

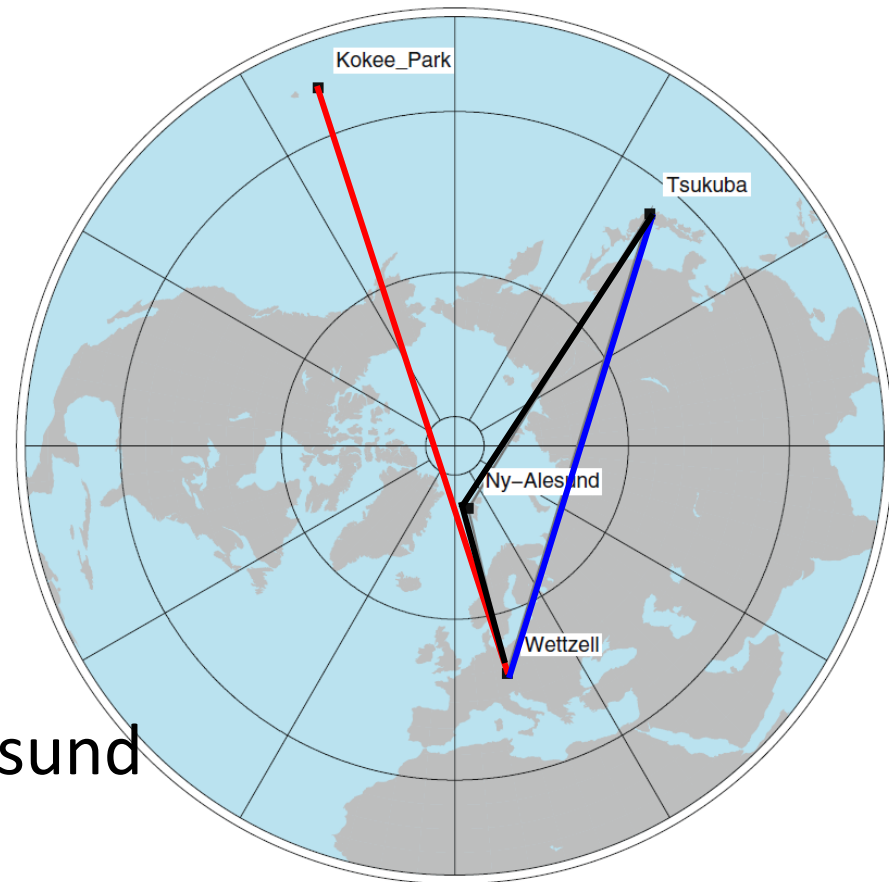
# Processing Intensive sessions with VieVS

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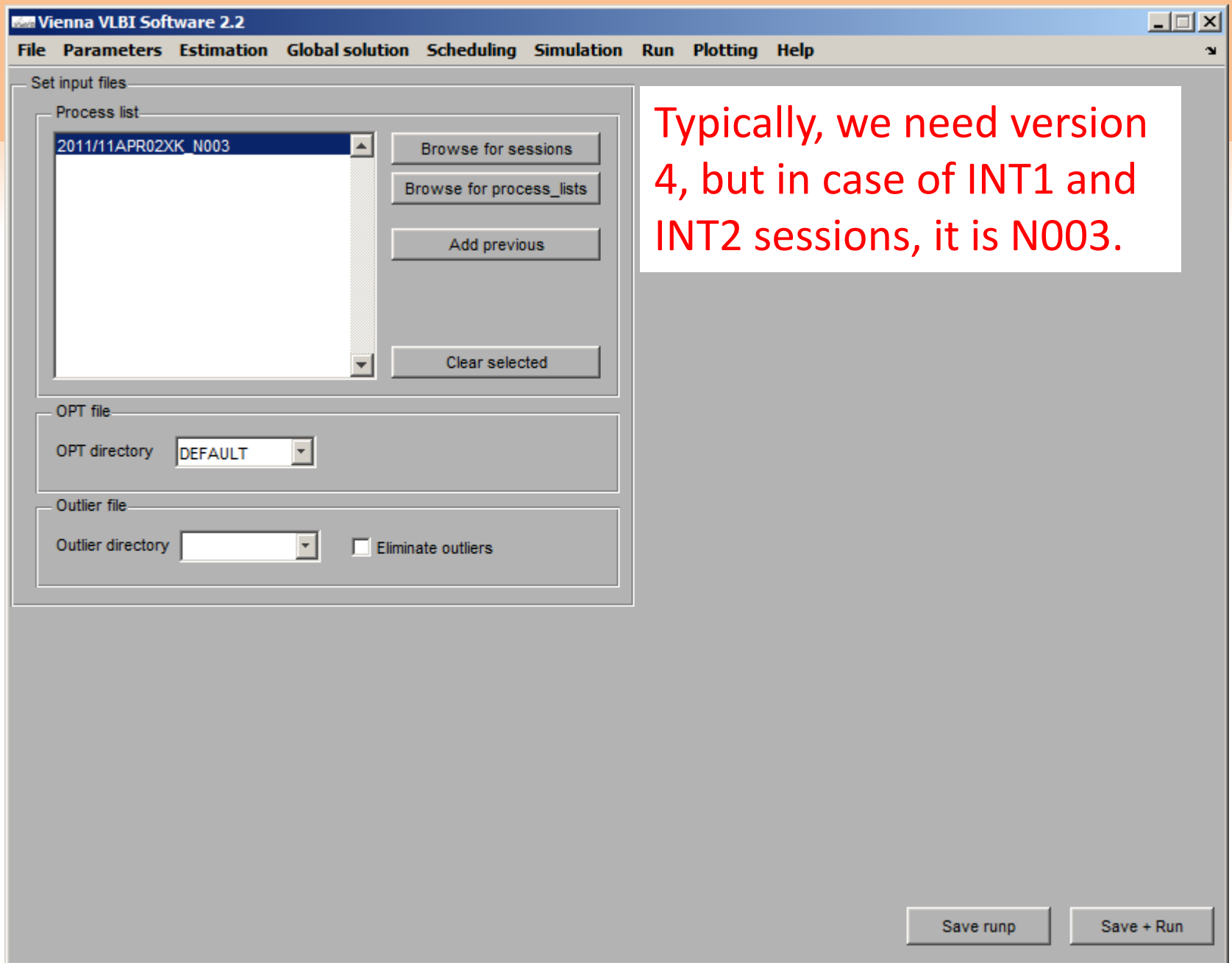


