TECHNISCHE UNIVERSITÄT WIEN
Vienna University of Technology

RESEARCH GROUP ADVANCED GEODESY
Institute of Geodesy and Geophysics

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Session 3: VLBI Data Structure, Analysis Strategies and Software

Comparison Campaign of VLBI Data Analysis Software – First Results

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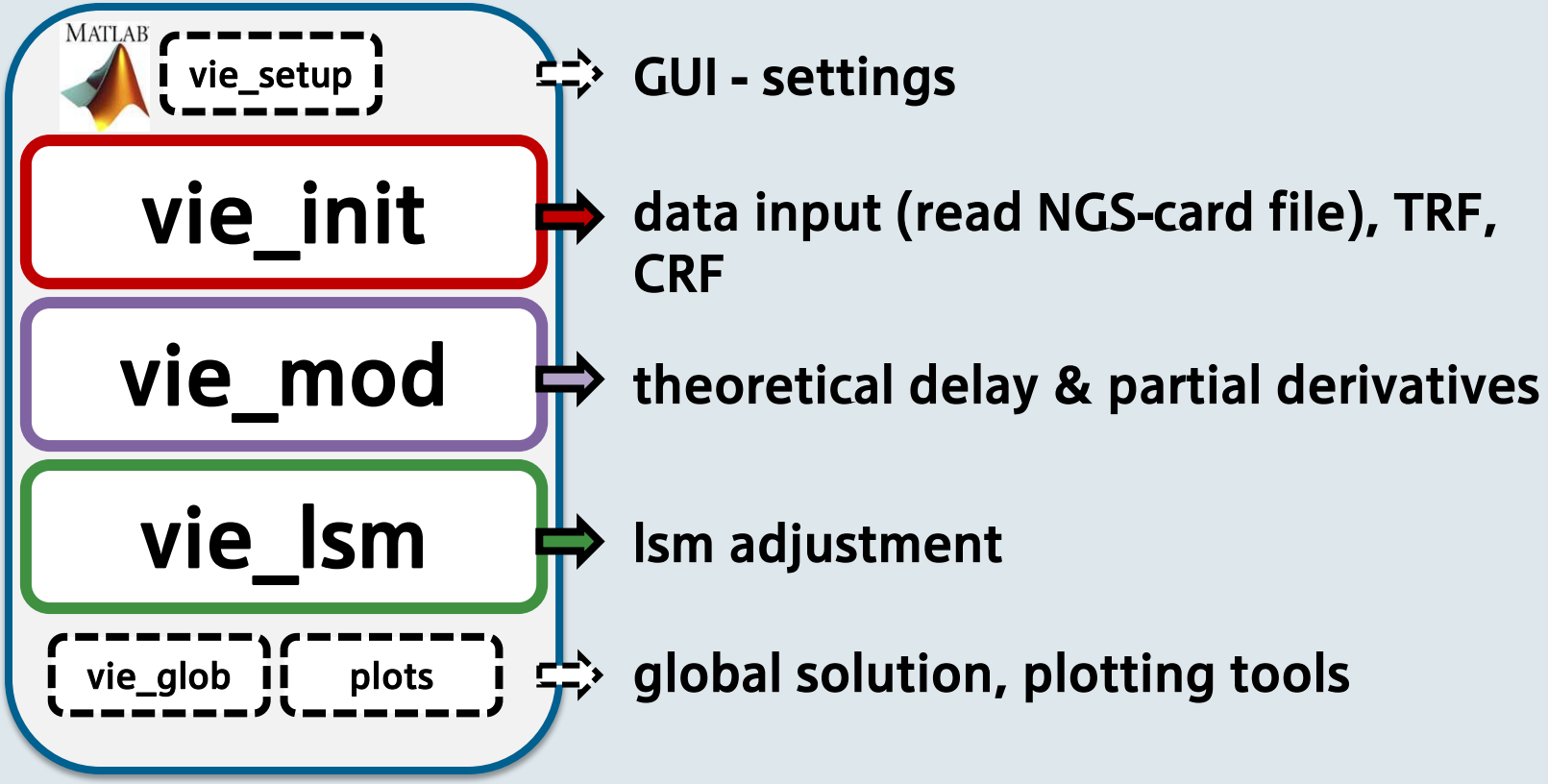
Vienna VLBI Software – VieVS

