

# Simulating VLBI observations with VieVS

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## 1 Description

This exercise will give a short introduction to the possibilities of simulating VLBI observations using the Vienna VLBI and Satellite Software (VieVS).

We will simulate our previously created schedules and look at the expected baseline length repeatability.

In a second exercise we will produce zero-input files for a session and investigate the effects of the solid earth tides.

## 2 Starting VieVS

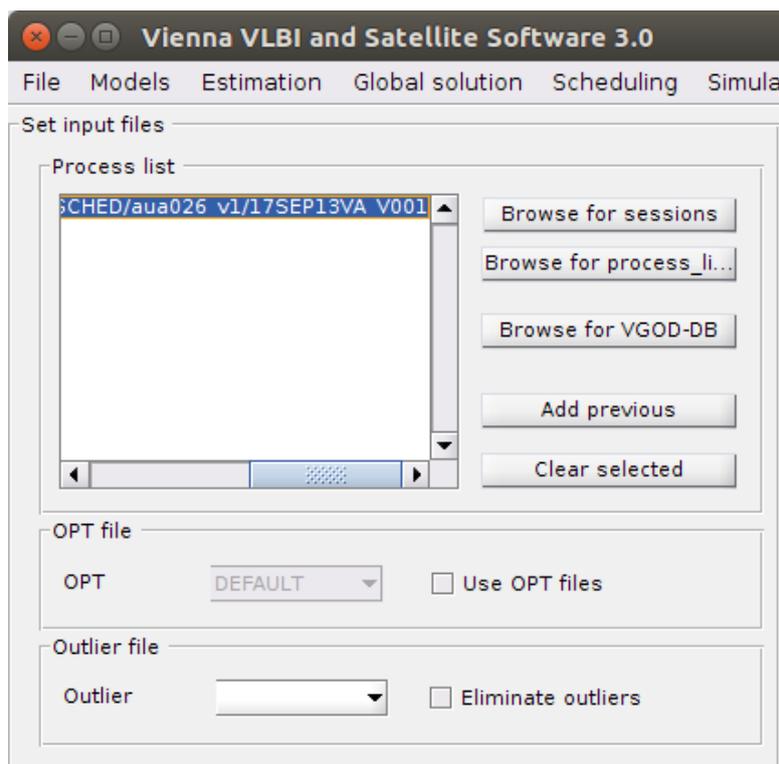
- start MATLAB
- browse to your VieVS folder *\*/VieVS/WORK*
- type *vievs* in the matlab command window

now VieVS should open

## 3 First exercise: simulate schedules

### 3.1 Select input files

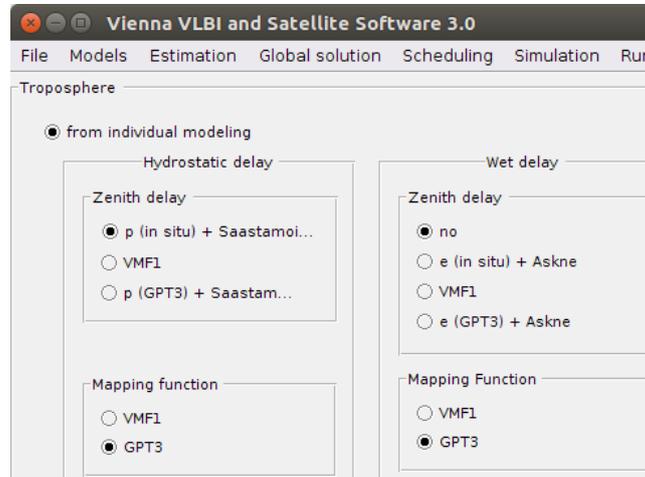
Select the input NGS file in *File/Set input files*. We want to simulate our previously created VLBI schedule. Click *Browse for session* and select the NGS file in *DATA/SCHEDED/\*your\_folder\*/17SEP13VA\_V001* (NOTE: you need to browse one folder back after you clicked *Browse for session*).



### 3.2 Models

Because we want to simulate a schedule for today we need to use different models than the default ones.

