Federal Agency for
Cartography and Geodesy

Source positions from VLBI combined solution

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Introduction

- 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

Source positions in VLBI Sessions

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.

Source positions in VLBI Sessions

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?

Combination Process

- **State-of-the-art**:

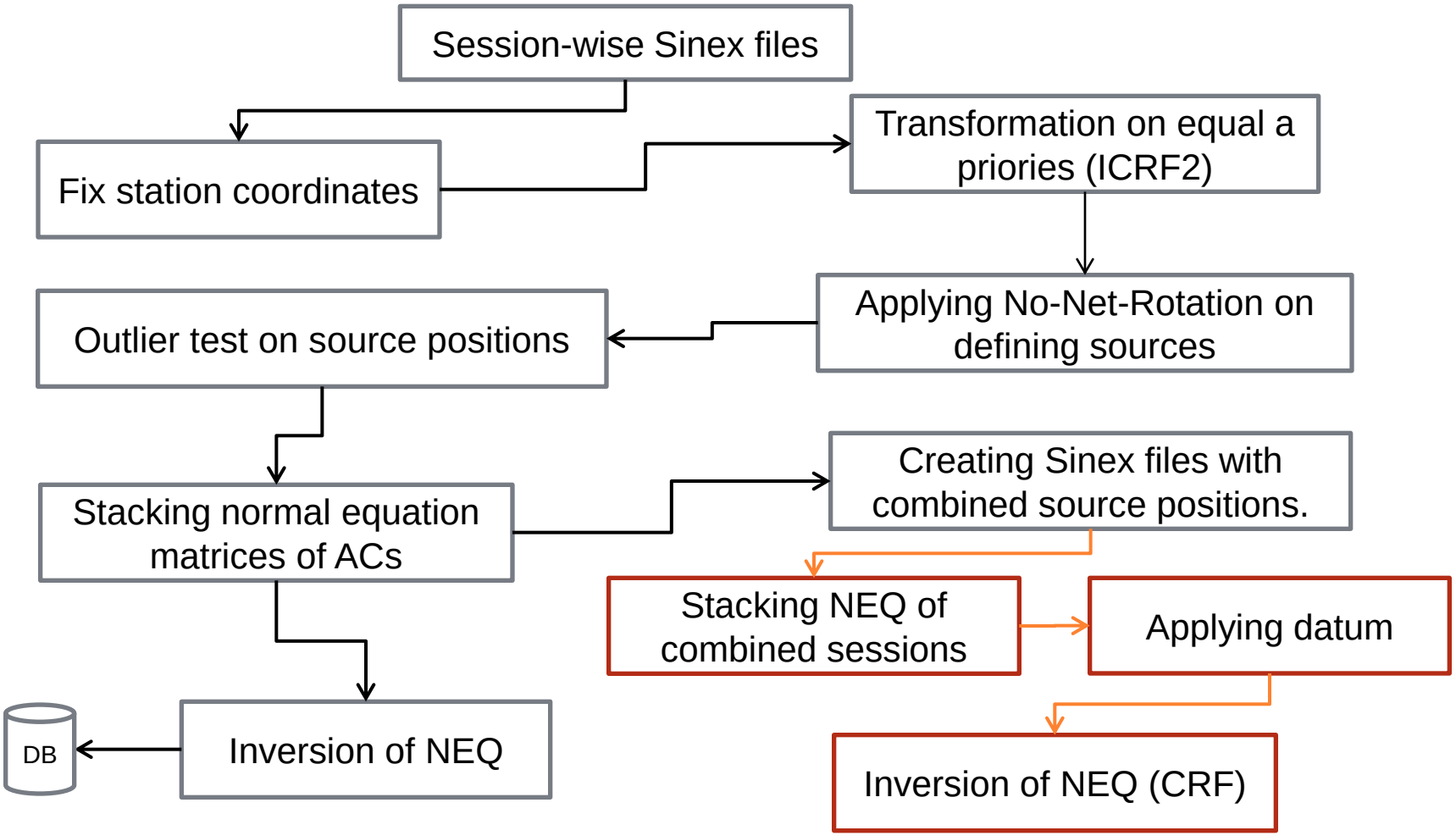
– Software package DOGS_CS (DGFI) + control scripts.
– Basic combination process kept with additions for source parameters.
– Quality control and statistic test – outlier tests, variance component estimation - from operational combination (station positions and EOP).
– Results so far:

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

Sinex files with combined solution for the whole time span.