# Introduction

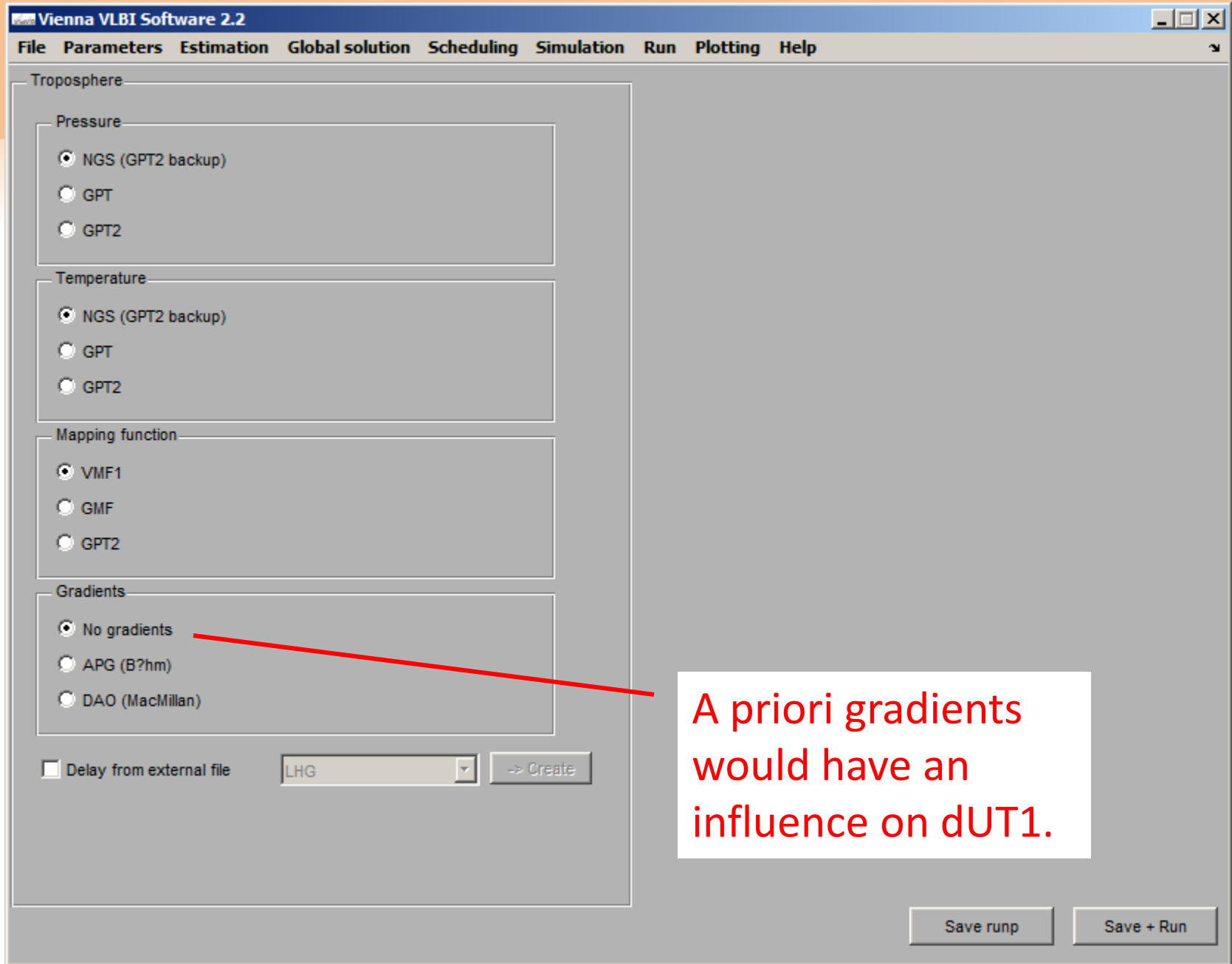
- **INT1** (2-3 days latency)
  - Kokee-Wetzzell
  - Mo-Fr 18:30
- **INT2** (e-transfer)
  - Tsukuba-Wetzzell
  - Sa-So 7:30
- **INT3** (e-transfer)
  - Tsukuba-Wetzzell-NyAlesund
  - Mo 7:00