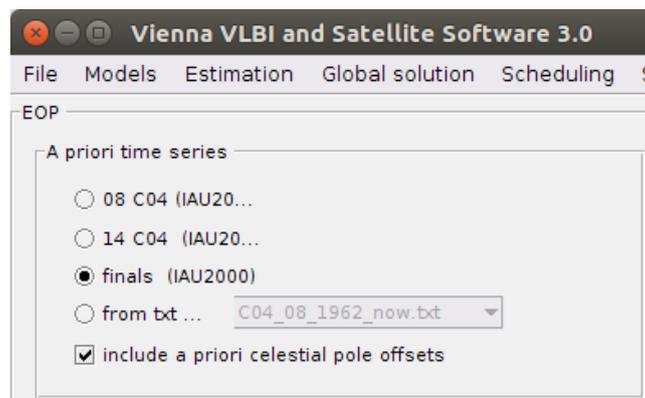
First we need to change the Mapping function. (VMF1 uses real weather data, which is not available in advance) Browse to *Models/Troposphere* and select GPT3 for both: hydrostatic and wet delay.



We also need to deselect the non-tidal atmosphere loading effects modelling for the same reasons. Browse to *Models/Station models* and uncheck the *Non-tidal atmosphere loading* checkbox.



Finally we also need to change the EOP time series to the *finals* series. Browse to *Models/EOP* and select *finals (IAU2000)* as your a priori time series.

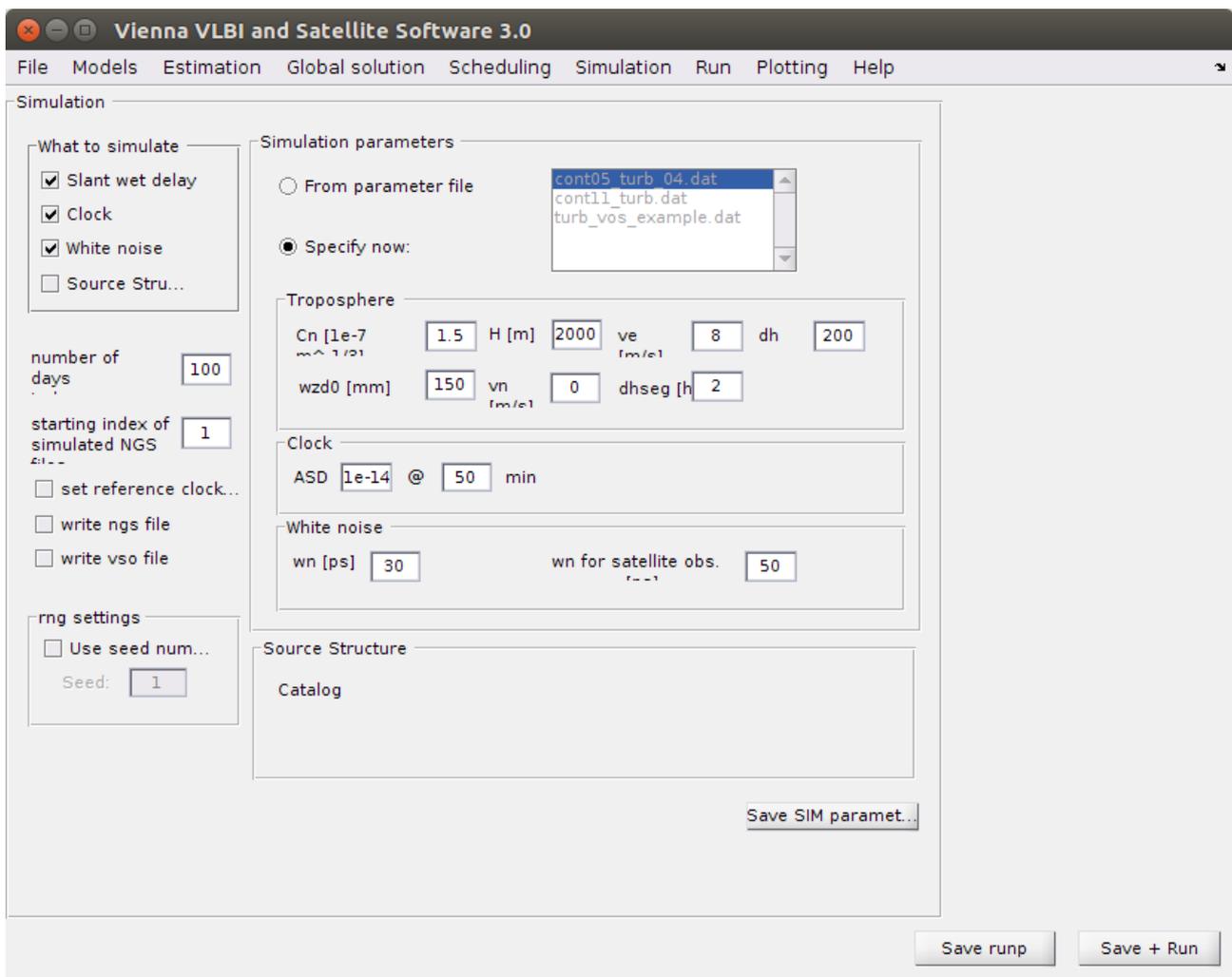


**NOTE:** in theory it doesn't really matter which model you use, because the modeled effects are then corrected with the same models again that the effect on  $o - c$  is zero.

