

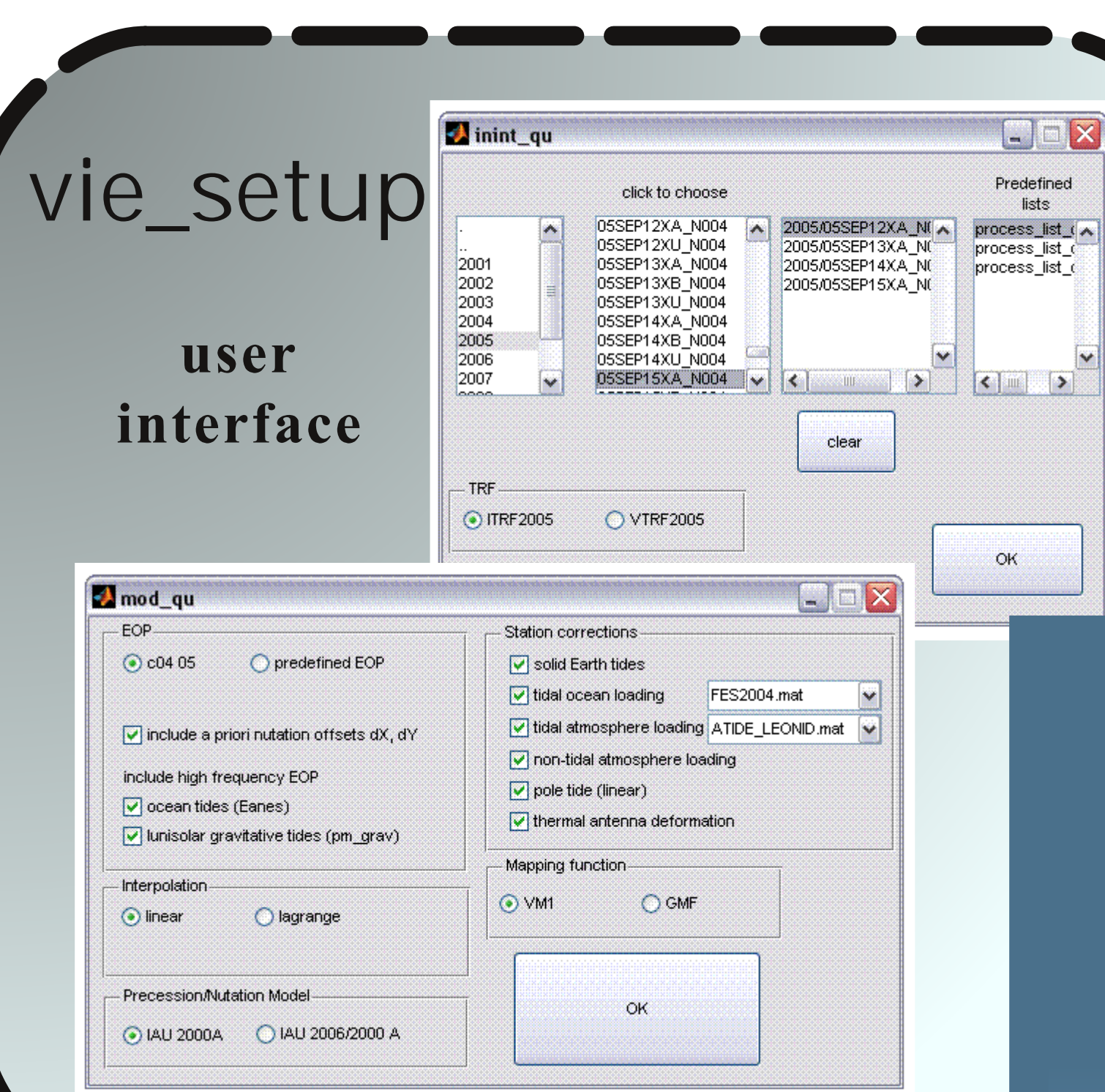
# The new Vienna VLBI Software VieVS

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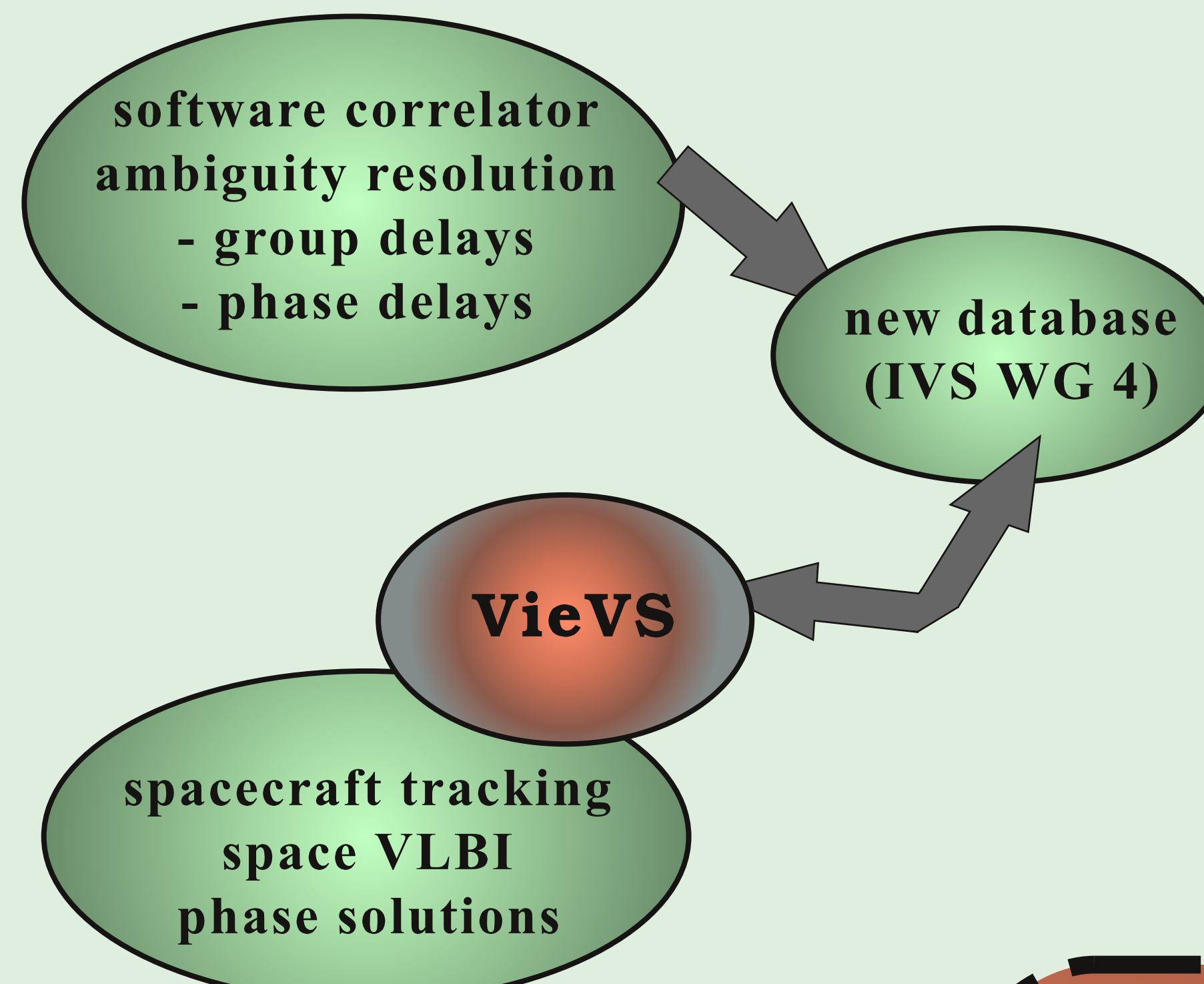
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A new VLBI (Very Long Baseline Interferometry) data analysis software, called Vienna VLBI Software (VieVS), is developed at the Institute of Geodesy and Geophysics in Vienna taking into consideration all present and future VLBI2010 requirements, e.g. phase delay solutions and a significantly denser observation schedule. Instead of updating existing software we carry out a complete re-design to make the software clearly arranged and of modular structure, and to get rid of obsolete features which have accumulated in existing VLBI software packages in the last decades. However, VieVS is not written from scratch, but we guided along the OCCAM VLBI software package which allows detailed comparisons of provisional results obtained with VieVS. The programming language Matlab (and its non-commercial counterpart Octave) is used, which eases considerably

the programming efforts because of many built-in functions and tools. This has tremendously simplified and shortened the source code. Matlab is the high-end programming language used for education at the Vienna University of Technology and at many other institutes worldwide. Thus the new software will attract students and scientists to get interested in VLBI and to contribute to VLBI analysis.



