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# Special files and OPT-files

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**VieVS User Workshop**  
**11 – 13 September, 2012**  
**Vienna**



# Special files

Process lists, parameter files, TRF and EOP files


# Creating predefined process lists

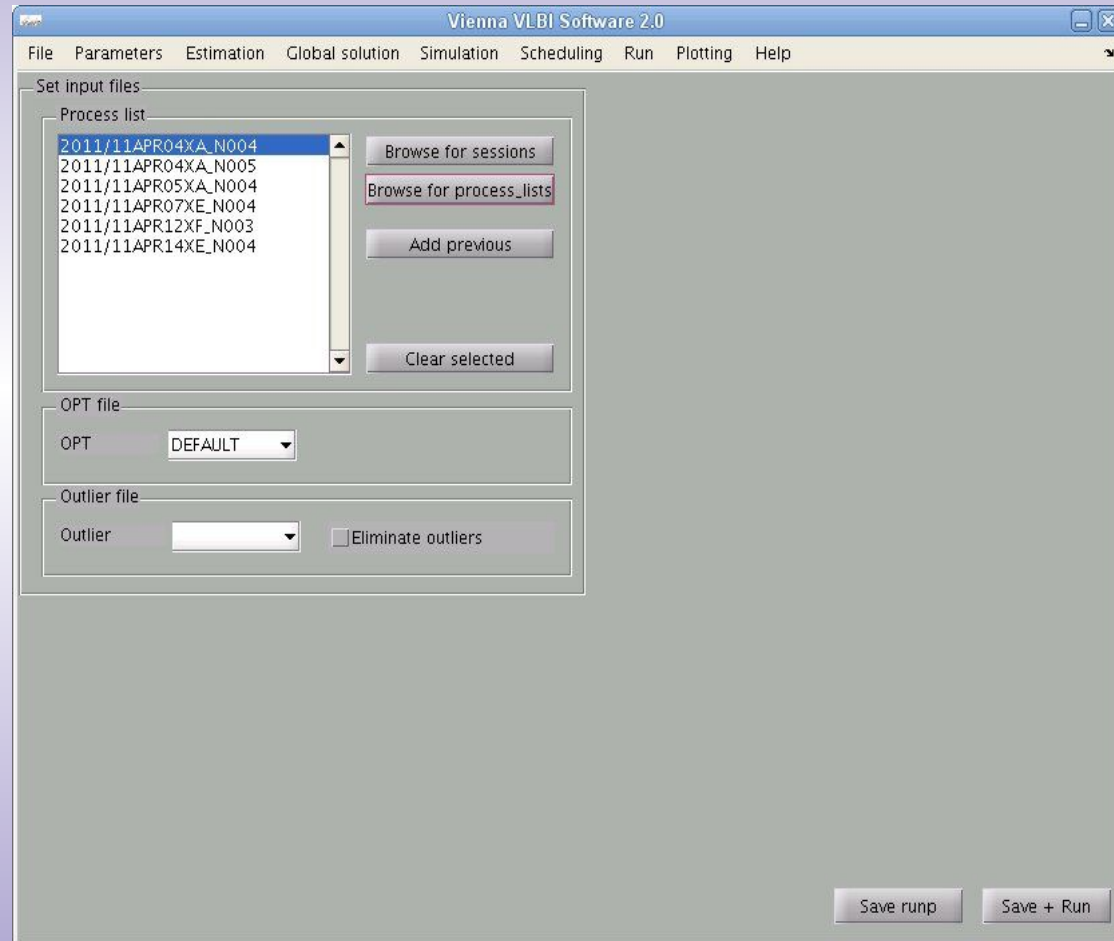
-  Sometimes it is good to have predefined lists of sessions which you analyse often, e.g. all R1/R4 sessions or all CONT08 sessions.
-  Then it is possible to simply choose this list in the GUI, and you do not have to choose every individual session.
-  Predefined process lists should be saved in the **WORK/PROCESSLIST/** directory.

# Creating process lists with VIE\_SETUP

 Start VIE\_SETUP  
with:

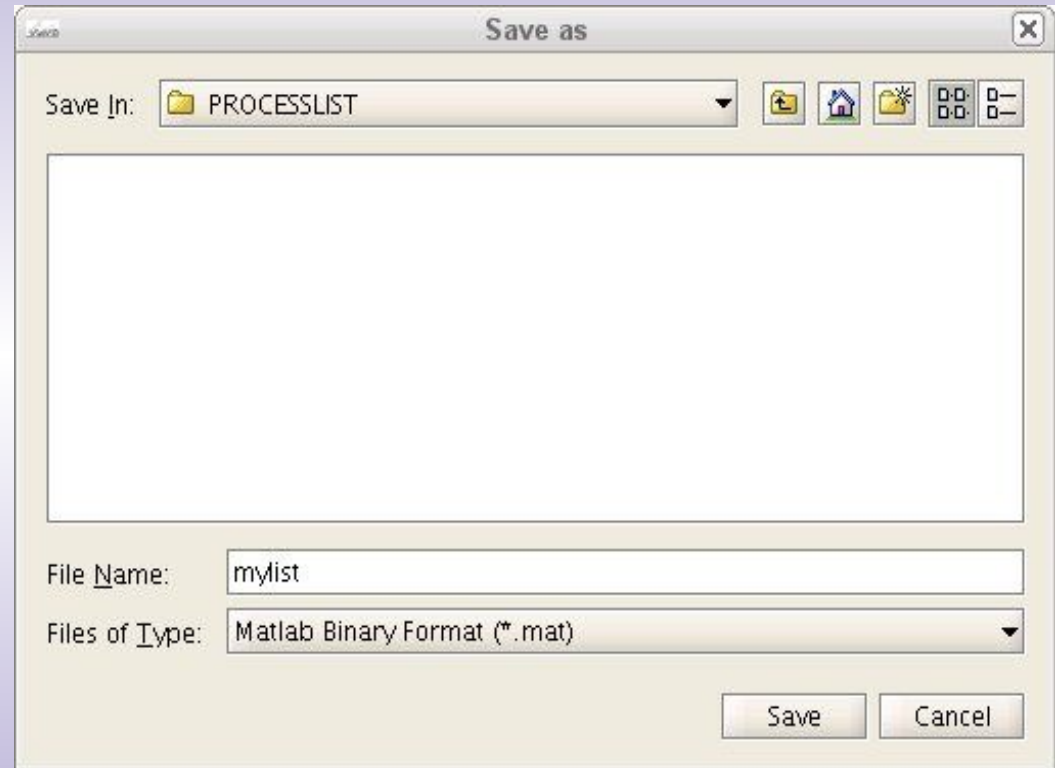
*views*

 Select the  
sessions you want  
to have included in  
the list





# Creating process lists with VIE\_SETUP

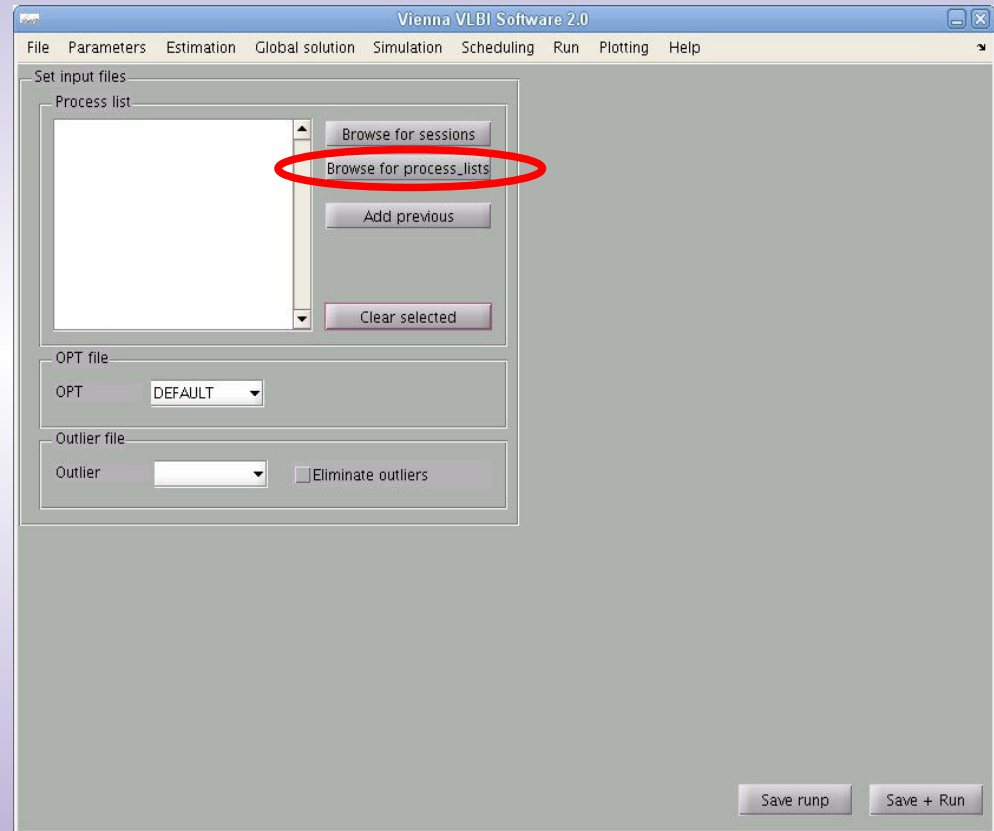
-  Choose in the menu:  
*File/Parameters*  
*Files/Save*  
*process list as*
-  Give the list a name and save it in the **PROCESSLIST** directory



# Creating process lists with VIE\_SETUP

 Now it is possible to choose the list in the VieVS GUI

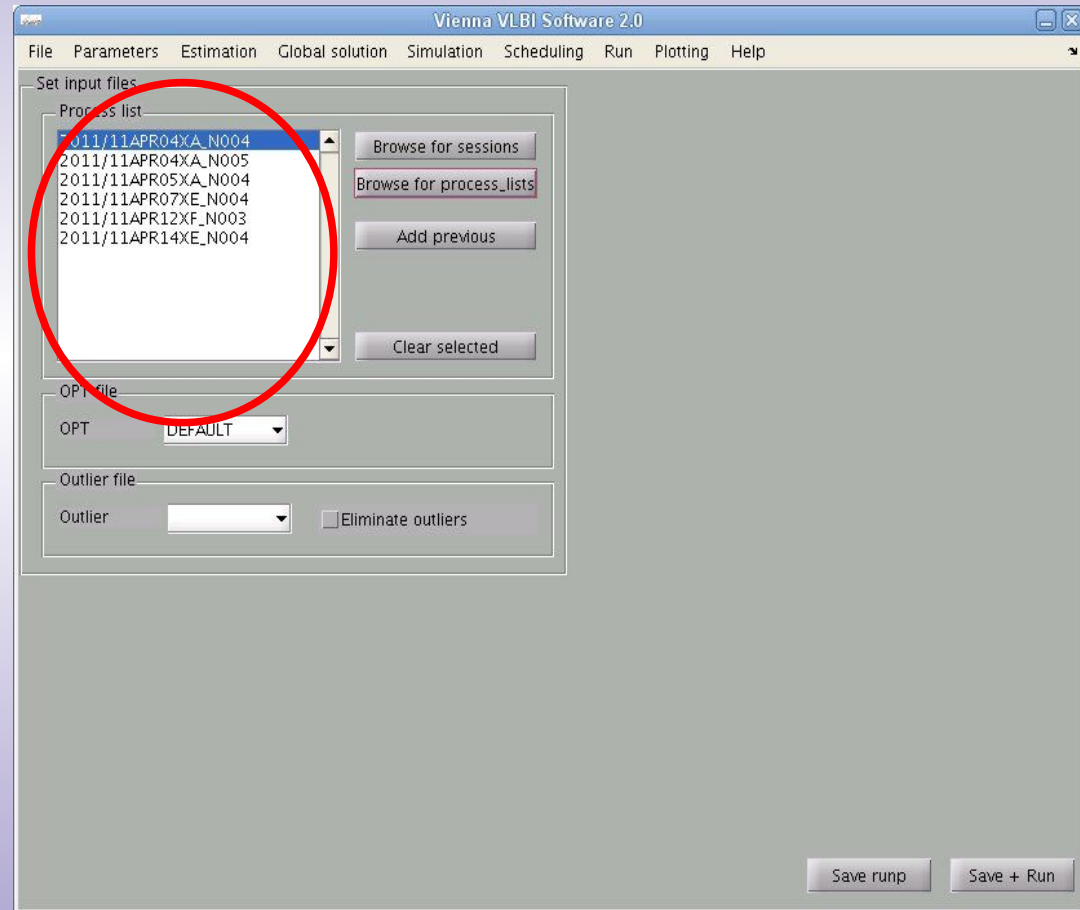
 When you click on *Browse for process lists* the list you have created can be chosen



# Creating process lists with VIE\_SETUP



When you select the list, all sessions in the list will appear in the list of sessions to be analysed




## Creating process lists using `mk_list`

- With the MATLAB script *mk\_list* (located in the **WORK** directory) you can make process lists.
- Requires that the master files of all VLBI sessions are available in the directory **DATA/MASTER**
- Useful for creating lists of e.g. all R1/R4 sessions, or all sessions with one specific station.
- The lists created will only include sessions who's NGS-files exist in the **DATA/NGS** directory.



# Syntax of `mk_list`

 `[process_list, sess]=mk_list(s1,s2,...)` where `s1`, `s2`, etc. are strings containing the types of sessions you want to include (e.g. 'R1', 'EURO', 'RDV',...). Use 'all' to get all sessions.

`process_list` is the list of sessions

`sess` contains the session names

 To make the process list available in the VieVS GUI, save it in the **WORK/PROCESSLIST** directory:

`save PROCESSLIST/mylist2.mat process_list`



To only include sessions from specific years:

```
process_list=mk_list(..., 'YEARS', yrs)
```

where *yrs* is an array with the years you want to include



To only include sessions with a specific station:

```
process_list=mk_list(..., 'REQSTAT', sta)
```

where *sta* is the two-letter ns-code of the station



To exclude some sessions specified in a list:

```
process_list=mk_list(..., 'EXCLUDE', excllist)
```


where *excllist* is the file name of the list containing the sessions to be excluded





```
process_list=mk_list(..., 'ALLVERSIONS')
```


includes all versions of the NGS files, not just the latest

# mk\_list examples

-  Create a list of all R1/R4 between 2003 and 2007  

```
process_list=mk_list('R1','R4','YEARS',2003:2007)
```
-  All sessions which Metsähovi has participated in:  

```
process_list=mk_list('all','REQSTAT','Mh')
```
-  All R1/R4 in 2009, except those listed in **exclude.txt**  

```
process_list=mk_list('R1','R4','YEARS',2009,  
    'EXCLUDE','exclude.txt')
```
-  All CONT02 sessions, including all versions of the NGS files (in case there are more than one):  

```
process_list=mk_list('C02','ALLVERSIONS')
```

# Format of file with sessions to be excluded

 Same format as:

`http://vlbi.geod.uni-bonn.de/IVS-  
AC/data/exclude.txt`

(list of sessions not suitable for EOP determination)

```
$08JAN08XN  
$08JAN21XA  
$08JAN21XF  
$08JAN30XN  
$08FEB14XF
```

# Creating parameter files



Run VIE\_SETUP:

*views*



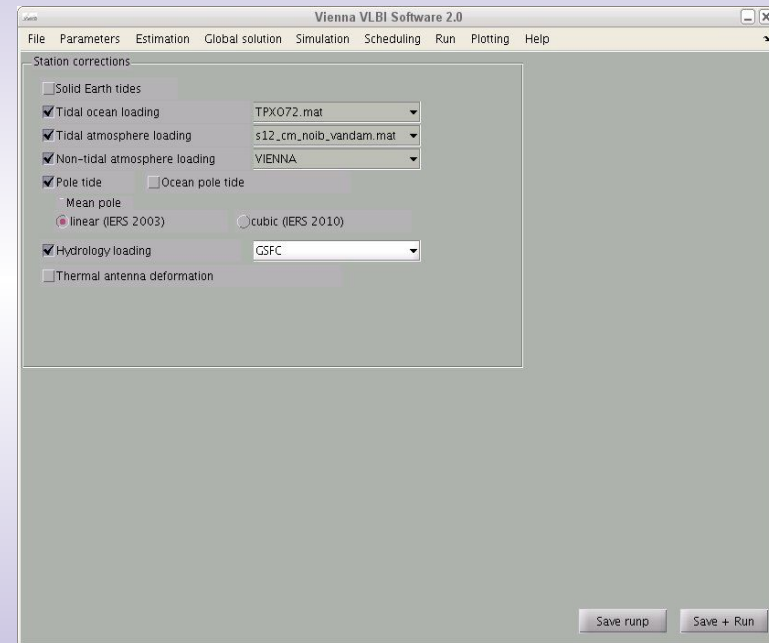
Select the options you like under *Parameters* and *Estimation*






Save the parameter file in the **PARAMETERS** directory by choosing *File/Parameter Files/Save parameters as...* in the menu





You can then load the file by choosing *File/Parameter Files/Load parameters...*



# Your own TRF and EOP files



-  Sometimes you may want to use other TRF and/or EOP files than the default VieVS TRF (*itr2005*, *vtrf2008* etc.) and EOP (*IERS 08 C04*) files
-  For example, you have created your own TRF and/or your own EOP series
-  Furthermore, for near real time applications, IERS 08 C04 is not available. Some other EOP series must then be used.

# Creating your own TRF file

-  Create an ascii file in the **TRF** directory. File name should end with **.txt**
-  Enter the coordinates of the stations in the following format:

```
WETTZELL 4075539.838 931735.315 4801629.404 -0.015 0.017 0.010 51544 0 99999
WETZ2010 4075539.899 931735.270 4801629.352 0.0 0.0 0.0 51544 0 55400
WETZ2010 4075539.899 931736.270 4801629.352 0.0 0.0 0.0 51544 55401 99999
```

# Creating your own TRF file

- 
 Create an ascii file in the **TRF** directory. File name should end with **.txt**
- 
 Enter the coordinates of the stations in the following format:

WETZELI	4075539.838	931735.315	4801629.404	-0.015	0.017	0.010	51544	0	99999
WETZ2010	4075539.899	931735.270	4801629.352	0.0	0.0	0.0	51544	0	55400
WETZ2010	4075539.899	931736.270	4801629.352	0.0	0.0	0.0	51544	55401	99999

Station names

Station coordinates  
(x, y, z) [m]

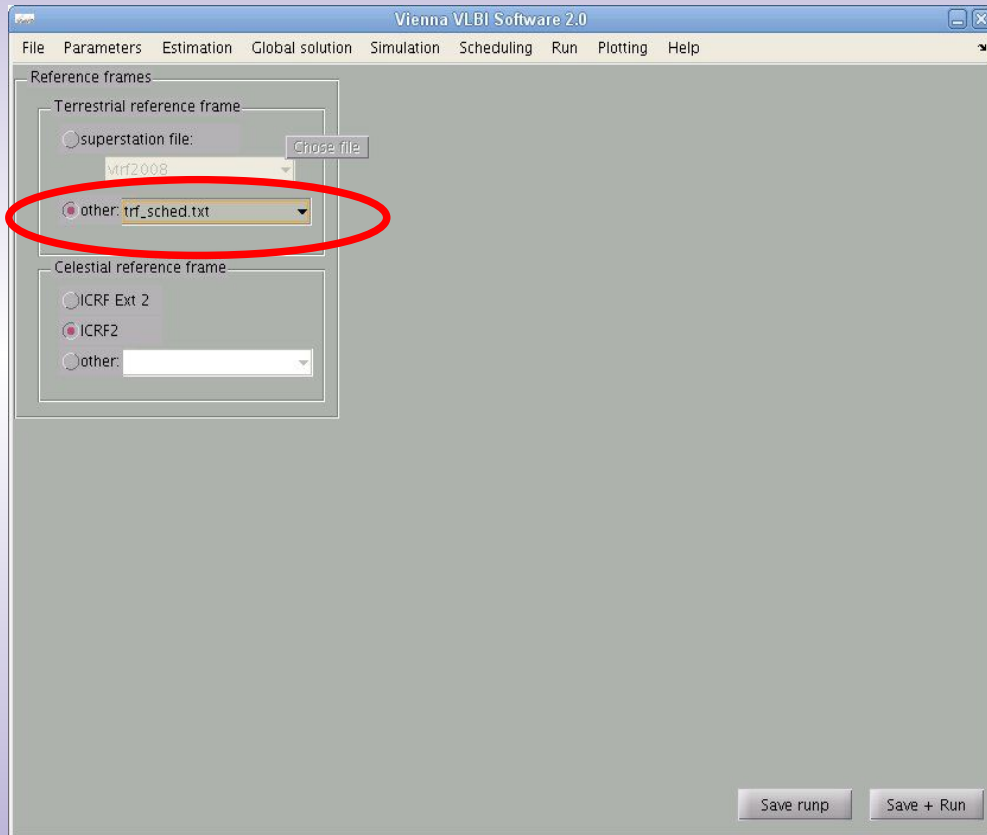
Station velocities  
(x, y, z) [m/year]


Reference epoch [mjd]

Valid (from to) [mjd]





# Using your own TRF file





-  If TRF-file is saved in the **TRF** directory, it can be chosen in the GUI by first selecting *Other* for the TRF, then choosing the text-file in the list.

# Creating your own EOP file

-  Create an ascii file in the **EOP** directory. File name should end with **.txt**
-  Enter the EOP's in the following format:

55353.00	-14.616	459.382	-55.0388	-0.1300	0.0300
55354.00	-12.003	461.149	-55.6933	-0.1300	0.0360
55355.00	-9.504	462.694	-56.2229	-0.1140	0.0220
55356.00	-6.658	464.340	-56.6631	-0.0940	0.0110
55357.00	-3.798	466.109	-56.9752	-0.0800	0.0110
55358.00	-1.214	467.757	-57.1680	-0.0720	0.0050
55359.00	1.675	469.337	-57.2482	-0.0620	-0.0070
55360.00	4.880	470.914	-57.2966	-0.0460	-0.0050

# Creating your own EOP file

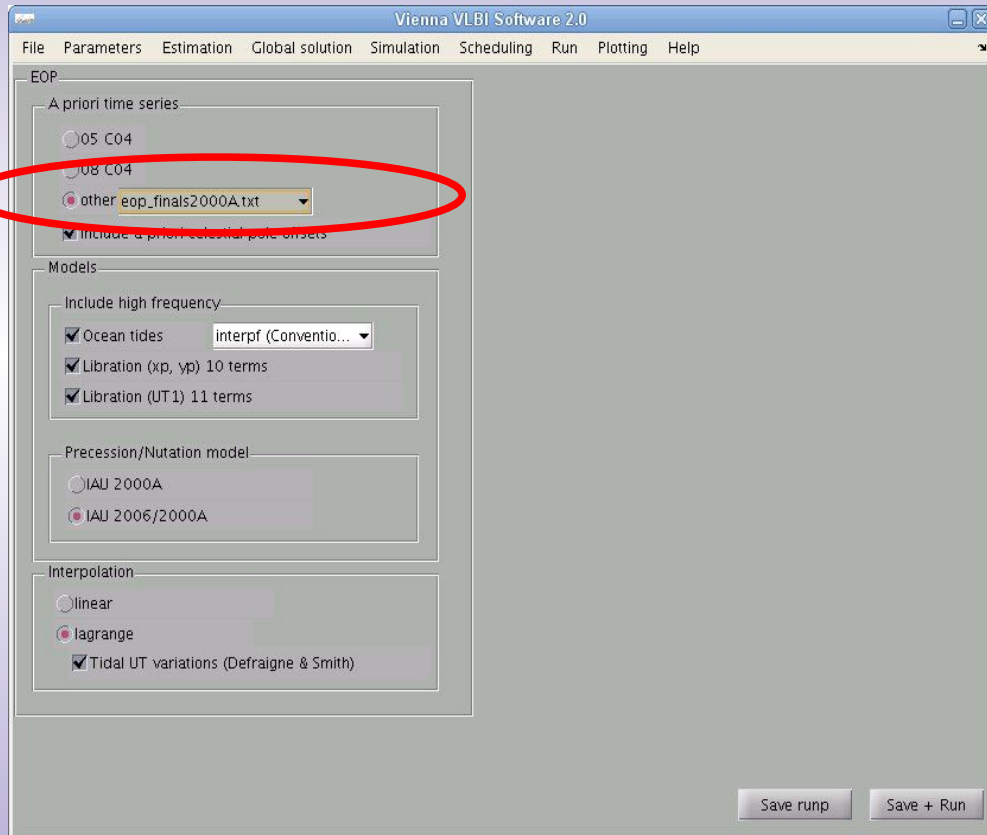
-  Create an ascii file in the **EOP** directory. File name should end with **.txt**
-  Enter the EOP's in the following format:


55353.00	-14.616	459.382	-55.0388	-0.1300	0.0300
55354.00	-12.003	461.149	-55.6933	-0.1300	0.0360
55355.00	-9.504	462.694	-56.2229	-0.1140	0.0220
55356.00	-6.658	464.340	-56.6631	-0.0940	0.0110
55357.00	-3.798	466.109	-56.9752	-0.0800	0.0110
55358.00	-1.214	467.757	-57.1680	-0.0720	0.0050
55359.00	1.675	469.337	-57.2482	-0.0620	-0.0070
55360.00	4.880	470.914	-57.2966	-0.0460	-0.0050

mjd	x-pole [mas]	y-pole [mas]	DUT1 [ms]	dX [mas]	dY [mas]
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# Using your own EOP file

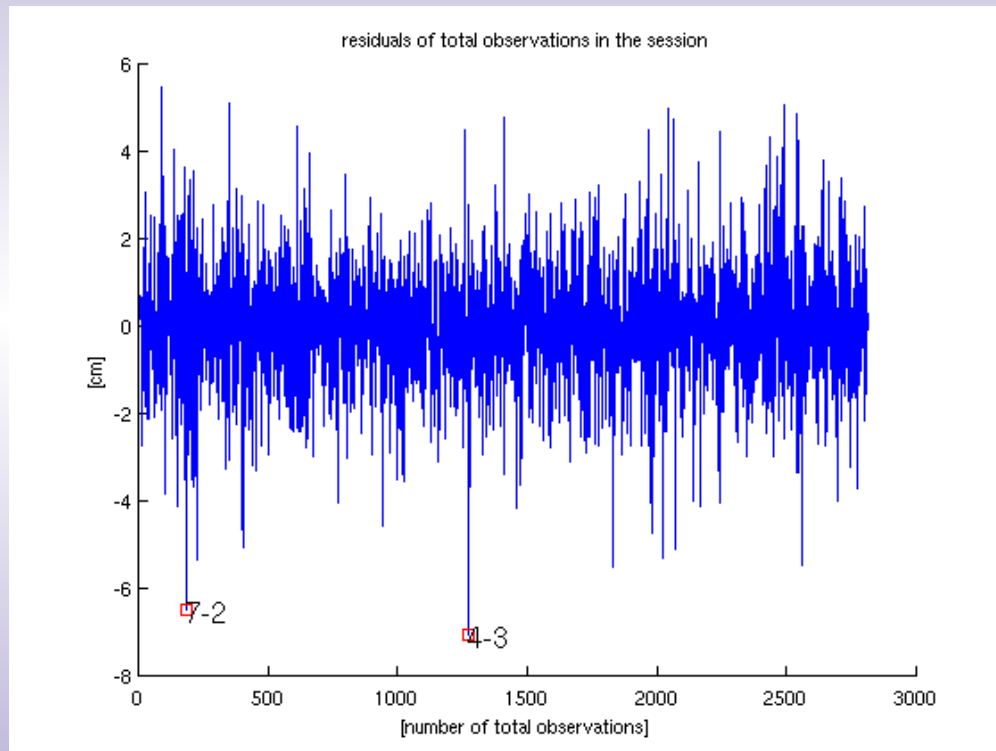





 If EOP-file is saved in the **EOP** directory, it can be chosen in the GUI by first selecting *Other* for the EOP, then choosing the text-file in the list.

# OPT files

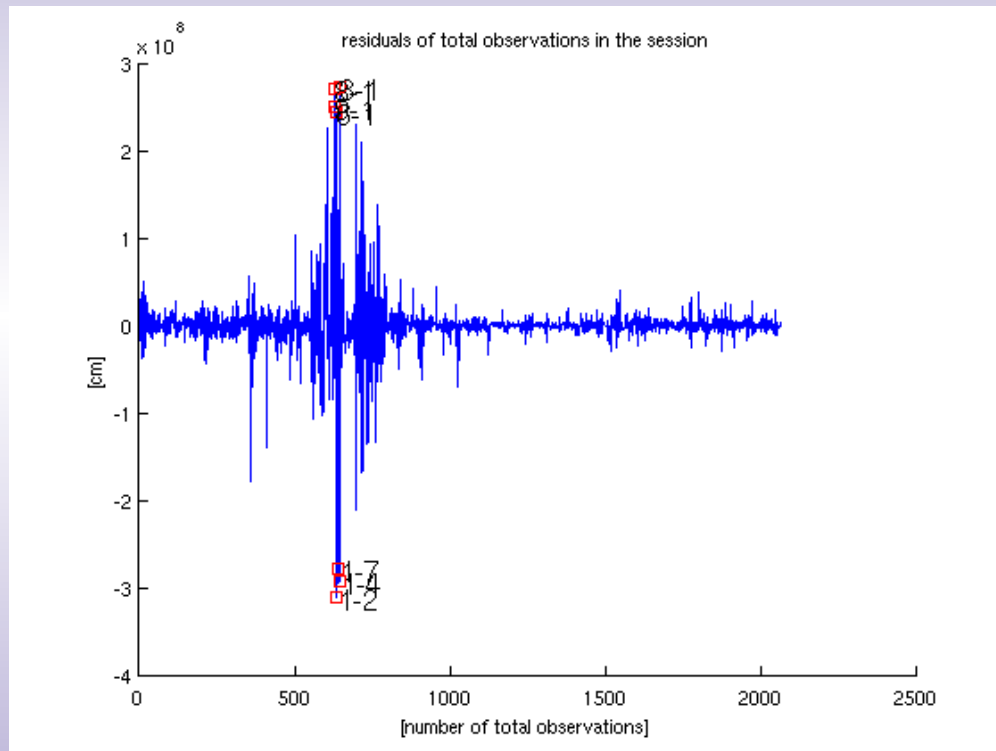
Detecting and solving problems




# In most cases, everything works fine



-  Residuals of main solution less than a few cm.
-  Chi-squared of main solution around 1 (1.12 if example left).
-  Occasional outliers can exist.

# In some cases, problems occur...



-  Many large residuals.
-  Chi-squared of main solution around much larger than 1.
-  Indicates that there is a problem with the session that needs to be fixed.

# Problematic VLBI session







- ♣ Problems that can occur:
  - ♣ Clock breaks
  - ♣ Bad stations, sources, baselines,...
  - ♣ Few observations for one station
  - ♣ ...
- ♣ Identifying the problem:
  - ♣ Correlation reports, analysis reports etc.
  - ♣ Investigation of the data (residual plots etc.)
  - ♣ Divine inspiration...