### 3.3 Simulation parameters

Next browse to *Simulation/Parameters*. We want to use the same parameters for all stations. Therefore select *specify now*:. If you want to use different parameters for each station use the option *From parameter file*: and make sure you have a file stored in *VieVS/DATA/TURB*.

- We want to use a lower troposphere turbulence  $C_n$  value of 1.5, and leave the rest of the parameters to their default values.
- Change the *number of days to be simulated* to 100.
- For this exercise we don't need NGS files with our simulated observation, so deselect *write ngs file*.

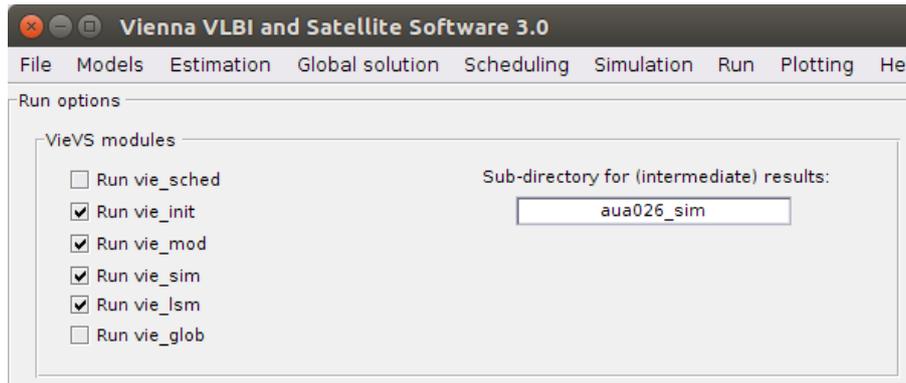


### 3.4 Run

Finally go to the panel *Run/Run options* and select the following VieVS modules:

- VIE\_INIT
- VIE\_MOD
- VIE\_SIM
- VIE\_LMS

Also choose a new sub-directory name for (intermediate) results like *aaa026\_sim* and press *Save + Run*.



If everything worked, you could also do the same for the schedule without subnetting. Simply select the other NGS file in *File/Set input file* and choose another sub-directory name in *Run/Run options* and press *Save + Run*.