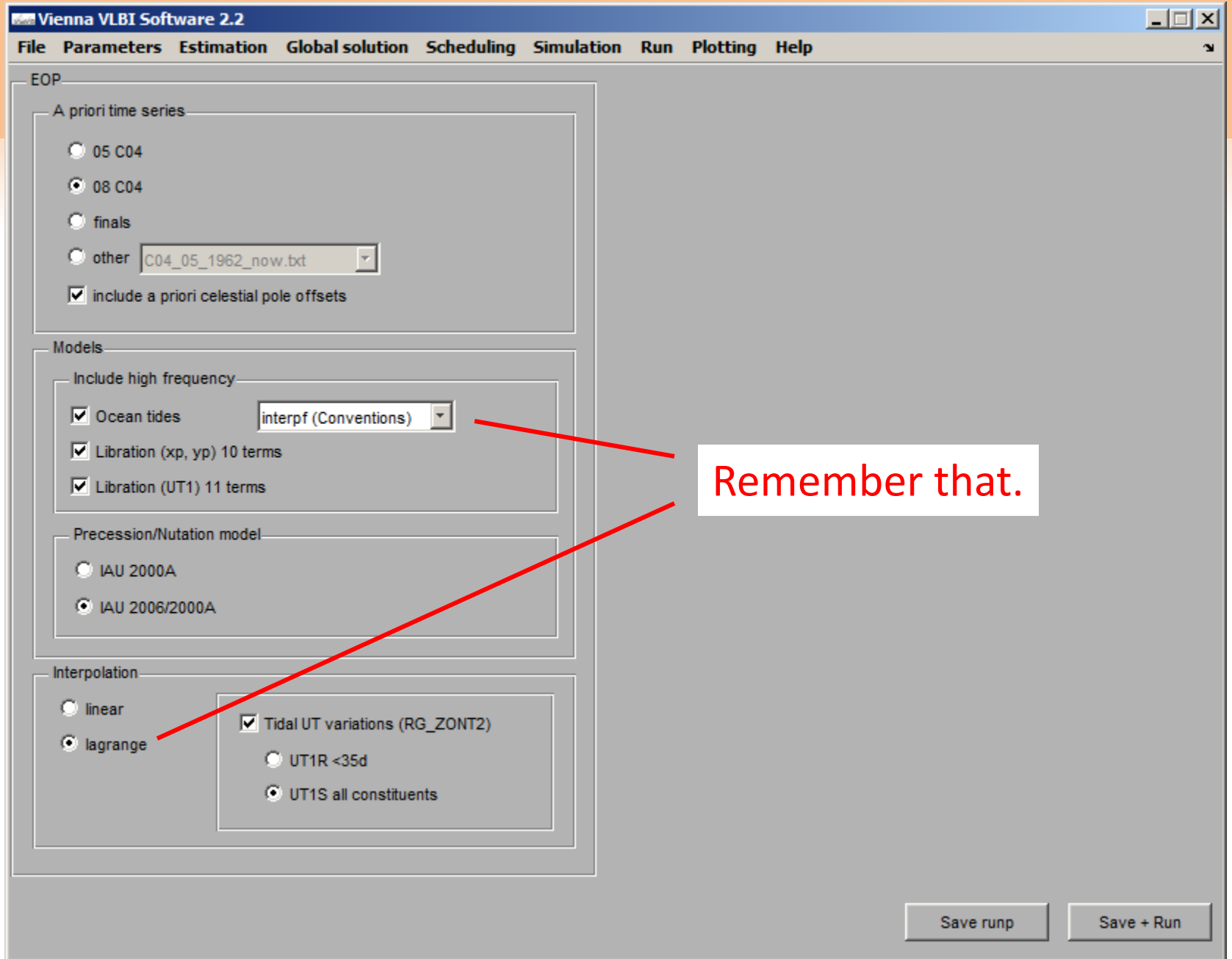
Luzum and Nothnagel (2010)

