbox"/>	1.0000e-04
dUT1 (rotation angle)	<input checked="" type="checkbox"/>	1440	<input checked="" type="checkbox"/>	1.0000e-04
nutdx (CIP coord. in celes. long.)	<input checked="" type="checkbox"/>	1440	<input checked="" type="checkbox"/>	1.0000e-04
nutdy (CIP coord. in obliquity)	<input checked="" type="checkbox"/>	1440	<input checked="" type="checkbox"/>	1.0000e-04

- unit of estimation intervals is minute  
 - constraints are mas/day & ms/day for EOP  
 - 30 mas/day and 2 ms/day are loose constraints  
 - 0.001 mas/day and 0.00007 ms/day are tight constraints

Back Next

vie\_lsm\_gui\_sourcoor

**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

- unit of constraints is mas/day.  
- unit of coordinate estimation intervals in minutes.  
- Please, fix at least one source which has more than 1 observation  
if you select estimate sources

	source name	total observations	est. coord.	constraints	coord. interval
1	0235+164	424	<input type="checkbox"/>	1.0000e-04	1440
2	1334-127	182	<input type="checkbox"/>	1.0000e-04	1440
3	0133+476	559	<input checked="" type="checkbox"/>	1.0000e-04	1440
4	0642+449	717	<input type="checkbox"/>	1.0000e-04	1440
5	1357+769	873	<input checked="" type="checkbox"/>	1.0000e-04	1440
6	0955+476	633	<input checked="" type="checkbox"/>	1.0000e-04	1440
7	4C39.25	558	<input checked="" type="checkbox"/>	1.0000e-04	1440
8	0552+398	583	<input checked="" type="checkbox"/>	1.0000e-04	1440
9	0528+134	158	<input type="checkbox"/>	1.0000e-04	1440
10	1611+343	496	<input type="checkbox"/>	1.0000e-04	1440
11	3C446	174	<input type="checkbox"/>	1.0000e-04	1440
12	2136+141	256	<input type="checkbox"/>	1.0000e-04	1440
13	2209+236	299	<input type="checkbox"/>	1.0000e-04	1440
14	0119+115	186	<input type="checkbox"/>	1.0000e-04	1440

Back Next

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

☐ write data into SINEX file (DATA/SINEX)

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

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/

**Add extra parameters to the N matrix**

☐ station velocities:  reference epoch in years

☐ Love number parameters ☐ Shown number parameters ☐ Free Core Nutation period

Back Finish

Thank you so much for your attention!