# OPT files





- ❑ ASCII files in sub-folders of **DATA/OPT/**, e.g. **DATA/OPT/DEFAULT/2009/09JUN23XH.OPT**
- ❑ Can be used to:
  - ❑ Specify reference clock
  - ❑ Introduce clock breaks
  - ❑ Exclude stations, sources, and baselines
  - ❑ Not use the cable cal of a station

```
CLOCK REFERENCE:
ONSALA60
CLOCK BREAKS: 3
WETTZELL 55818.51
WETTZELL 55818.9
KOKEE 55818.43
STATIONS TO BE EXCLUDED: 1
ONSALA85
SOURCES TO BE EXCLUDED: 3
1830+011
1612+339
0334+004
BASELINES TO BE EXCLUDED: 2
HOBART26 HOBART12
MATERA MEDICINA
NO CABLE CAL: 1
FORTLEZA
# This is a comment
```

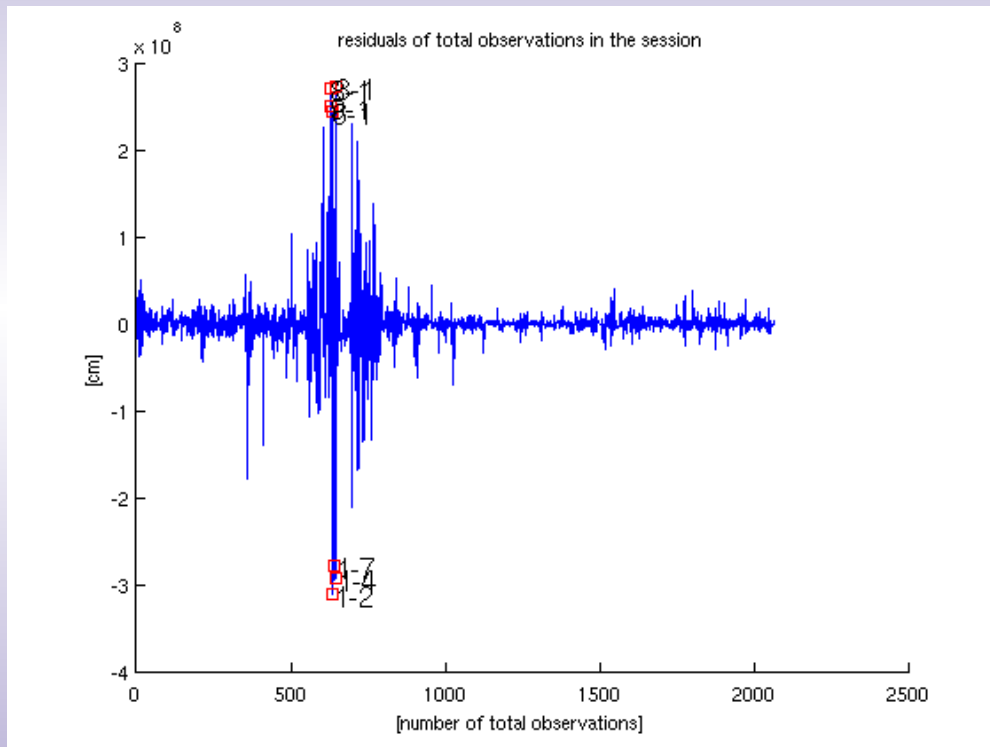
-  ONSALA60 is the reference clock
-  Three clock breaks
-  Exclude all observations including ONSALA85
-  Exclude all observation to sources 1830+011, 1612+339, and 0334+004.
-  Exclude all observations of baselines HABART26-HOBART12 and MATERA-MEDICINA
-  Do not use cable cal corrections for FORTLEZA


# Reference clock

CLOCK REFERENCE:  
WETTZELL


-  Specifies which station clock is used as reference.
-  If not specified, 1<sup>st</sup> station in the *antenna* structure array is used
-  Normally does not matter for the results.
-  **Important:** reference clock should not have any clock breaks.

# Finding a clock break

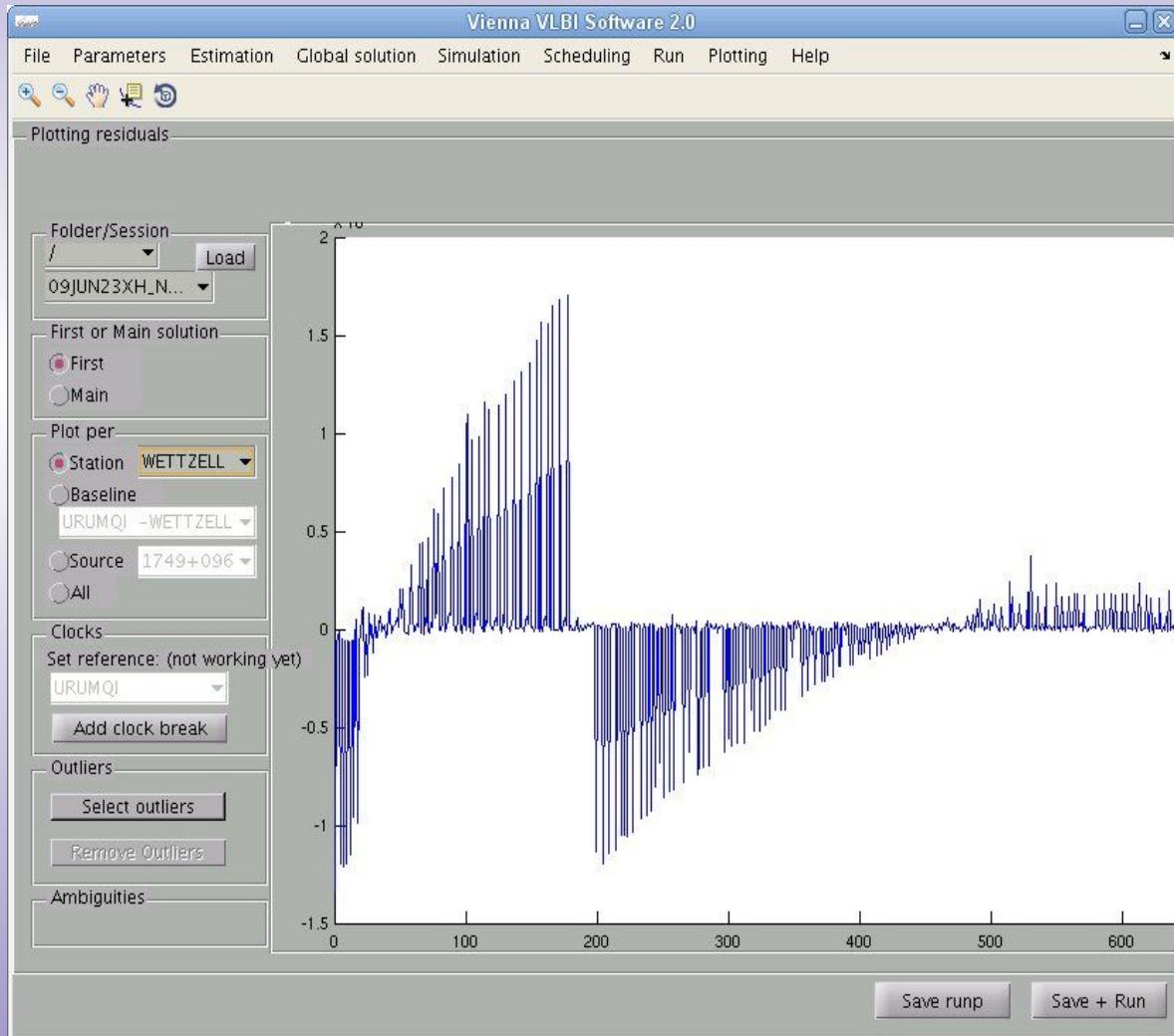


 Session  
09JUN23XH\_N006  
(T2062)

 Large residuals

 Chi-squared of  
main solution:  
45983779.3926!