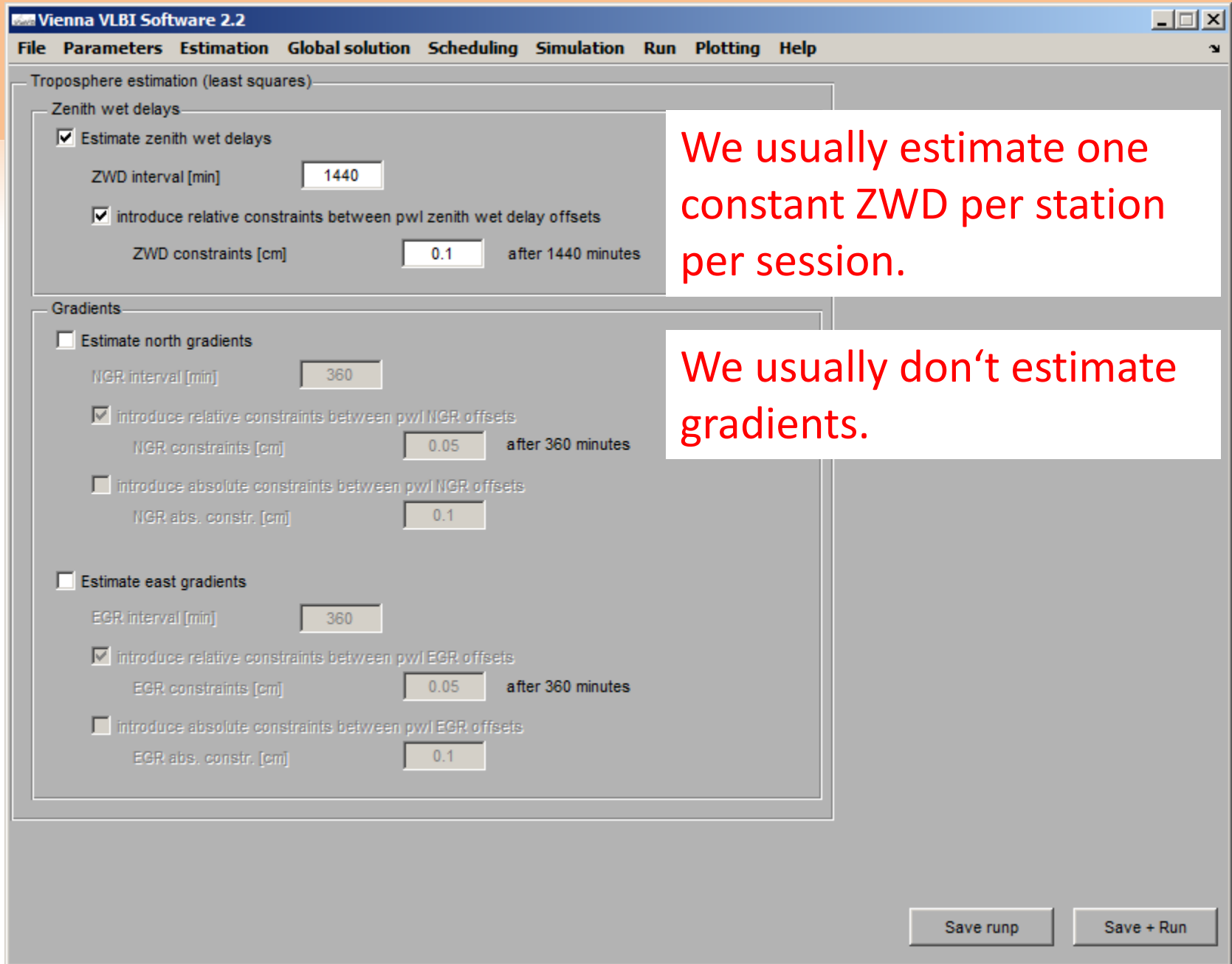


Typically, we need version 4, but in case of INT1 and INT2 sessions, it is N003.



A priori gradients would have an influence on dUT1.





We usually estimate one constant ZWD per station per session.

We usually don't estimate gradients.

Vienna VLBI Software 2.2

File Parameters Estimation Global solution Scheduling Simulation Run Plotting Help

Clock estimation (least squares)

- Use clock breaks (from OPT file)
- Estimate clocks
  - piecewise linear (pwl) offset per clock
  - pwl offset & one rate per clock
  - pwl offset, one rate & one quadratic term per clock

Clock interval [min]

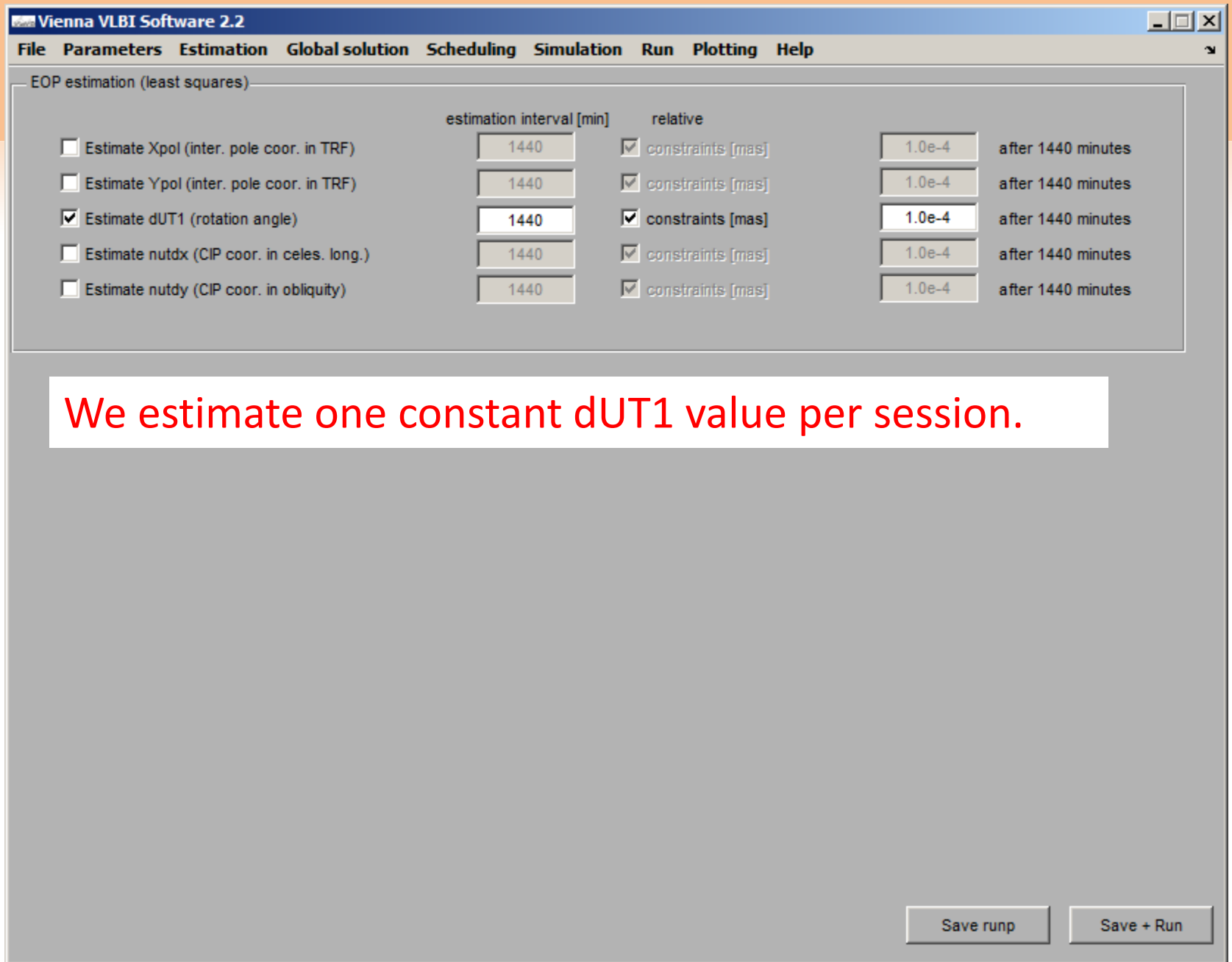
introduce relative constraints between pwl clock offsets