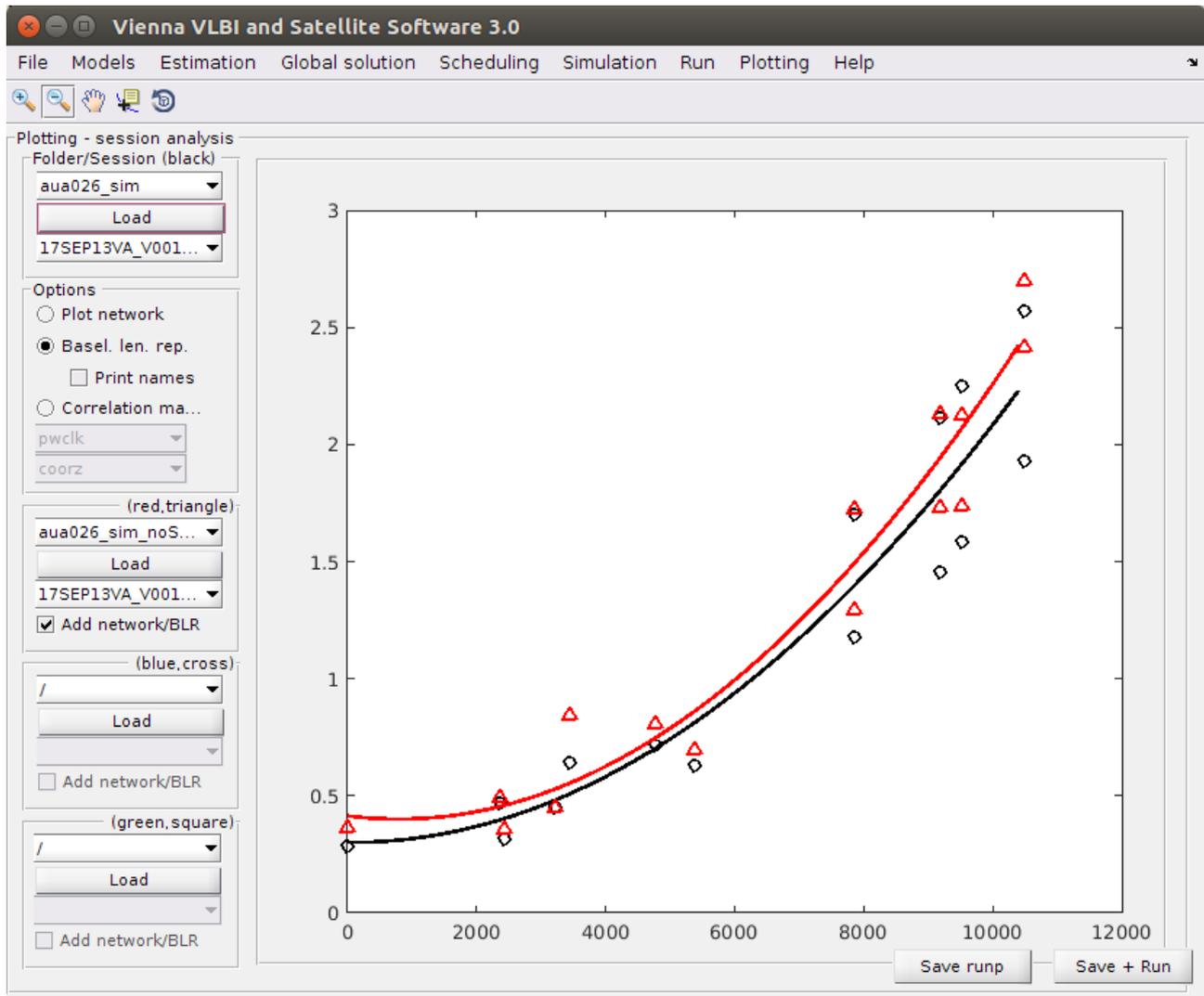
**NOTE:** If you want to simulate your schedule you could also do all at once. Therefore simply select all VieVS modules except VIE\_GLOB.

### 3.5 Results

If everything worked you can look at the baseline length repeatability of both simulated scheduling versions. Go to the *Plotting/Session analysis* panel and load your first folder by pressing the *Load* button at the *Folders/Session (black)* panel.

Plot the baseline length repeatability by pressing the *basel. len. rep.* radiobutton.

Afterwards also load your second folder by pressing the *Load* at the *(red,triangle)* panel and check the *Add network/BLR* checkbox.

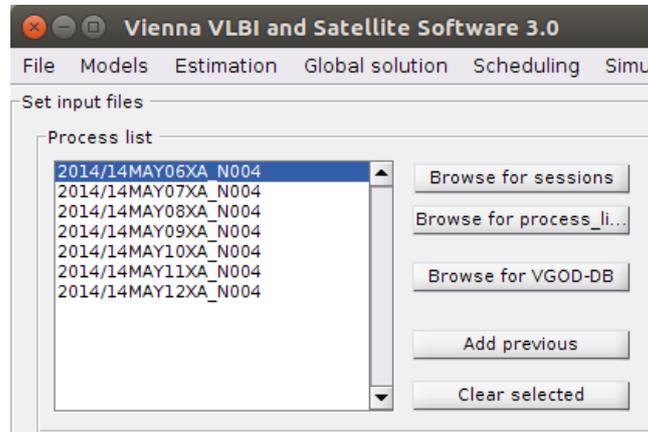


## 4 Second exercise: zero input simulations

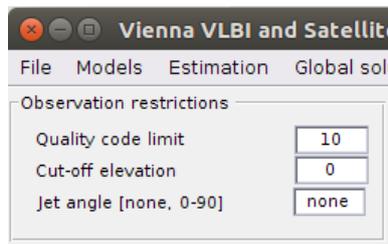
In the second exercise we want to investigate the impact of solid earth tides on geodetic VLBI.