- Developing new VLBI Software VieVS
- verify (intermediate) results by comparison with Occam 6.1



Motivation

- Responsible for vie_mod
- Different strategies of calculating the theoretical "model" delay
- Difficulties when comparing VieVS and Occam 6.1 with standard observations

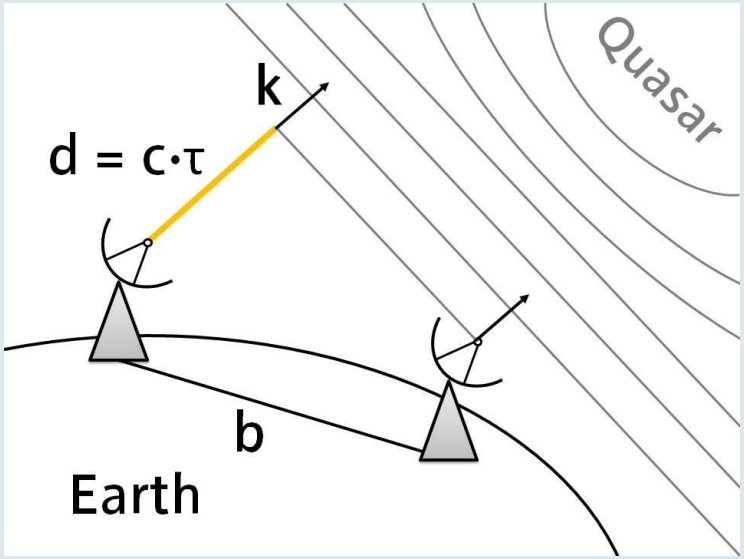
  → idea of fictitious observations
- Interest by the IVS Analysis Coordinator (A. Nothnagel) to start a (global) campaign

  → DeDeCC – delay and partial derivatives comparison campaign

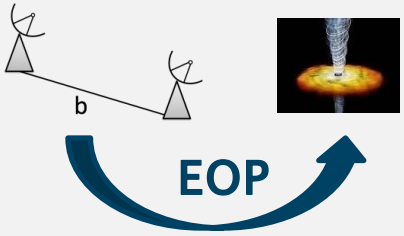
… goal is to compare different VLBI analysis software packages on the basis of the computed delay and its partial derivatives, in order to detect present inadequatenesses in the modelling part.

computed delay τ

$$\tau = -\frac{\vec{b} \cdot \vec{k}}{c}$$



computed delay



+ gravitational delay
+ relativistic corr.

e.g. consensus model [Eubanks, 1991]

observed delay

- from NGS-card file, corrected for ionosphere

O-C

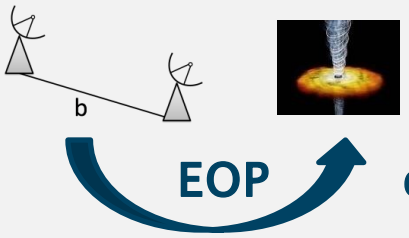
adjustment (lsm)

computed delay τ - models

+ **EOP** (oceanic & gravitational high frequency terms, nutation corrections)
+ **solid Earth tides**
+ **troposphere delay** (VMF / GMF / NMF)
+ **ocean loading** (FES2004 / EOT08a / GOT00 / AG06)
+ **thermal antenna deformation**
+ **axis offset**

(+ atmosphere loading)

computed delay



+ gravitational delay
+ relativistic corr.

e.g. consensus model [Eubanks, 1991]

observed delay

- from NGS-card file, corrected for ionosphere

O-C

adjustment (lsm)

campaign setup

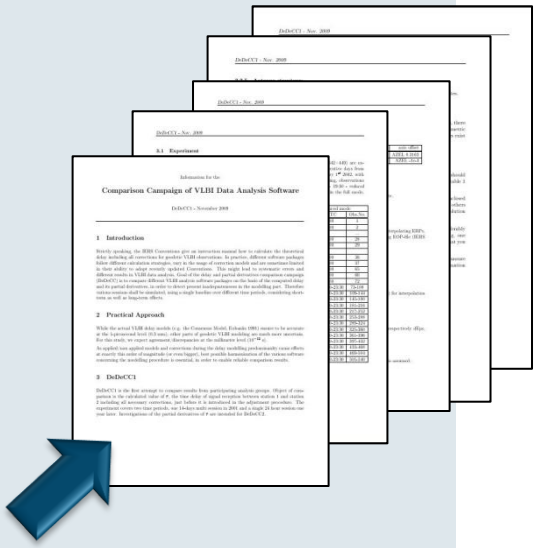
- 1 baseline (Westford – Wettzell)
- 1 source
- various sessions (e.g. 14 days @ 30 min)

