



# Source positions from VLBI combined solution

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- The IVS combination center at BKG exists since 2010.

- **Main Tasks:**

- 1) EOP combination of rapid VLBI observations (R1 and R4).
- 2) Generation of a quarterly EOP solution.
- 3) IVS contribution to ITRF: station positions, EOP

Other products:

- Baseline lengths between VLBI stations.
- TRF from VLBI observations



## Motivation

- Currently 4 ACs (increasing) provide source positions beside EOP and station coordinates throughout the entire data files (since 1980s).
- Consistent combination of EOP, station coordinates and source positions.
- ITRF2013 Call for participation:  
“IVS is highly encouraged to provide [...] quasar coordinates for future studies by the combination centers.”
- No combined CRF solution presented until now.



**Idea:** Generate combined source positions.

→ “Feasibility study”

## **Objectives:**

- May a combined VLBI solution contribute to an ICRF?
- Possibilities for a consistent combination of TRF, CRF and EOP in the near future?



## ▪ **State-of-the-art:**

- Software package DOGS\_CS (DGFI) + control scripts.
- Basic combination process kept with additions for source parameters.
- Quality control and statistic test – outlier tests, variance component estimation - from operational combination (station positions and EOP).

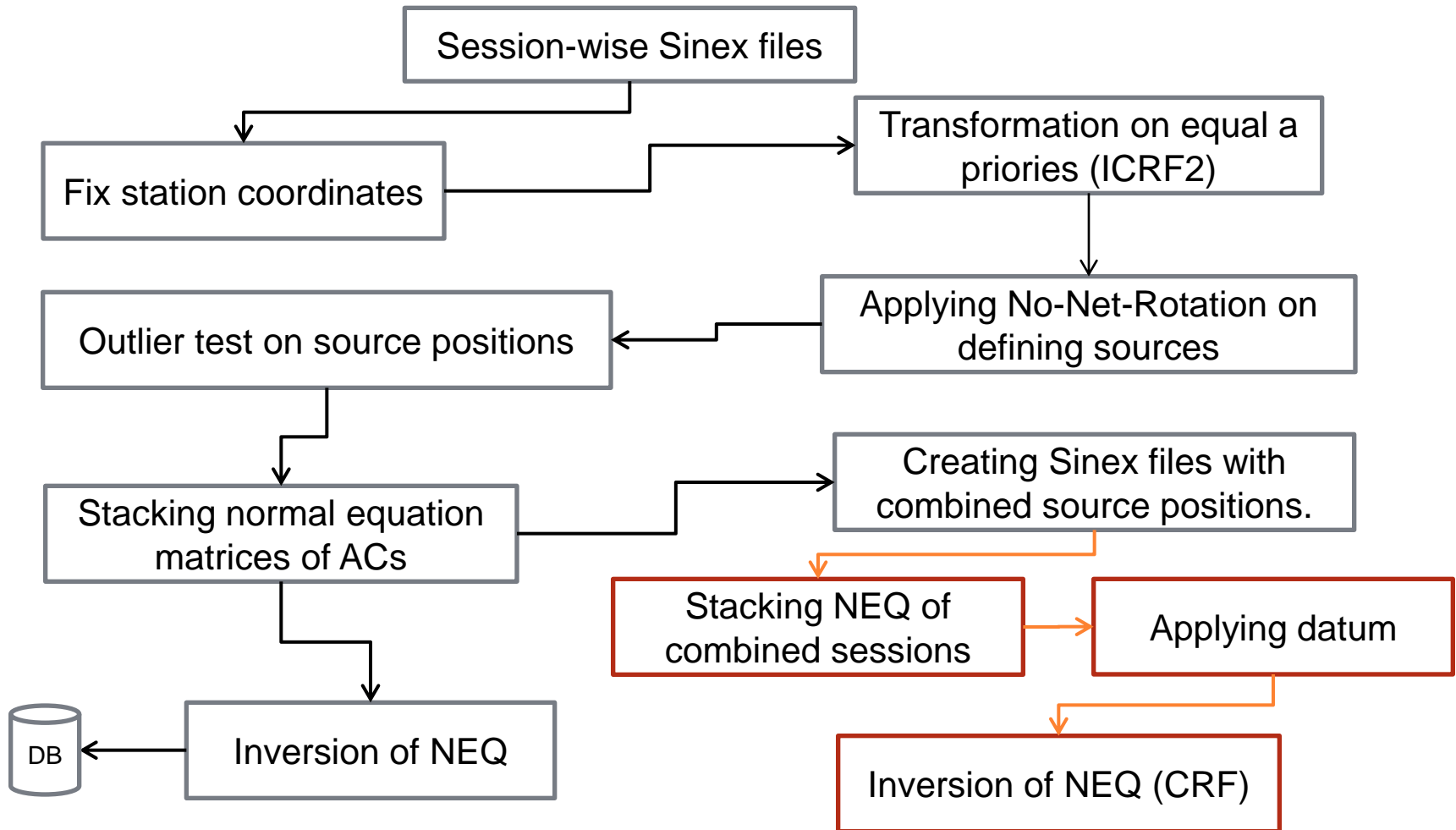
– Results so far:

Database with individual and combined source parameters including standard deviation since 1980s.

Sinex files with combined solution for the whole time span.

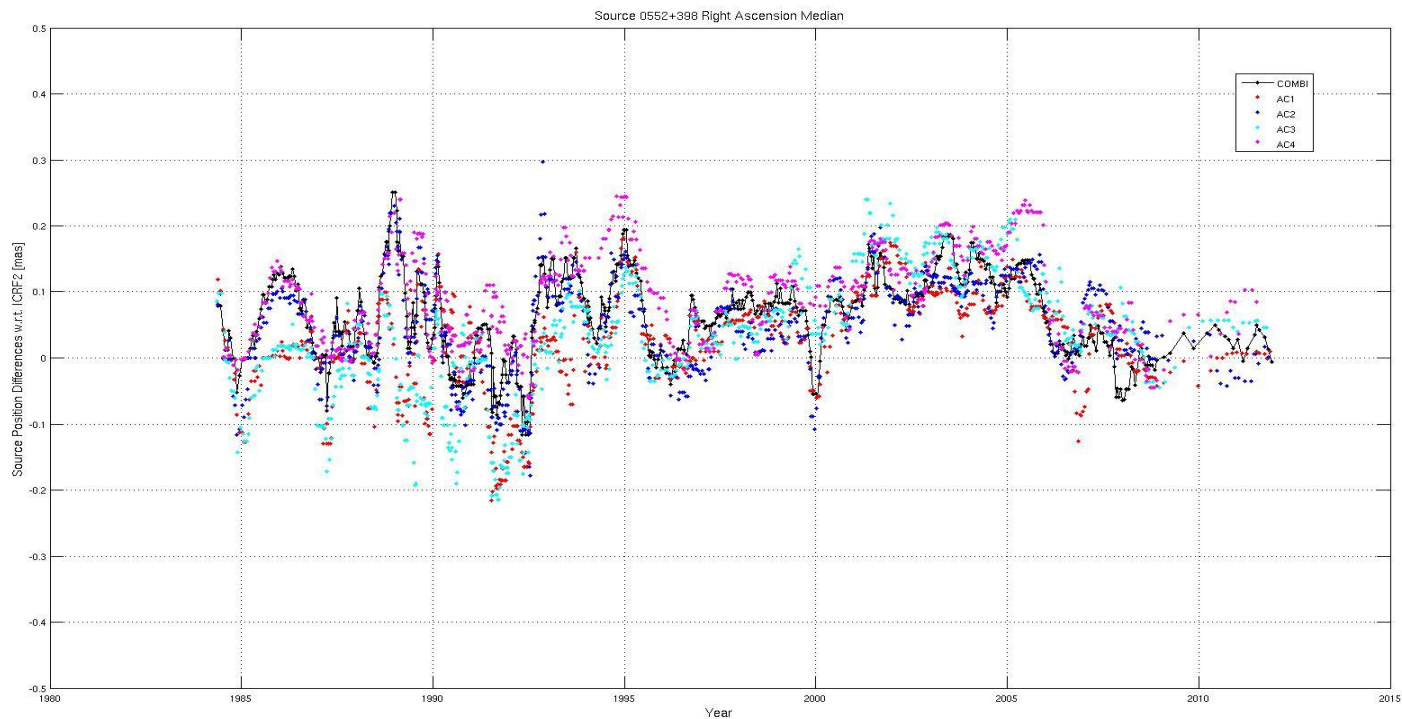