### 4.1 Select input files

This time we want to simulate the first week of CONT14. Go to *File/Set input files* and select the CONT14 files:



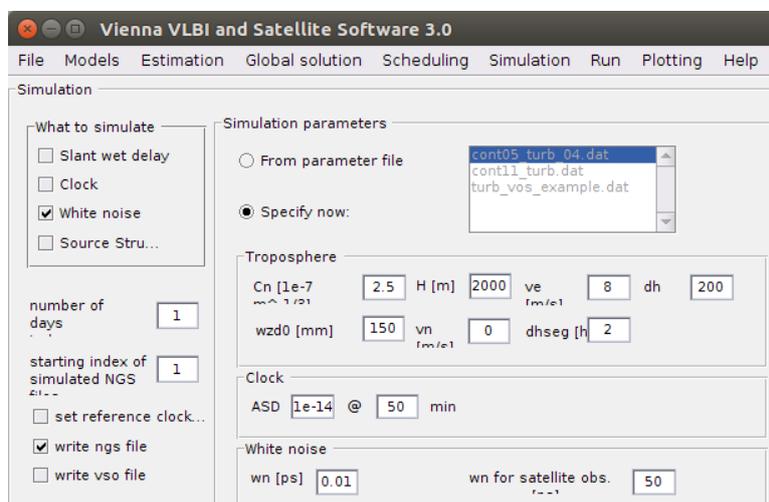
Because we use real observation NGS files this times we need to make sure we use all observations. Go to *Models/Observation restrictions* and set the quality code limit to 10.



### 4.2 Simulation parameters

In *Simulation/Parameters* we want to uncheck *Slant wet delay* and *Clock*, only *White noise* remains checked. In order to avoid a program crash (e.g. dividing with 0), it is advisable to simulate a tiny noise (e.g. 0.01ps).

This time we only want to simulate 1 day and we need to write NGS files.