# Finding a clock break



Go to *Plotting/Residuals*

Select directory and click on *load*

Select the session

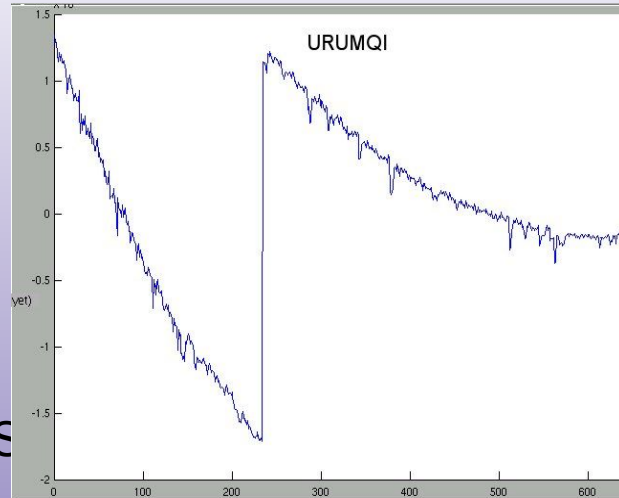
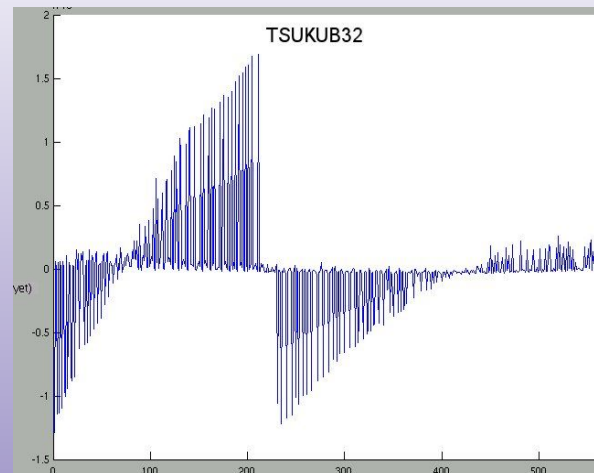
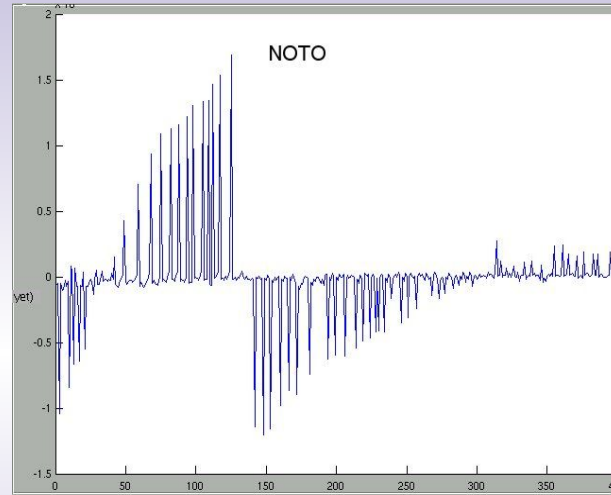
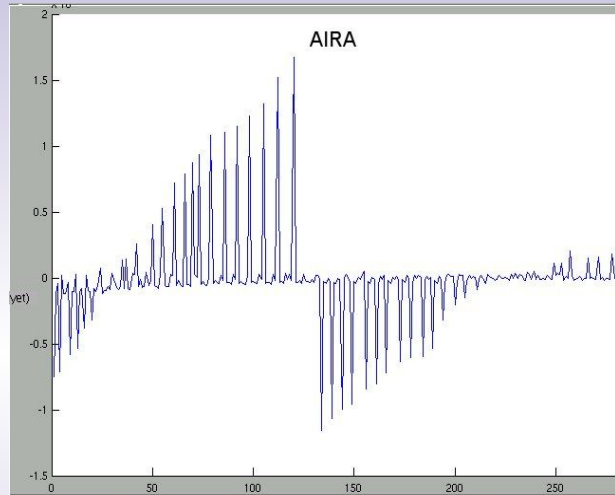
Click on *First*

Click on *Station*

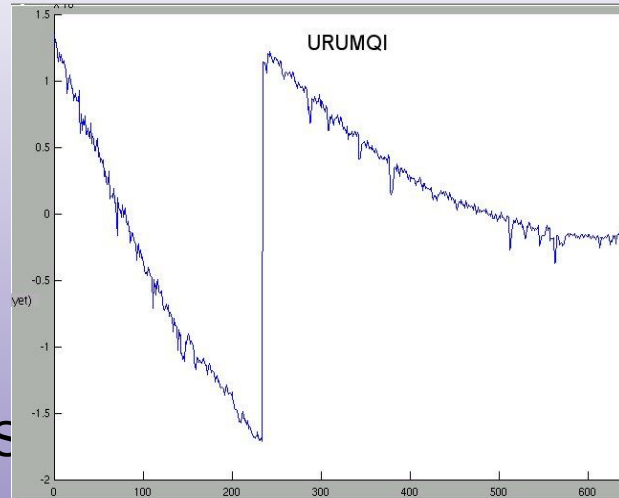
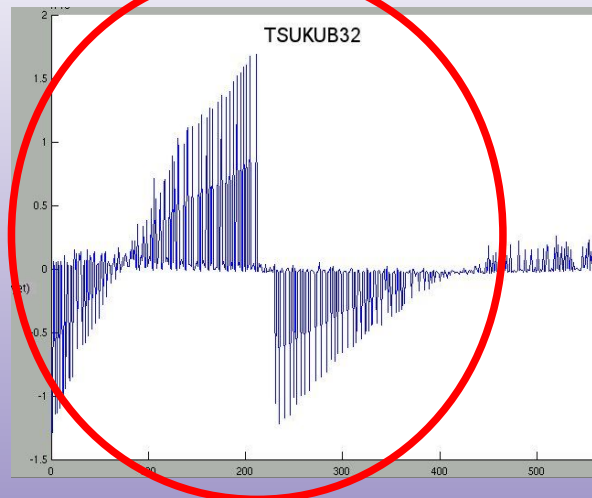
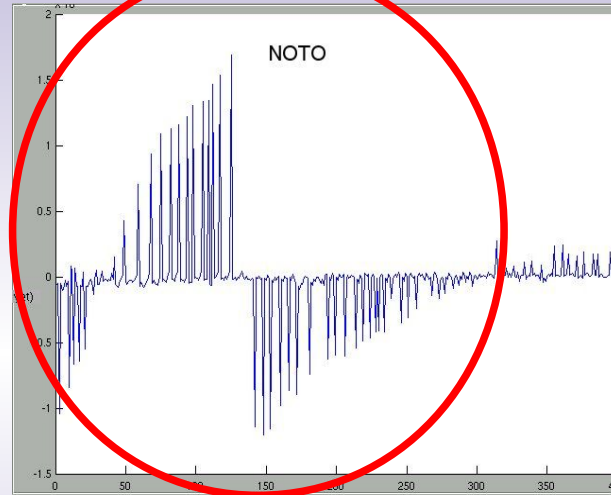
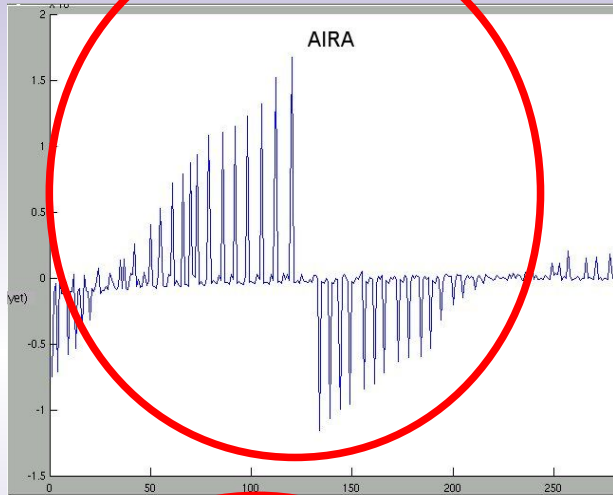
Select a station in the pull-down menu