Diagram of the main source combination processes:



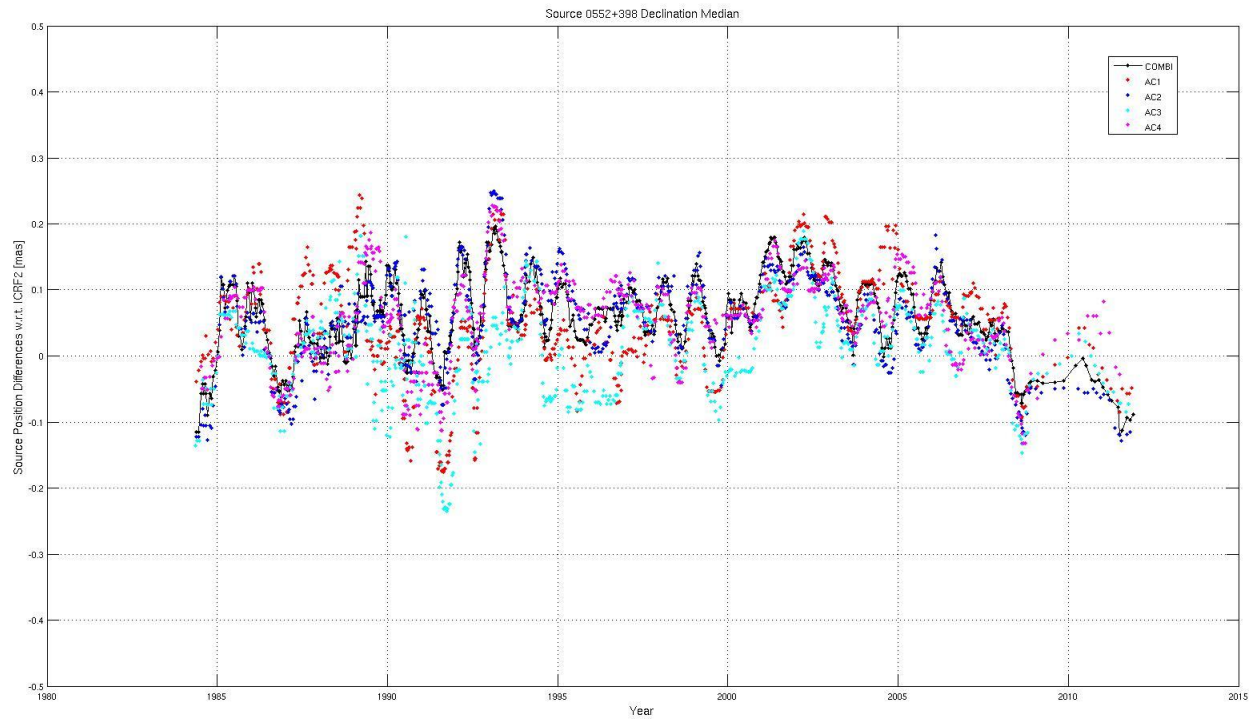


- Right Ascension median (sliding window; window width 70 days, 5 days steps); Source 0552+398 (3648 observations in total); Differences w.r.t. ICRF2.