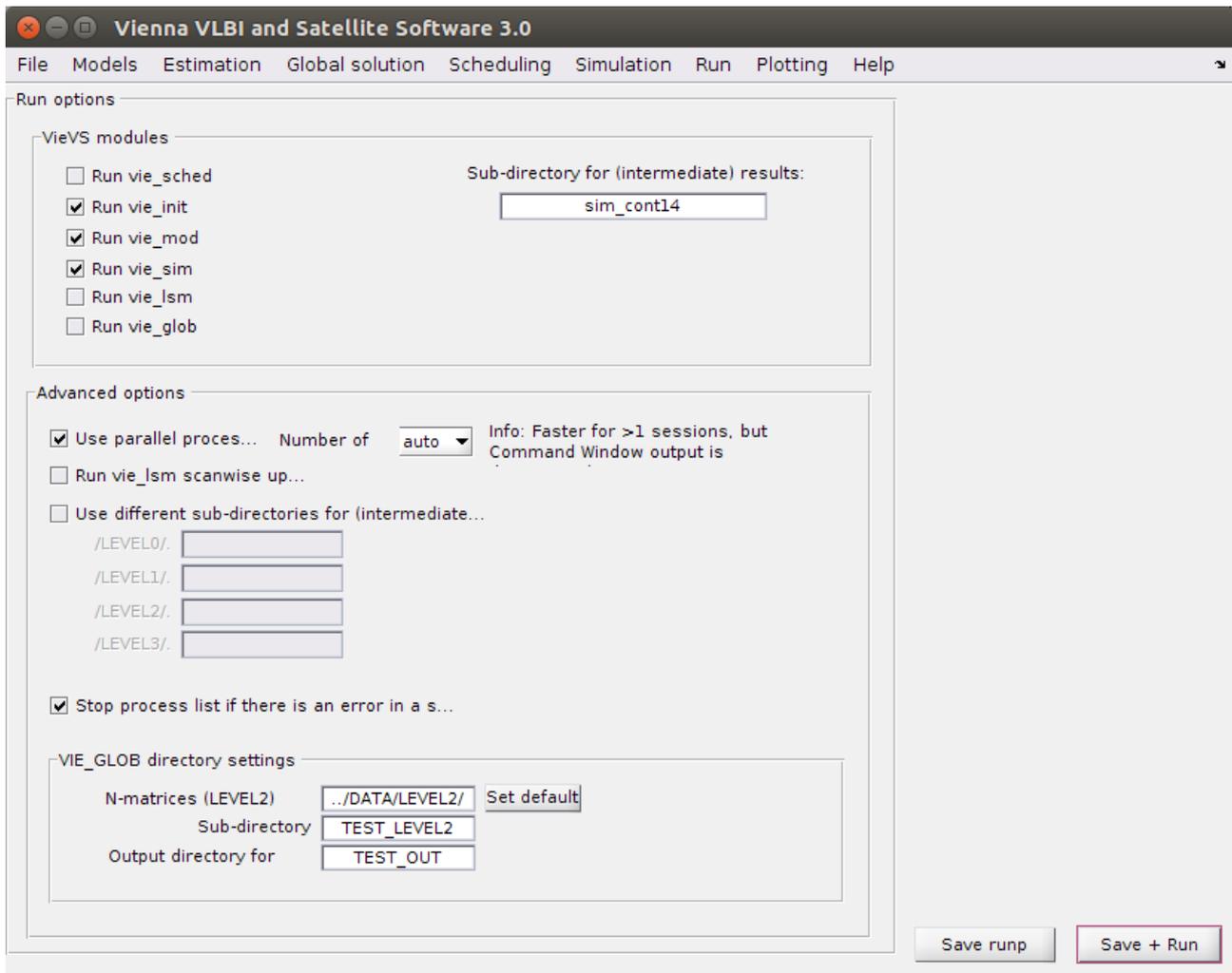


### 4.3 Run

Now go to *Run/Run options* and check the following VieVS modules:

- VIE\_INIT
- VIE\_MOD
- VIE\_SIM

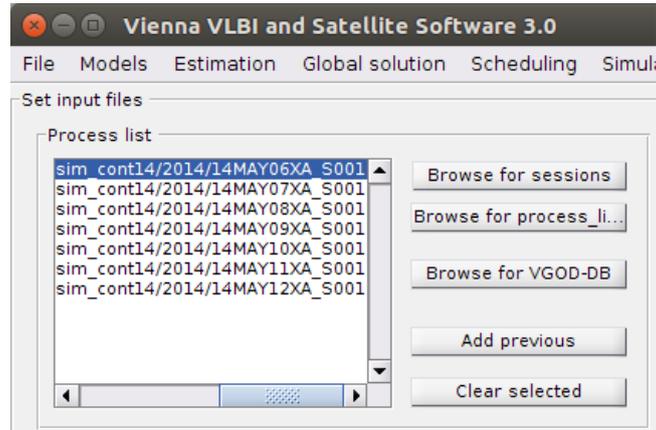
To speed things up we want to use parallel processing this time. Check the *Use parallel processing* checkbox therefore. Choose an appropriate sub directory name and press the *Save + Run* button.



You can find your new NGS files with the simulated observations at:  
*VieVS/DATA/SIM/\*your\_subDirecotry\*/2014.*

## 4.4 Session analysing

Now we want to analyse our simulated observations. Go to *File/Set input files* and select the newly created NGS files in *DATA/SIM/\*your\_subDirecotry\*/2014*.



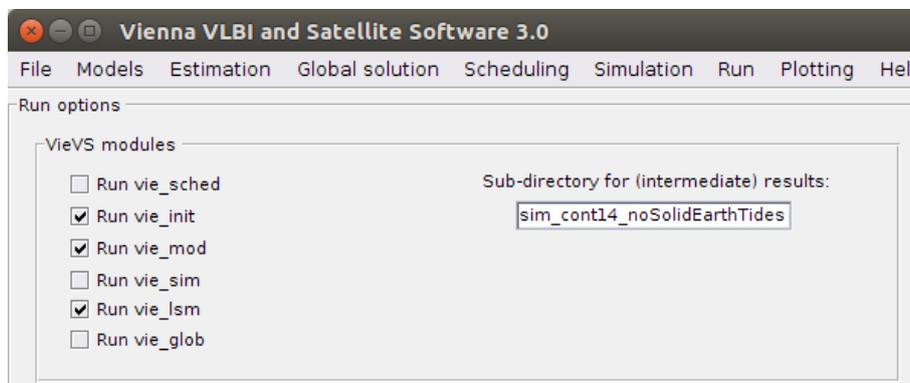
Our goal is to see the effect of solid earth tides. Go to *Models/Station models* and uncheck the *Solid Earth tides* checkbox.



Next, go to *Run/Run options* and check the following VieVS modules:

- VIE\_INIT
- VIE\_MOD
- VIE\_LSM

To speed things up we want to use parallel processing again. Check the *Use parallel processing* checkbox therefore. Choose an appropriate sub directory name and press the *Save + Run* button.



## 4.5 Results

To see the impact of missing solid earth tide modelling at the geodetic parameters go to *Plotting/Parameters* and look at the results.