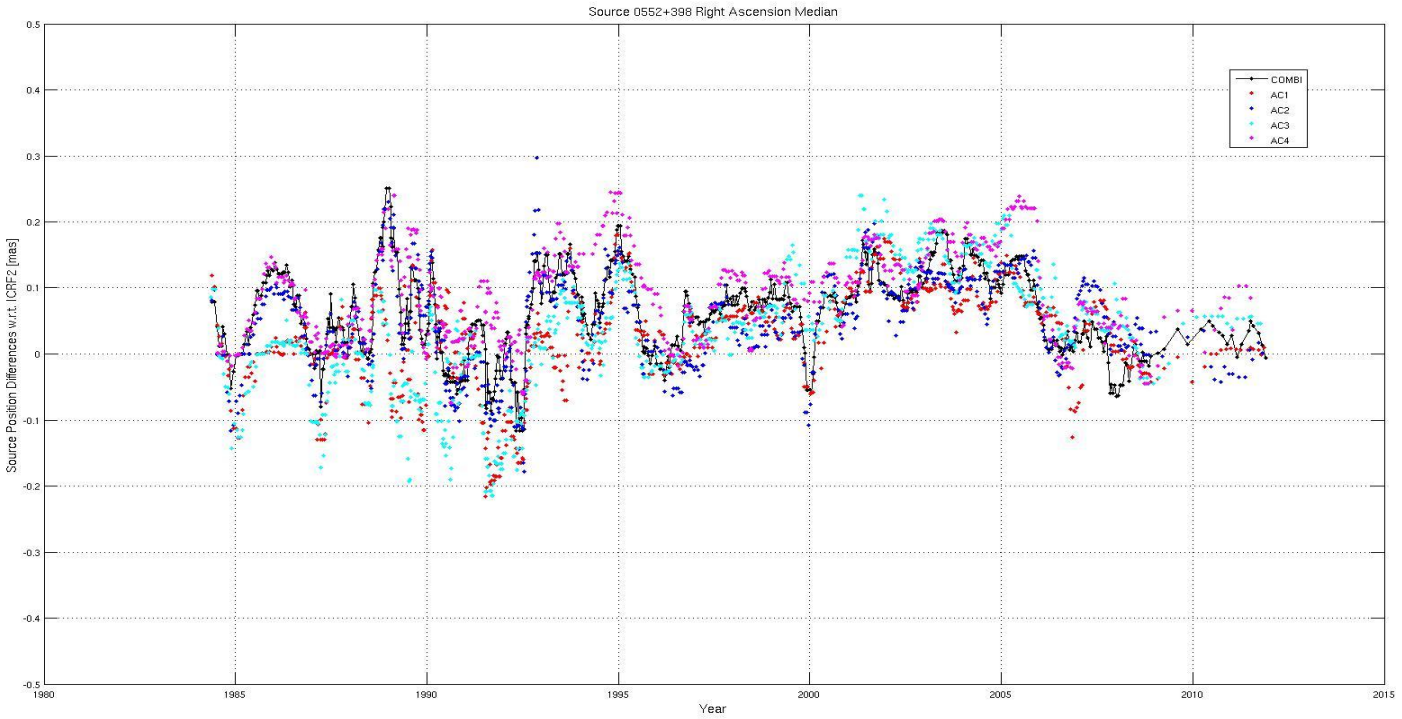
Combination Process

Diagram of the main source combination processes:



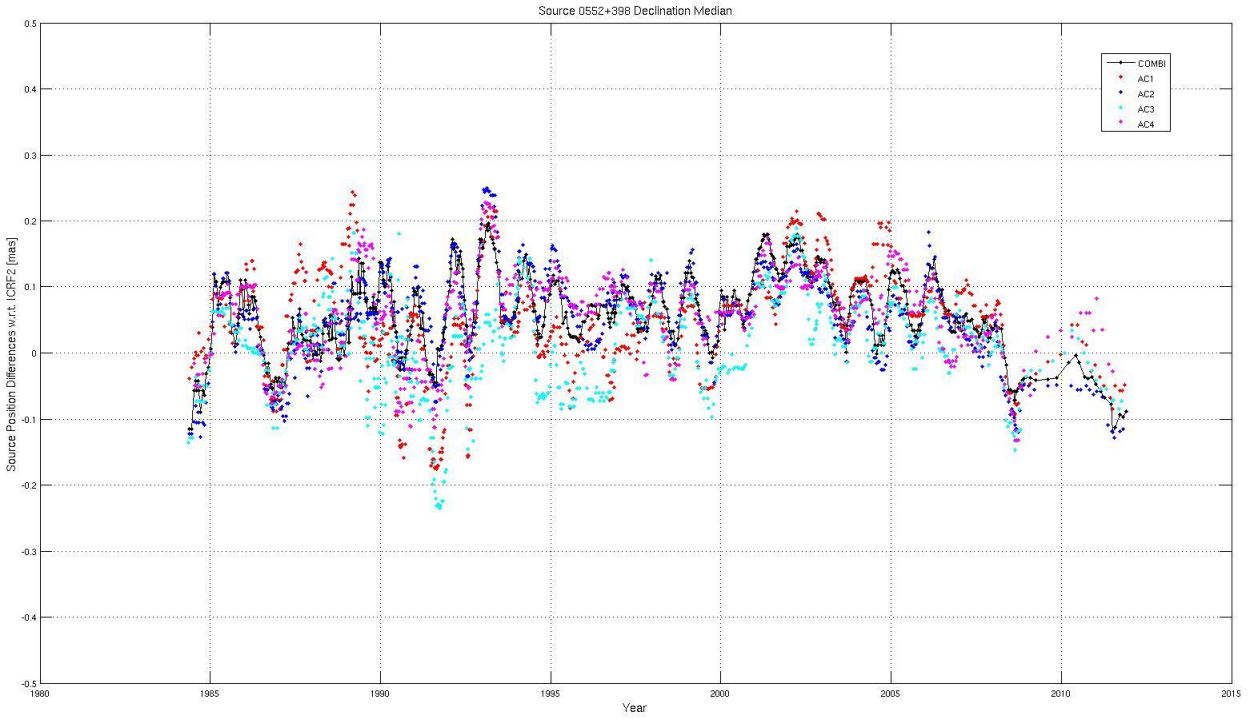
First Results

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



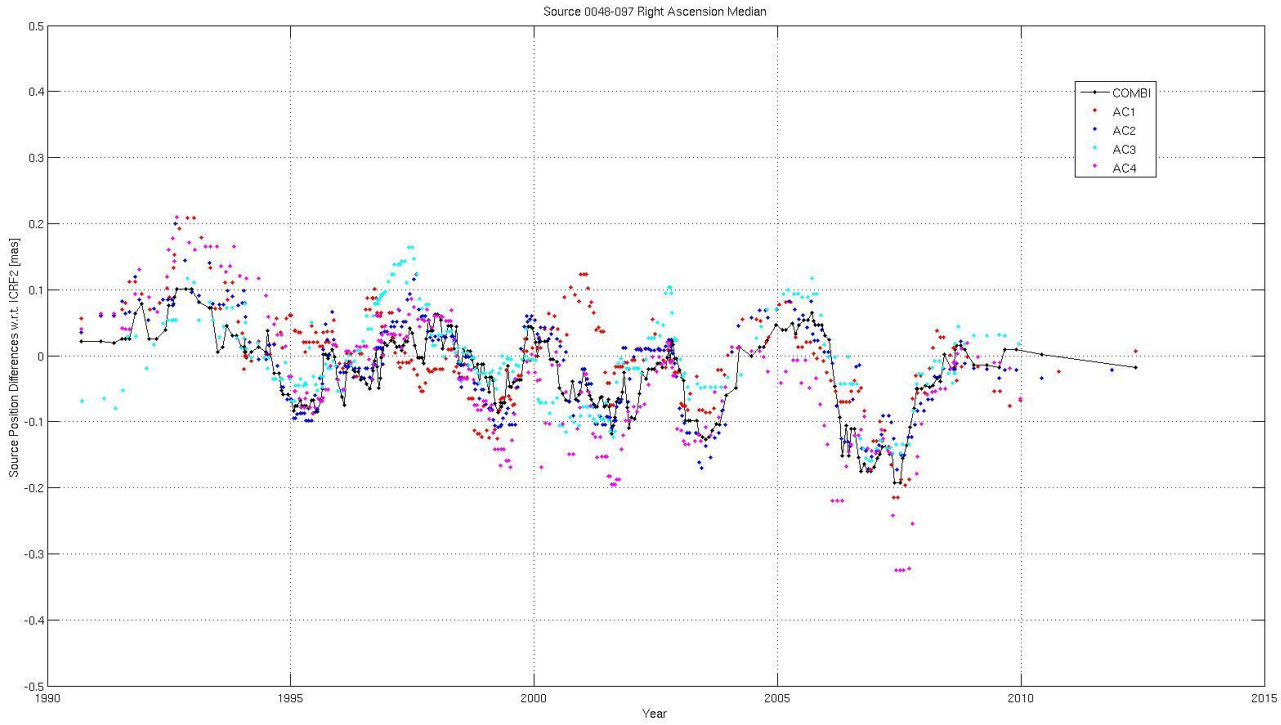
First Results

- Declination median of source 0552+398



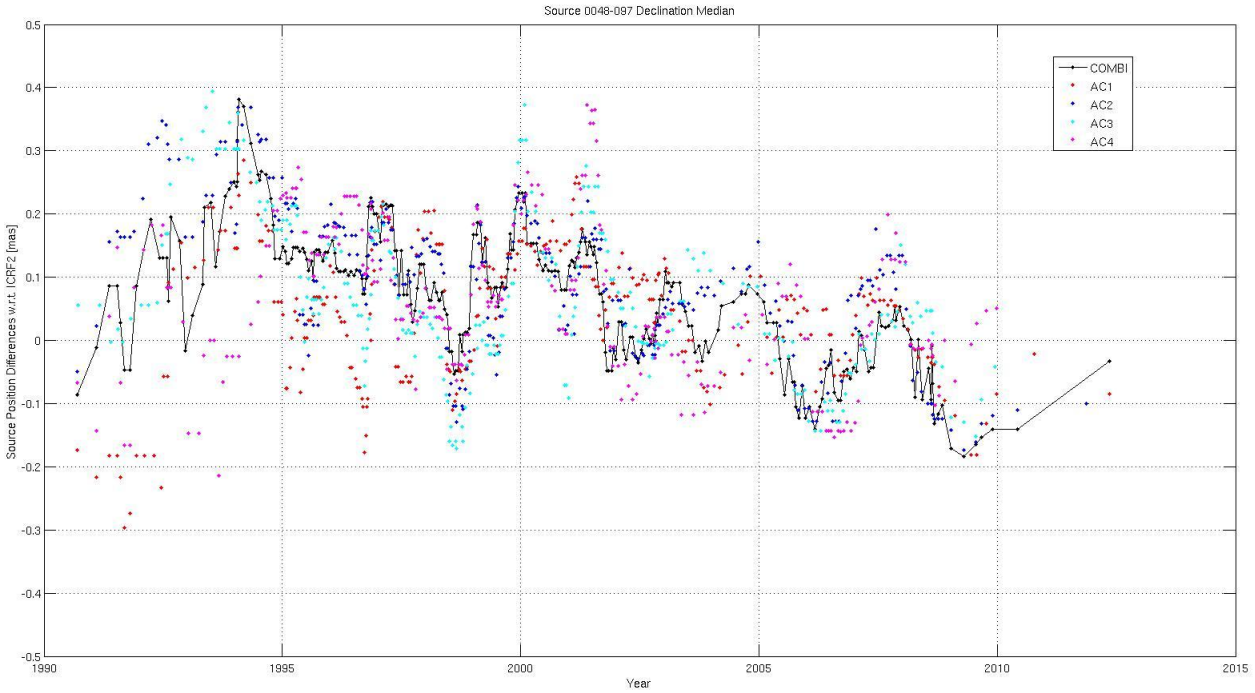
First Results

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