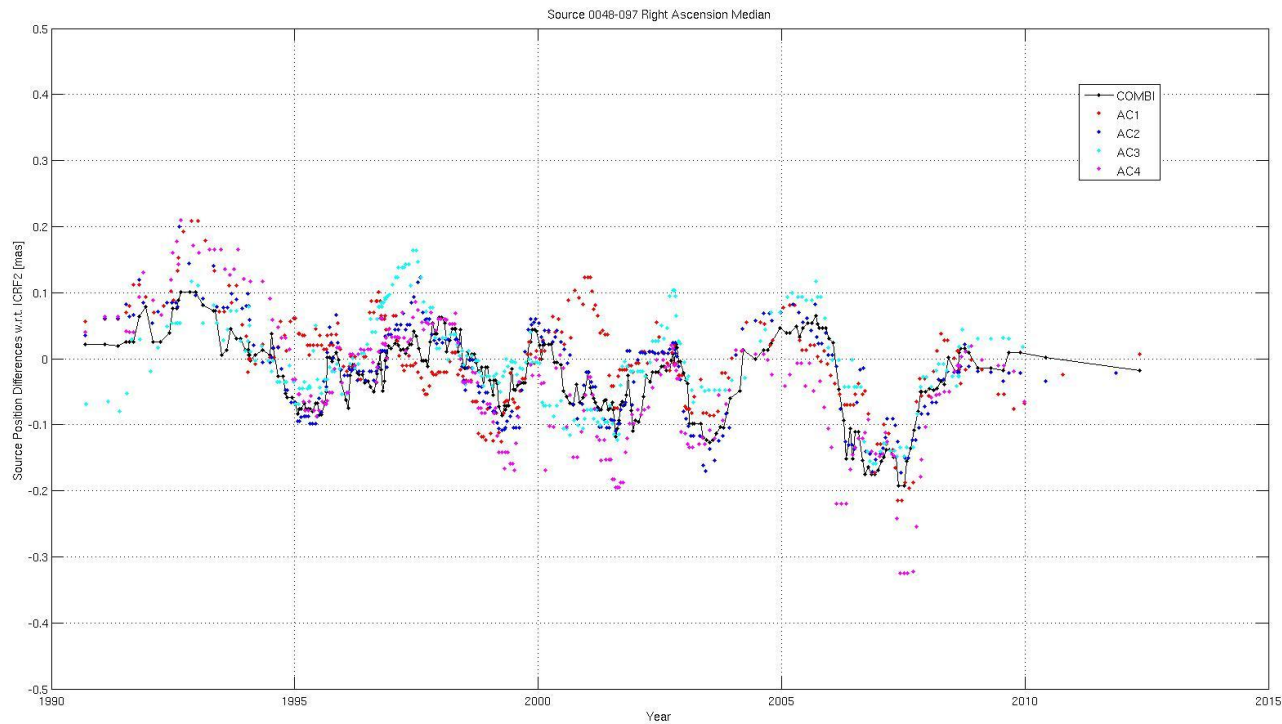
## ■ Declination median of source 0552+398





