Comparing the baseline length repeatability of the two CONT17 networks

Aim of exercise

In this exercise, the two VLBI networks, which observed CONT17, should be compared by the means of baseline length repeatability.

CONT17

Purpose: "CONT17 is a campaign of continuous VLBI sessions, scheduled to be observed in November and December 2017 (28-NOV-2017 00:00 UT through 12-DEC-2017 24:00 UT)."[1]
Goals: "The plan for the CONT17 campaign is to acquire state-of-the-art VLBI data over a time period of about two weeks to demonstrate the highest accuracy of which the legacy S/X VLBI system is capable, to investigate possible network biases..."[1] Both networks consist of 14 VLBI stations, see Figure 1. The Legacy-1 network (suffix XB) is depicted in blue and the Legacy-2 network (suffix XA) in red.
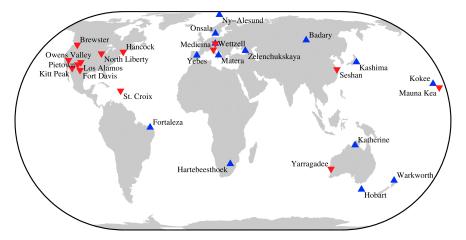

Figure 1: The two legacy networks used to observe CONT17.

1

Baseline length repeatability

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). An example is provided in Figure 2. We use the measure of baseline length repeatability to identify how consistent our solutions are. It is also a great tool to investigate the impact of models on the station coordinates. Generally speaking, we can assume that a model that reduces the baseline length repeatability also increases the consistency of the VLBI result.
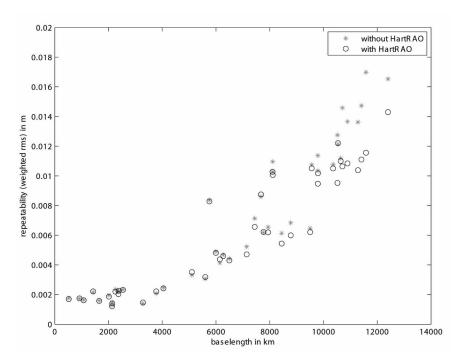

Figure 2: Baseline length repeatability plot.

---

[1]https://ivscc.gsfc.nasa.gov/program/cont17/

Processing steps

Find the data

Go to the GUI and select (*File/Set input files/Brows for VGOS-DB*) the first four sessions of the Legacy-1 network in VGOS-DB format, they are: 17DEC01XB, 17NOV28XB, 17NOV29XB and 17NOV30XB.

Select a suitable parameterization

We will now change the parameterization. Follow these steps:

- OPT files of these sessions are available, click on *Use OPT files* to make sure VieVS uses them.

- Go to *Models/Reference frame/* and select the ITRF2014 as a priori TRF and the ICRF2 as a priori CRF in the drop-down list.

- Go to *Estimation/Least squares/Troposphere* and change the estimation interval for the ZWD to 30 min and the estimation interval for gradients to 180 min.

- Go to *Estimation/Global parameters* and click on the "Prepare N_global and b_global for global solution" check box. (this is needed for an exercise tomorrow)

- Go to *Run/Run options* and make sure that only the "Run vie_init", "Run vie_mod" and "Run vie_lsm" checkbox are selected.

  Parallel processing When you analyze a process list (more than one session) you can use the parallel processing option: Go to *Run/Run options* and select the check box "Use parallel processing". This will distribute the analysis of your sessions on the available cores of your processor you can save a lot of time by doing this. The disadvantage is that the output in the command window will be scrambled.

- Select a suitable name for the sub directory and click on "Save + Run"

Investigate results

Go to *Plotting/Session analysis* and load the folder content. You can display the observing network by selecting the "Plot network" radio button. The baseline length repeatability can be shown by selecting the "Basel. len. rep." radio button.

When you are finished with these steps, you can repeat this process with the Legacy-2 network (sessions 17DEC01XA, 17NOV28XA, 17NOV29XA and 17NOV30XA).

When you did everything correctly, you should see this figure in your plotting window:
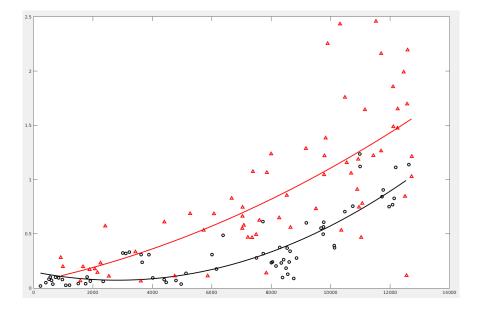

Figure 3: Baseline length repeatability plot of Legacy-1 and Legacy-2 network.

If there is enough time, we can compare the time series of ZWD at a co-located site such as WETTZELL and WETT13N. Please follow the presenter for this exercise.