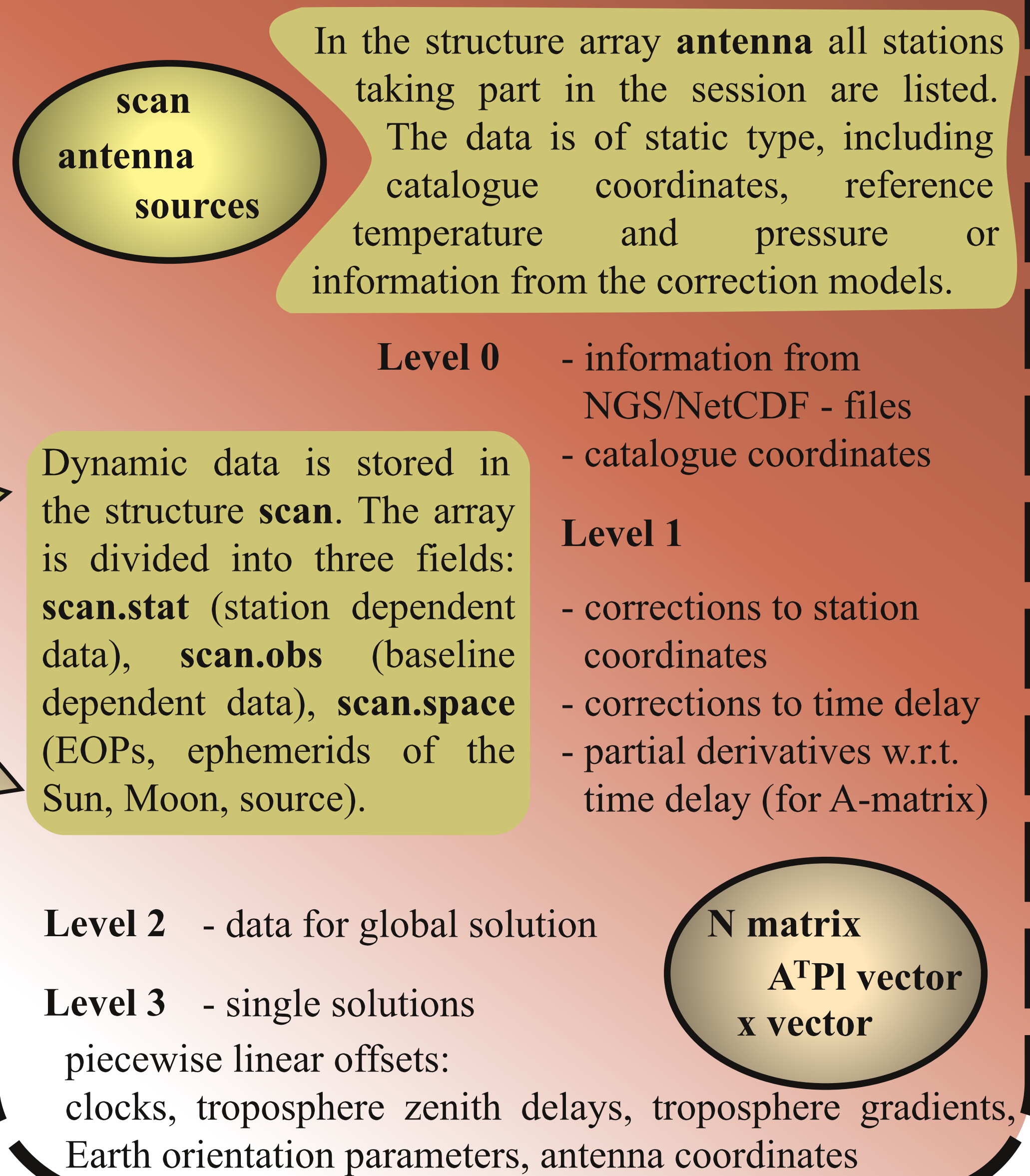
## NICT and IGG Vienna



Together with the National Institute of Information and Communications Technology (NICT, Japan) phase delay solutions will be implemented in VieVS and initial steps will be taken to equip the software with tools for spacecraft tracking and space VLBI. Furthermore, the existing gap will be closed between the correlator output provided by NICT and the Vienna VLBI software. The common efforts will result in a relevant contribution to the new specification of the VLBI data format, which is proposed to be defined as a NetCDF file within Working Group 4 on 'VLBI Data Structure' of the International VLBI Service for Geodesy and Astrometry (IVS).