Clock constraints [cm]  after 1440 minutes

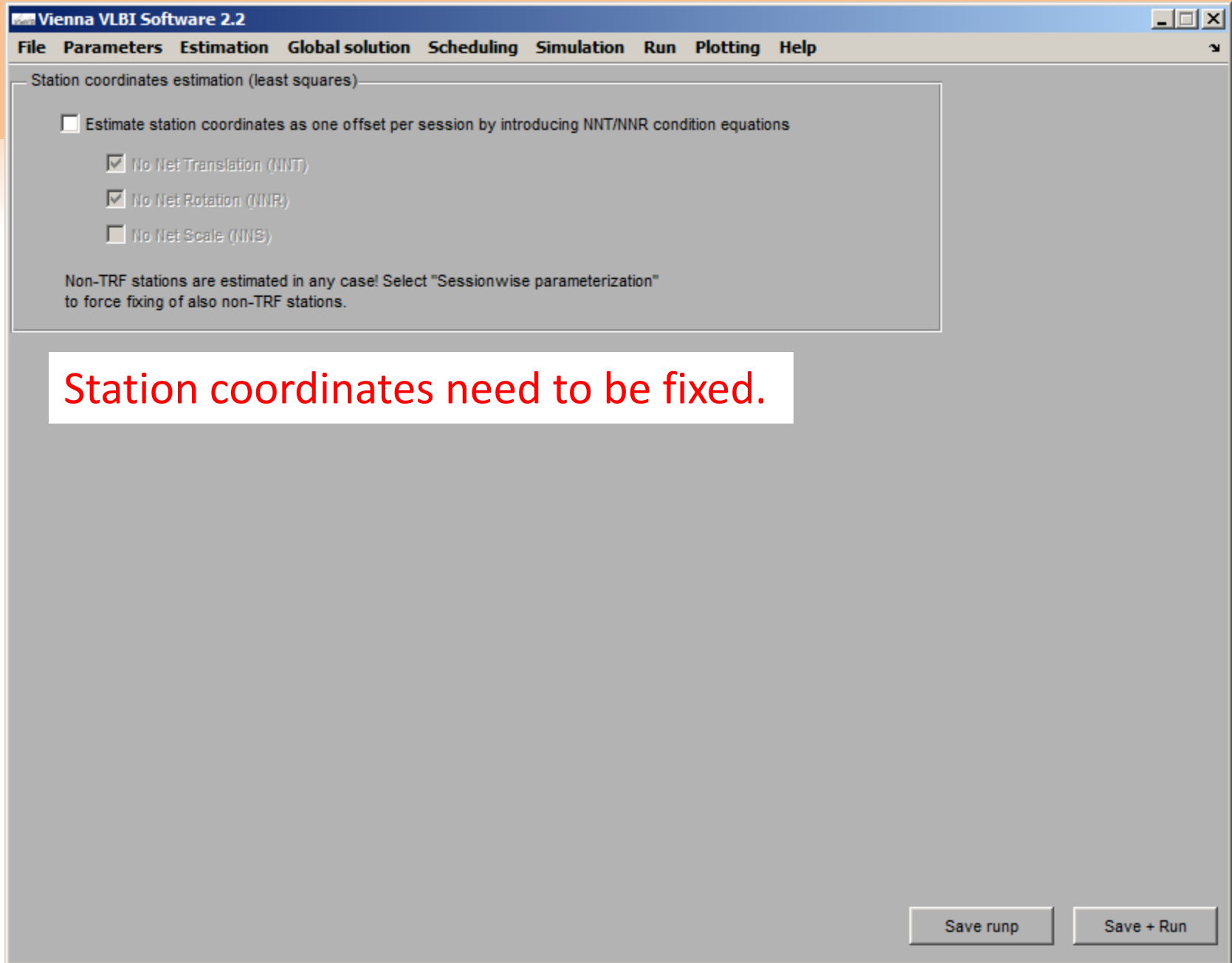
Save runp Save + Run

In total we estimate a linear clock function between the two station clocks.  
No constraint is needed.