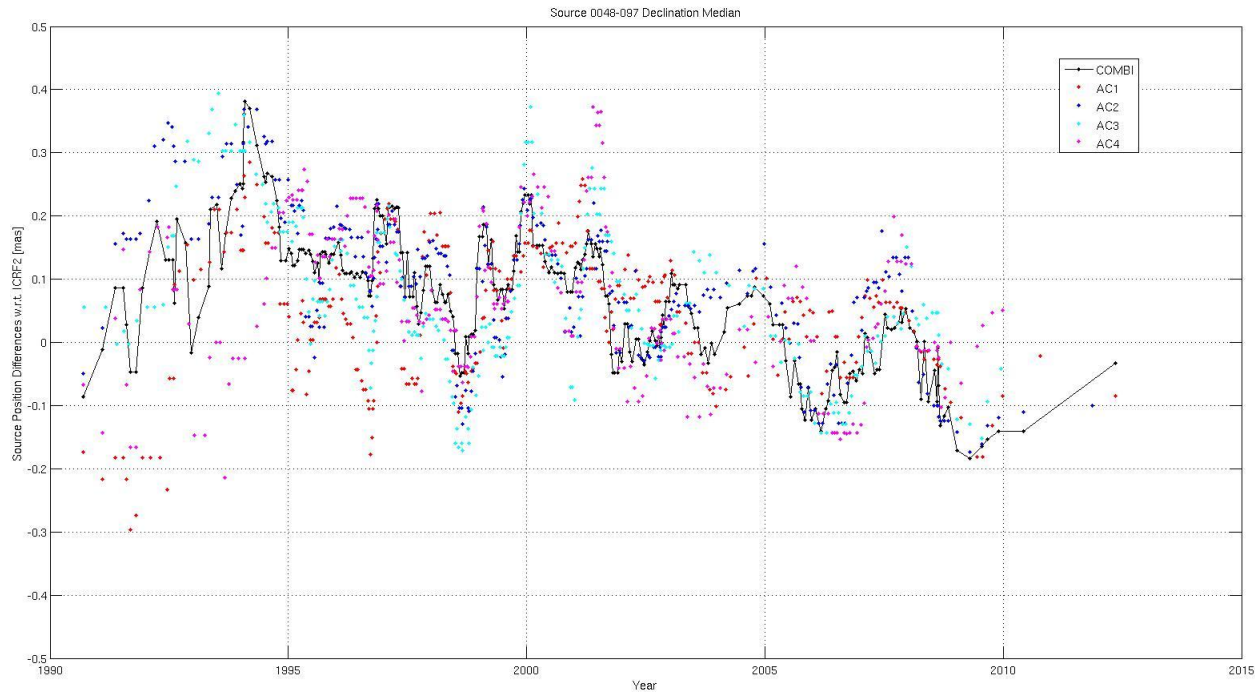


- Right Ascension median (sliding window; window width 70 days, 5 days steps); Source 0048-097 (1589 observations in total); Differences w.r.t. ICRF2.





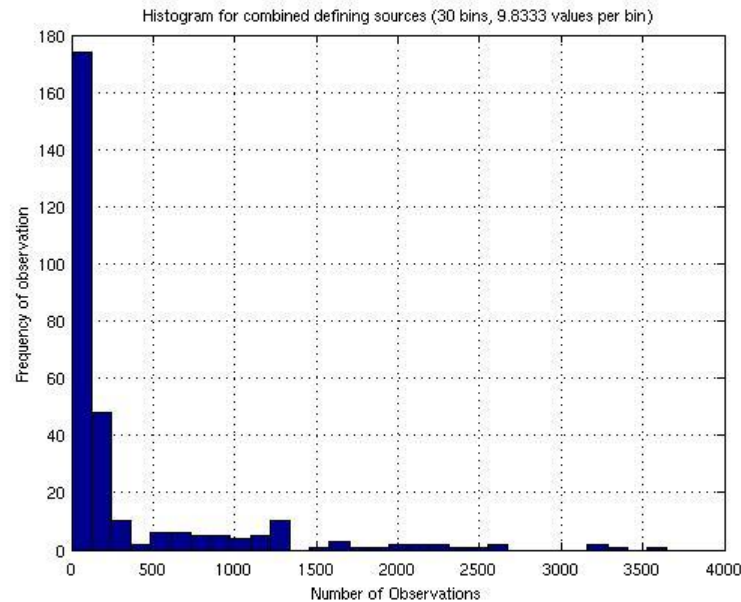
## Declination median of source 0048-097





## Frequency of defining sources

- Number of sources in DB in total: 3422/295 (ICRF2 and other)
- High number of sources with nb. of observations < 10
- Maximum number of observations = 3648 (source 0552+398)





- Increase the number of ACs providing source positions.
- Refine the combination process in order to increase the number of successfully combined sources.
- Increase the number of total sessions within the combination (others than rapid daily sessions).
- Integrate non-ICRF2 sources into a VLBI CRF.



## Future plans:

- Stack normal equations from combined sessions in order to generate a VLBI-CRF.
- Study source stability of all observed sources.
- Investigate source time series with irregularities.
- Detailed comparisons to ICRF2.