Exercise: Multi session analysis

In brief

Work with process lists – detect and consider outliers – use parallel processing – compare baseline length repeatabilities from different processing settings.

Baseline length repeatability (BLR)

The baseline length repeatability is a commonly used tool to investigate the quality of VLBI results. It represents the precision of the baseline length measured with VLBI. On the x-axis, we have the baseline length and on the y-axis, we plot some sort of repeatability measure (standard deviation, RMS, WRMS). We use BLR to identify how consistent our solutions are. It is also a great tool to investigate the impact of models on the station coordinates. We can assume that a model that reduces the baseline length repeatability also increases the consistency of the VLBI result. In VieVS the repeatability is calculated only for baselines which have at least 10 days of observations. A linear regression is calculated from the time series of adjusted baseline lengths and the post-fit (weighted) residuals are the BLR values.

Sessions

We will use 12 R1 and R4 sessions from 2020:

20JAN09XE
20JAN13XA
20JAN16XE
20JAN21XA
20JAN23XE
20JAN27XA
20JAN30XE
20FEB03XA
20FEB06XE
20FEB10XA
20FEB13XE
20FEB17XA

Processing steps

1. Usually you would create OPT files for the sessions where a special handling is necessary. To save time we provided the OPT files for these sessions within the webinar data.
2. Create a process list with all 12 sessions. In the panel "Set input files" click on the button *Browse for VGOS-DB* and select the XE and XA sessions from the list. To save the process list go to "File > Parameter files > Save process list as …" and store your session list.
3. Outlier detection: we will now use ready-made OPT-files from the directory WEBINAR, to enable the outlier detection go to "Run > VieVS estimation settings"

and tick *Simple outlier test* in the panel *Main solution*. Outliers will be written to VLBI/DATA/OUTLIER/2020/ in session-wise files with the extension OUT. In "Run > Run options" define a sub-directory for the results, for example "standard" and check *Use parallel processing* in the panel *Advanced options*. Click the button "Save + Run".

4. Create a "standard" solution and apply outliers. To eliminate outliers we have to go again to "File > Set input files > Outlier file" and tick the option *Eliminate outliers*. In "Run > VieVS estimation settings" you have to deselect *Simple outlier test*, otherwise more outliers are detected and appended to the existing *.OUT file. Since the outliers are applied in vie_lsm we do not have to run vie_init and vie_mod again: go to "Run > Run options" and deselect *Run vie_init* and *Run vie_mod*. Click the button "Save + Run".

5. Create a solution with different modelling for comparison: select again *Run vie_init* and *Run vie_mod*, use a different sub-directory for the results, for example "no_soltid". Then we will change something in the modelling of the station coordinates – go to "Models > Station models" and deselect "Solid Earth tides". Click the button "Save + Run".

Investigate results

Analyse the baseline length repeatabilities of the two solutions: Go to "Plotting > Session Analysis" and choose the "standard" folder in the first drop down window and press *Load*. In the *Options* panel choose *Basel. len. rep.*, in the second drop down window select the "no_soltid" folder and tick *Add network/BLR*.

The result should look like this (standard (black), no_soltid (red)):