Look at the Station-wise residuals from the first solution

# Residuals after 1<sup>st</sup> solution

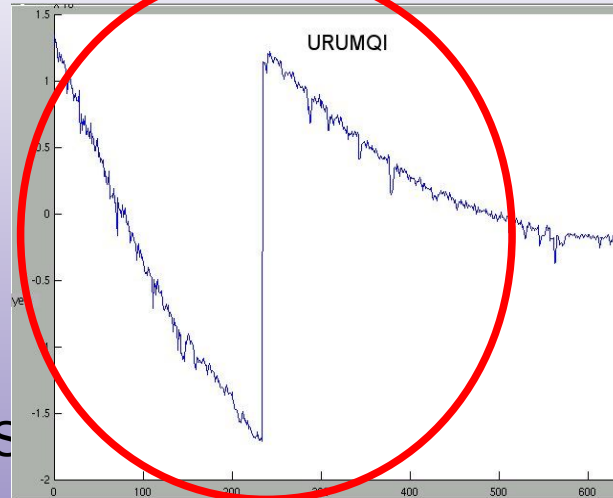
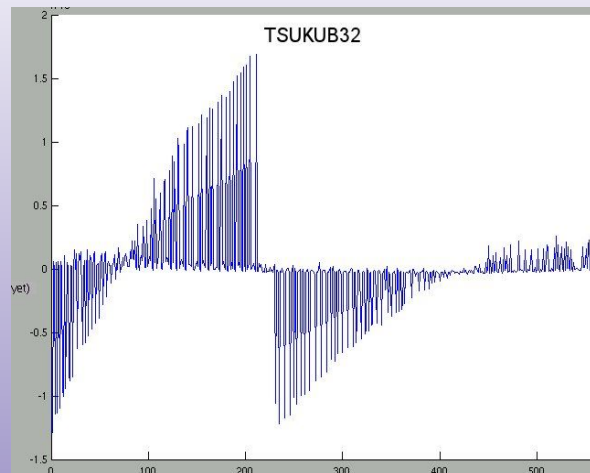
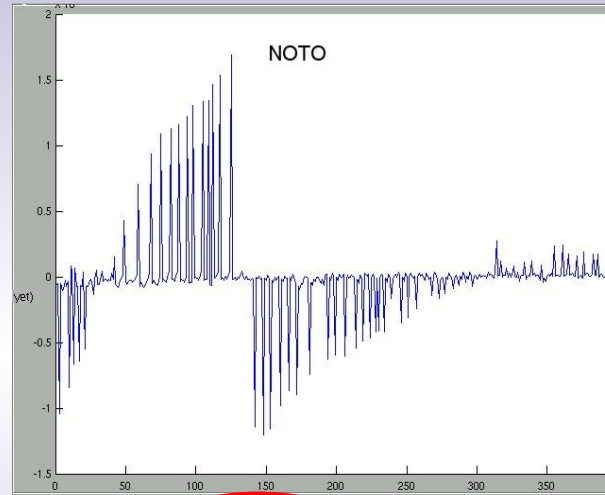
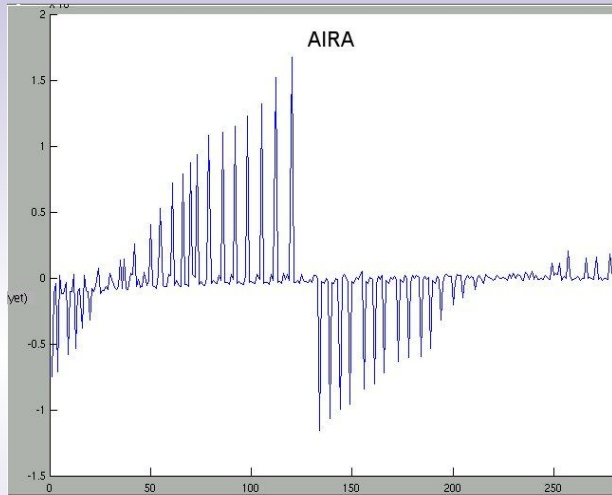


# Residuals after 1<sup>st</sup> solution



Large residuals to station number 1 (URUMQI). Indicates that there is a problem with this station (e.g. a clock break).

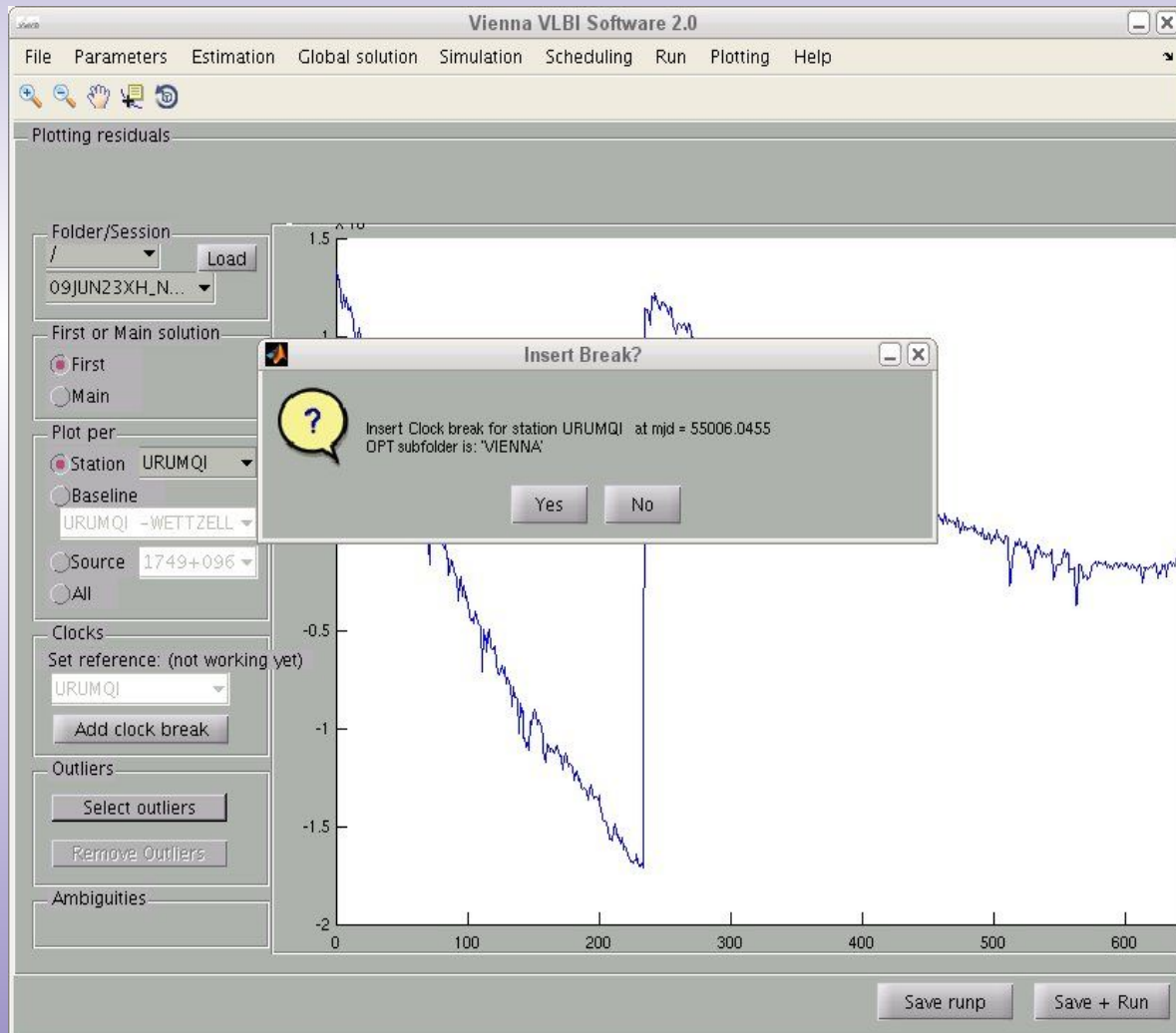
# Residuals after 1<sup>st</sup> solution



Large jump in the residuals of station 1 (URUMQI). A strong indication of a clock break at this station.