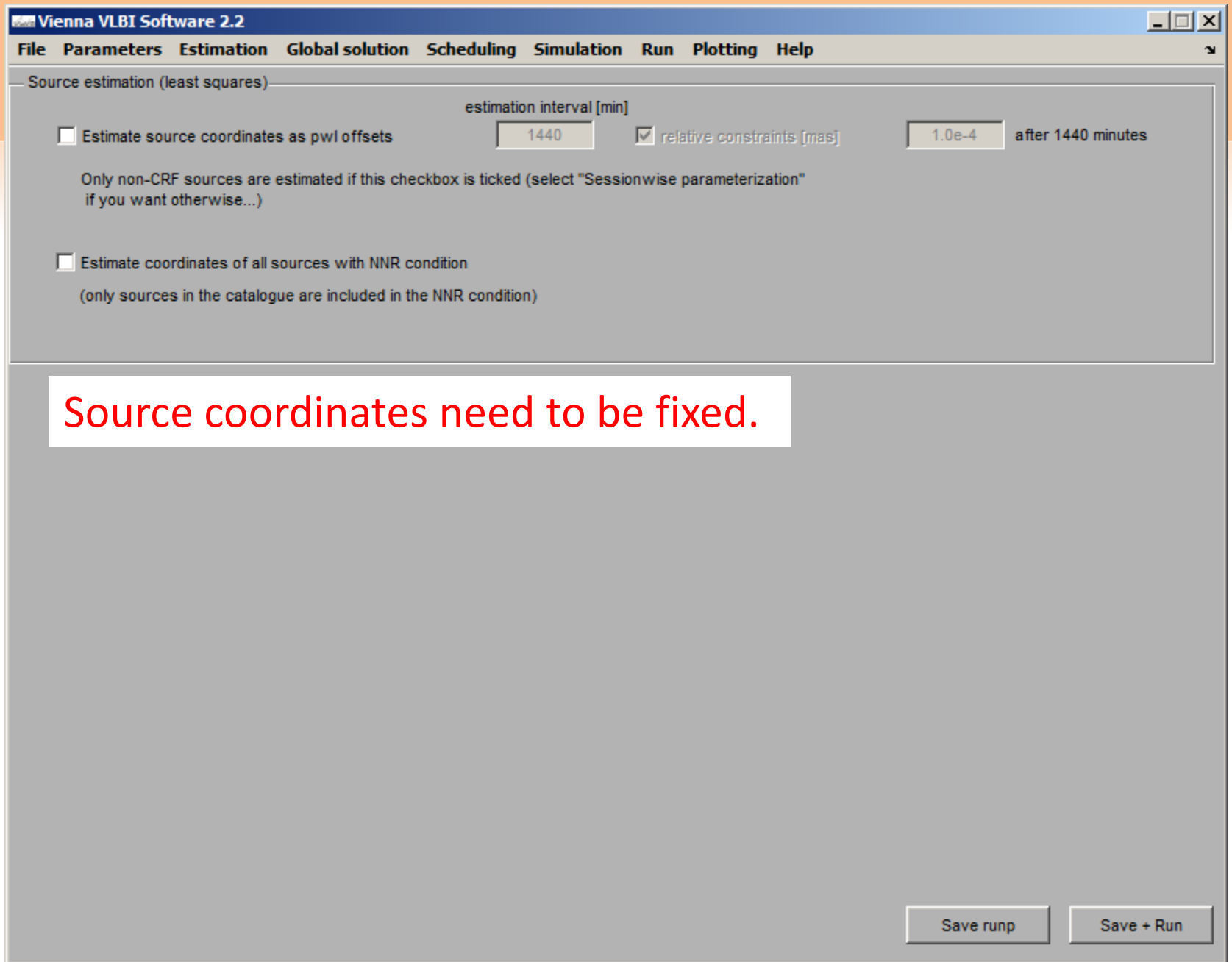
But take care that the interval is long enough to cover the session.







Station coordinates need to be fixed.



Source coordinates need to be fixed.

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File Parameters Estimation Global solution Scheduling Simulation Run Plotting Help

VieVS estimation settings

First solution

- 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
  - Manually find clock breaks