## VieVS/Data/

data is stored and exchanged between the program units in **structure array** format



## vie\_mod

station coordinates in TRF  
(application of Solid Earth tide, Ocean tidal loading, Atmosphere tidal/non-tidal loading, Pole tide)

$$XYZ_{GCRS} = PN \cdot R(\Theta) \cdot W(xp, yp) \cdot XYZ_{TRS}$$

station coordinates in GCRF

GCRF - Geocentric Celestial Reference Frame  
SSB - Solar System Barycentric

Lorentz transformation

station/baseline in SSB

source, planets position in SSB

$$\tau = \tau_{geometric} + \tau_{gravitational}$$

compute gravitational delay

Lorentz transformation

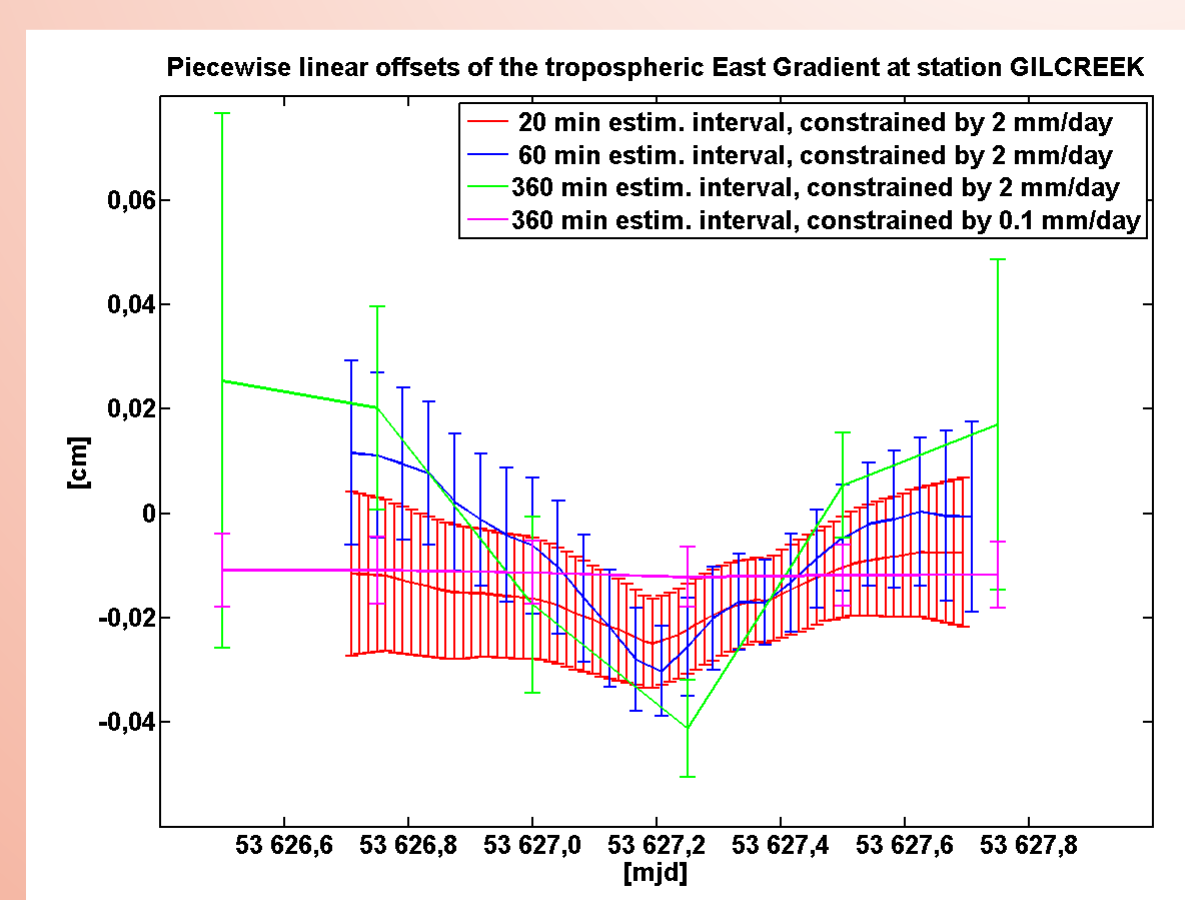
delay in TT-scale

VLBI-delay model according to IERS Conventions 2003

add troposphere delay, thermal deformation, axis offset correction

## Internal structure of VieVS

## vie\_lsm



$$y(t) = a_{n-1} + \frac{a_n - a_{n-1}}{t_n - t_{n-1}} (t - t_{n-1})$$

Example of output:

Estimates of troposphere east gradient at station GILCREEK on 13 September 2005 with various estimation intervals and constraints.

## References

- IERS Conventions (2003). Dennis D., McCarthy and Gérard Petit. (IERS Technical Note; 32) Frankfurt am Main: Verlag des Bundesamts für Kartographie und Geodäsie. 2004. paperback. ISBN 3-89888-884-3 (print version).
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- Teke K., Boehm J., Spicakova H., Pany A., Plank L., Tanir E., Schuh H.; Piecewise Linear Offsets for VLBI Parameter Estimation. Proceedings of the 19th European VLBI for Geodesy and Astrometry Working Meeting, 23-28 March 2009, Bordeaux, France. In press.