# Finding the epoch of the break



Select the station with a clock break

Click on *Add clock break*

Click in the plot on the epoch of the clock break

Click on **Yes**

The clock break is automatically saved in the OPT-file

# Adding a clock break manually to an OPT-file

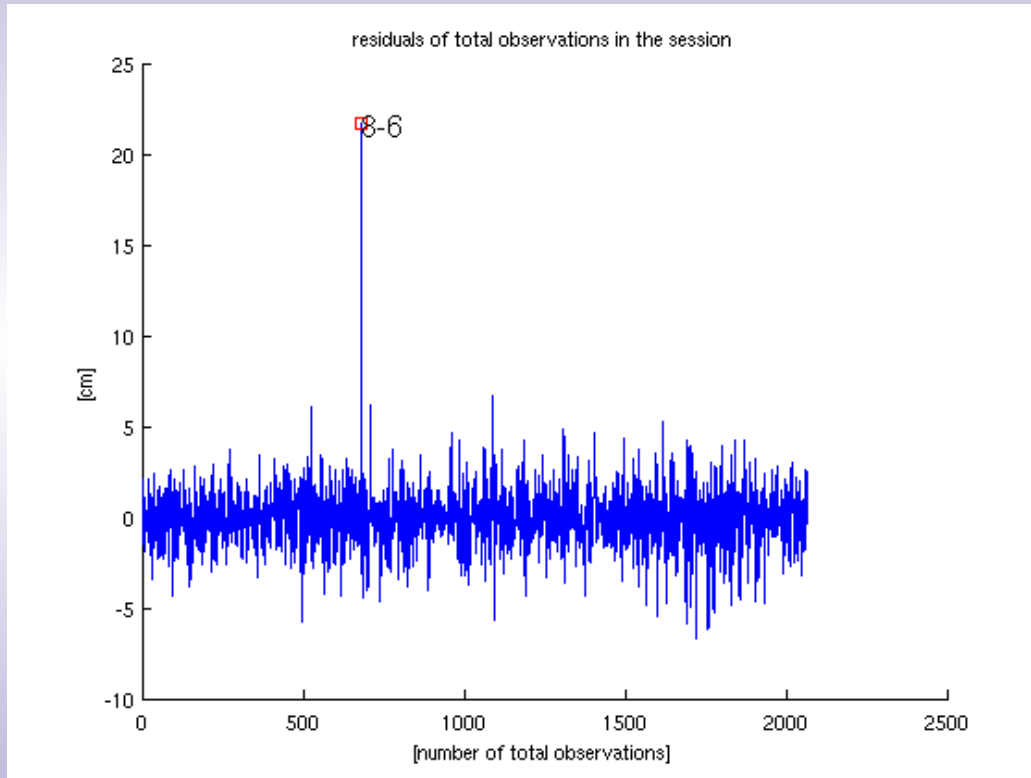
-  Create an OPT-file using a text editor:


**DATA/OPT/DEFAULT/2009/09JUN23XH.OPT**


(replace DEFAULT with the name of your OPT directory)

```
CLOCK REFERENCE :  
WETTZELL  
CLOCK BREAKS :   1  
URUMQI          55006.06
```

# Residuals, clock break corrected





 The residuals of the main solution is now ok (1-2 cm, except one outlier).




 Chi-squared 1.38.

# Excluding a station

STATIONS TO BE EXCLUDED: 3  
WETTZELL  
WESTFORD  
ONSALA60


-  Each station name needs to be 8 characters (fill with blanks on the end if name is shorter)





-  Reasons to exclude a station:

-  Large residuals for this stations observations. No other solution can be found.
-  Few observations for a station
-  Special tests

# Excluding a source



SOURCES TO BE EXCLUDED: 3  
1830+011  
1612+339  
0334+004




-  Each source name needs to be 8 characters (fill with blanks on the end if name is shorter)

-  Reasons to exclude a source:
  -  Large residuals for observations to this source. No other solution can be found.
  -  Bad source coordinates (and you do not want to estimate source coordinates)
  -  Special tests

# Excluding a baseline

BASELINES TO BE EXCLUDED: 2  
NYALES20 OHIGGINS  
KOKEE HARTRAO

-  Each station name needs to be 8 characters (fill with blanks on the end if name is shorter)
-  Two blanks between station names

-  Reasons to exclude a baseline:
  -  Large residuals for this baseline. No other solution can be found.
  -  Special tests

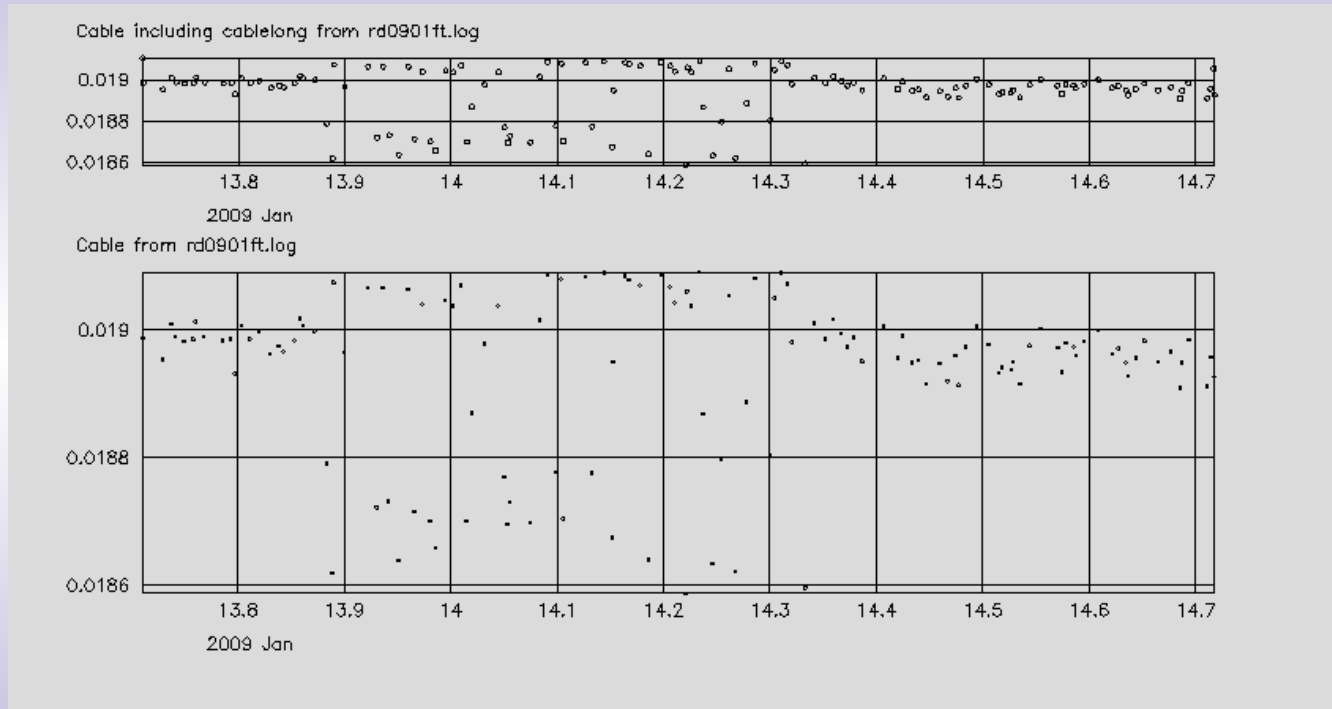
# Not using cable cal

NO CABLE CAL: 1  
FORTLEZA

- Each station name needs to be 8 characters (fill with blanks on the end if name is shorter)

- Sometimes the cable cal of a station is bad and should not be used.
- Ways to identify bad cable:
  - Visual inspection of cable cal plots
  - From correlation reports, station logs etc.







# Example of a bad cable



<http://lupus.gsfc.nasa.gov/sess/sesshtml/2009/rd0901.html>



# Other problems that can occur

-  A few observations are bad
  -  **Solution:** add observations manually to Outlier file (if not done by outlier test)
-  A clock has a large diurnal variability
  -  **Solution:** use very loose constraints for the piecewise linear offsets of that clock.
-  The normal equation matrix in the Least squares adjustment is (close to) singular
  -  **Solution:** reduce the number of parameters to be estimated

Hopefully, you are now able to process VLBI sessions with VieVS without any problems!