Global solution

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Global solution

- What does that mean?

  A global solution combines VLBI sessions and enables an estimation of common parameters.

- Why use it?

  With this approach the whole history of VLBI data can be used to estimate static parameters such as station coordinates and velocities, source coordinates etc.

Theoretical background

- Sort parameters in the N-matrix and b-vector
- Reduction of parameters
  - always reduced: clock parameters, zwd, and troposphere gradients
  - can be reduced: EOP, stations and sources not suitable for global solution

$$\begin{bmatrix} N_{11} & N_{12} \\ N_{21} & N_{22} \end{bmatrix} \cdot \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} b_1 \\ b_2 \end{bmatrix}$$

globally estimated p.

reduced p.

$$N_{reduc} = N_{11} - N_{12} \cdot N_{22}^{-1} \cdot N_{21}$$

$$b_{reduc} = b_1 - N_{12} \cdot N_{22}^{-1} \cdot b_2$$

→ the reduced normal equation matrices are saved during a normal run in VieVS in the LEVEL2 directory.

- Stacking of the reduced normal equation systems

$$N = N_{reduc\_1} + N_{reduc\_2} + \ldots + N_{reduc\_nse}$$

$$b = b_{reduc\_1} + b_{reduc\_2} + \ldots + b_{reduc\_nse}$$

Final solution

- applying of the constraints

$$N^{C}_{REDUC} = \begin{bmatrix} N_{REDUC} & B^{\mathrm{T}} \\ B & 0 \end{bmatrix} \qquad b^{C}_{REDUC} = b_{REDUC} + w$$

- final solution for global parameters

$$dx_1 = \left(N^{C}_{REDUC}\right)^{-1} \cdot b_{REDUC}$$

- estimates are stored as a structure array in Matlab format and as a txt file
  - VLBI/OUT/GLOB/_ESTIMATES/*TEST_OUT*/
    - globsol_*TEST_LEVEL2*.mat
    - glob_results_*TEST_LEVEL2*.txt

Vie_GLOB

- parameters which can be estimated from combination of more sessions
  - station coordinates and velocities: TRF
  - source coordinates: CRF
  - Earth orientation parameters
  - antenna axis offset
  - station seasonal harmonic signal
  - tidal ERP variations
  - pole tide Love/Shida number
  - APL regression coefficients
- session-wise as reduced parameters
  - zenith wet delay
  - tropospheric gradients
  - Earth orientation parameters
  - station and source coordinates (not suitable for global estimation)