Main solution

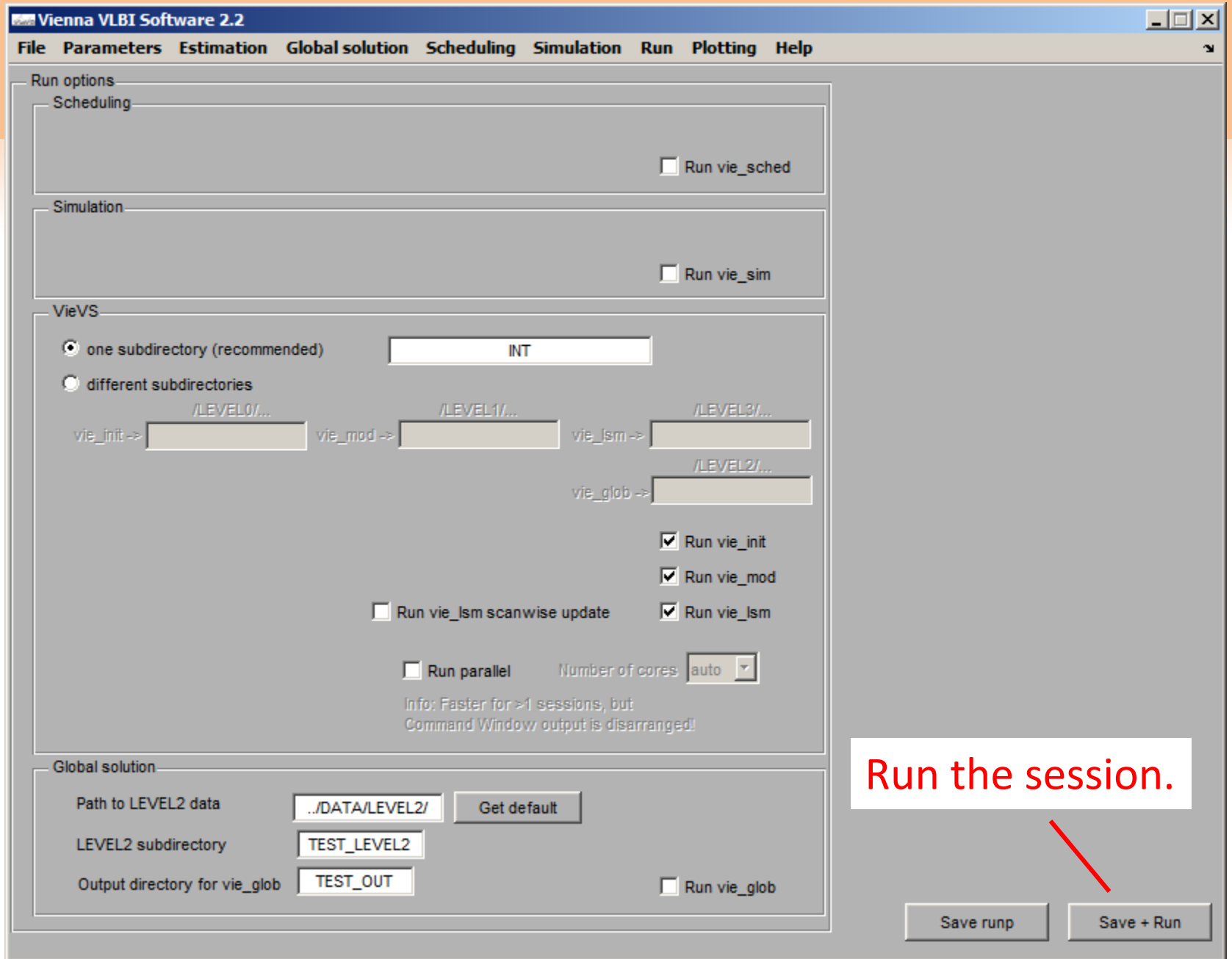
- Run main solution (parameter estimation)
  - Simple outlier test ( $c * m0$ )
  - Normal outlier test ( $c * m0 * \text{sqrt}(qv\text{v})$ )
  - Apply baseline dependent weights (only vie\_lsm)

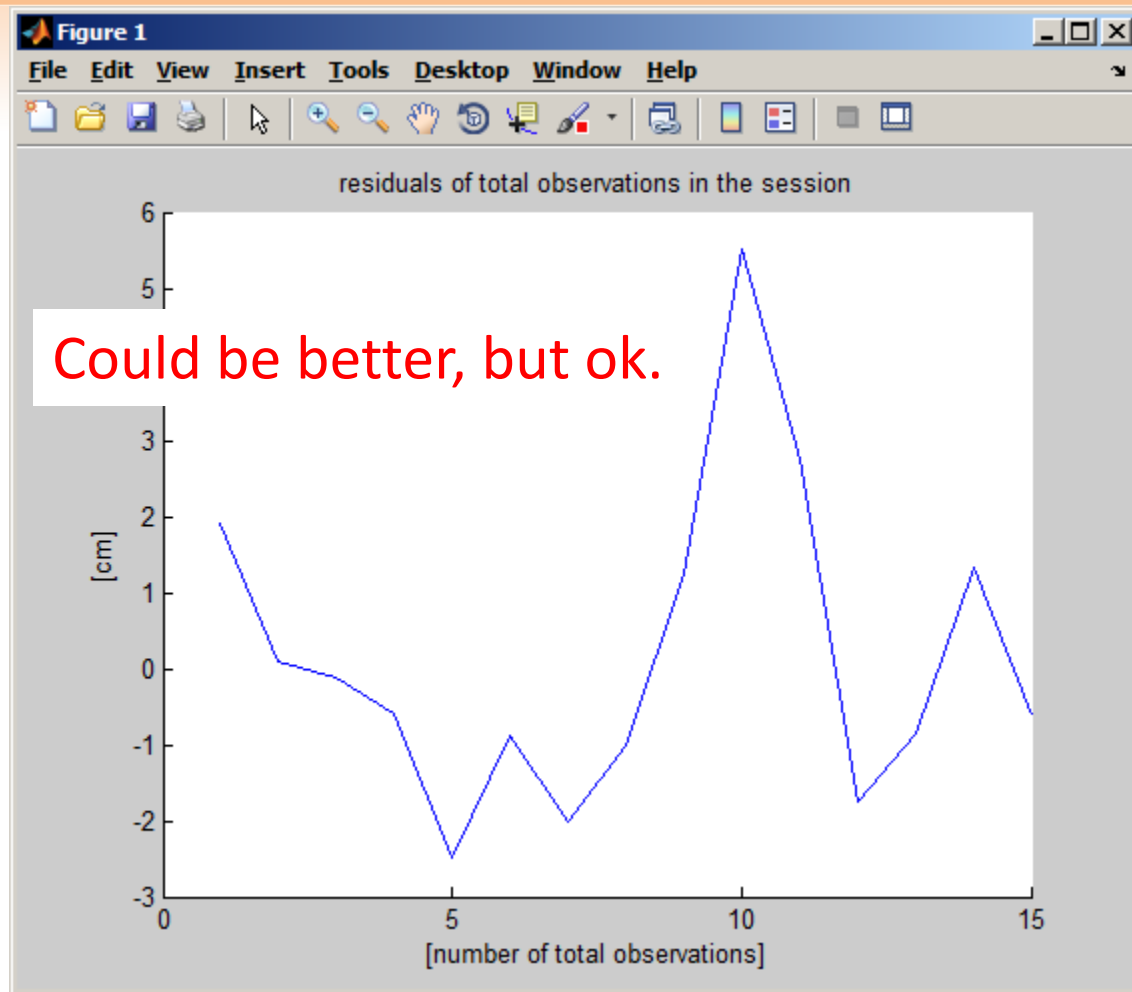
Estimate parameters (otherwise: only N matrix created)