First Results

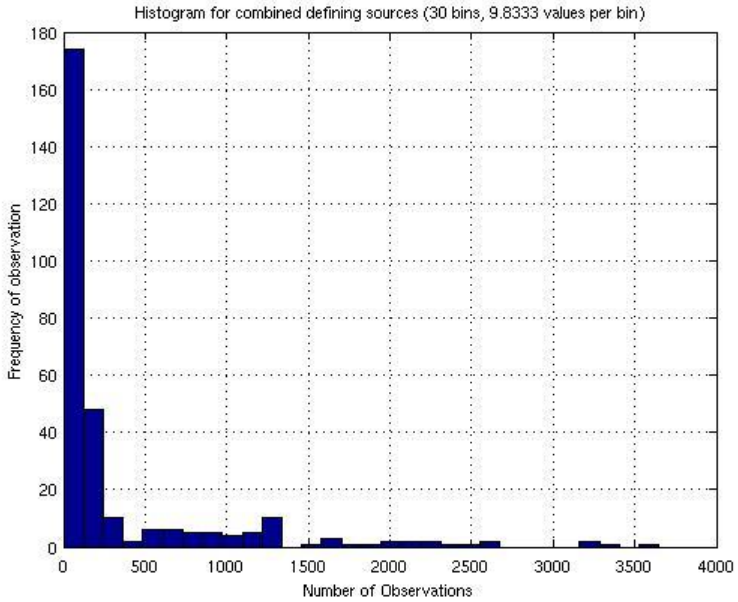
- Declination median of source 0048-097



Defining Sources

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)



Problems to manage

- 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

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.