Write all parameters to ASCII file

Allow for stationwise and sourcewise parameterization for each session

You could skip the first solution, but if you apply it, don't estimate more parameters than a linear clock function between the stations.





```
session 1 of 1
Current file: ../DATA/LEVEL0/INT/11APR02XK_N003
```

```
-----
|           Welcome to VIE_INIT!!!!           |
-----
```

```
No OPT file was found
Stations to be excluded: 0
Stations to be down-weighted: 0
Sources to be excluded: 0
Baselines to be excluded: 0
```

```
Start reading 2011/11APR02XK_N003
[antenna,sources,scan]=read_ngs(ngsfile,trffile,crffile,ini_opt,pt, tp, trf, crf)
Done reading the file!
```

```
A total of 2 stations, 14 sources and 15 scans were found
The following stations were found:
```

```
KOKEE
WETTZELL
VIE_INIT finished!!! You can now continue with VIE_MOD
```

```
-----
|           Welcome to VIE_MOD           |
-----
```

```
C04_08
remove tidal UT
UT1S
Lagrange interpolation of EOP
re-add tidal UT
UT1S
interpf (Conventions)
load existing ephemerides ...
IAU_2006A
station corrections
Cubic model after 2010.0 is not available, a linear model for extrapolation is used. (IERS Conv. 2010)
```

```
vie_mod successfully finished!
```

15 scans are not so many ...

-----  
| Welcome to VIE\_LSM!!!! |  
-----

number of scans : 15  
number of antennas : 2  
number of sources : 14  
number of obs. : 15  
2. CREATING DEFAULT OPTIONS  
3. FORMING THE WEIGHT MATRIX OF THE OBSERVATIONS "Pobserv"  
apriori std. dev. of unit weight. : 1.4741  
obs. of the antenna KOKEE : 15  
obs. of the antenna WETZELL : 15  
4. FORMING THE REDUCED OBSERVATION VECTOR "oc\_observ"  
clock KOKEE is selected as the ref. clock for the first solution  
chi-squared of first solution: 5.4959  
5. FORMING THE DESIGN MATRICES "A(i).sm" ...  
6. FORMING THE CONSTRAIN MATRIX and WEIGHT MATRIX OF CONSTRAINTS  
7. ESTIMATING THE PARAMETERS WITH LEAST SQUARES  
clock KOKEE is selected as the ref. clock for the main solution  
  
chi-squared of main solution vTPv/degOfFreedom: 2.6821  
WRMS of post-fit residuals sqrt(v\_realTPv\_real/sumOfWeights): 1.7768cm( 59.2688ps)

-----

outlier detection test was not applied!

-----

total number of estimated parameters: 8  
total clock offsets: 2  
total rate and quad. terms of clock funct.: 0  
total zenith wet delay offsets: 4  
total tropo. north gradients: 0  
total tropo. east gradients: 0  
total pole coor. (x-pol) offsets: 0  
total pole coor. (y-pol) offsets: 0  
total dUT1 offsets: 2  
total celestial pole (nutations dx) offsets: 0  
total celestial pole (nutations dy) offsets: 0  
total right ascension offsets of sources : 0  
total declination offsets of sources : 0  
antenna coor. dx offsets: 0  
antenna coor. dy offsets: 0  
antenna coor. dz offsets: 0

-----

estimated parameters are saved as ../VieVS/DATA/LEVEL3/INT/x\_11APR02XK\_N003.mat  
estimation options are saved as ../VieVS/DATA/LEVEL3/INT/opt\_11APR02XK\_N003.mat  
normal equation matrix is saved as ../VieVS/DATA/LEVEL3/INT/atpa\_11APR02XK\_N003.mat  
right hand side vector is saved as ../VieVS/DATA/LEVEL3/INT/atpl\_11APR02XK\_N003.mat  
residuals are saved as ../VieVS/DATA/LEVEL3/INT/res\_11APR02XK\_N003.mat  
8. vie\_ism IS COMPLETED!  
Elapsed time is 0.110194 seconds.

Actually, we only have 5 parameters  
(one linear clock, two ZWD offsets, one  
dUT1 offset).



```
>> load('..\DATA\LEVEL3\INT\x_11APR02XK_N003.mat')
>> x_.dut1
ans =
    col: [7 8]
    mjd: [55653 55654]
    val: [-0.0094 -0.0094]
    mx: [0.0155 0.0155]
```

The result is  $-9.4 \mu\text{s}$ , which is reasonable.  
Also the formal error is ok.

# Thanks!