  → "self-made" NGS files

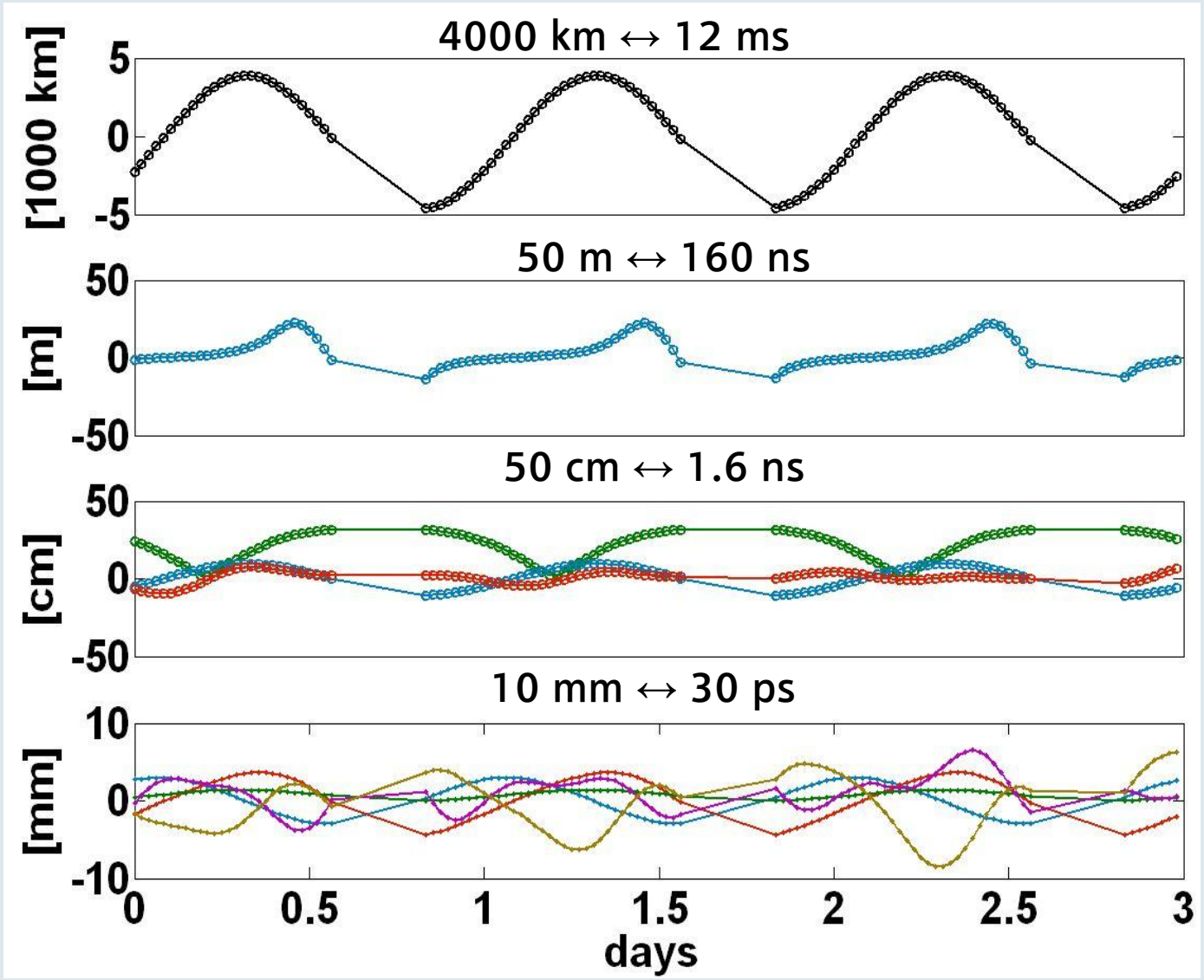
INPUT PARAMETERS:

- constant EOP
- constant air pressure & temperature
- no atmosphere loading

find details in the
information note for the Comparison Campaign
http://mars.hg.tuwien.ac.at/~vievs/



contribution to the delay



total

troposphere

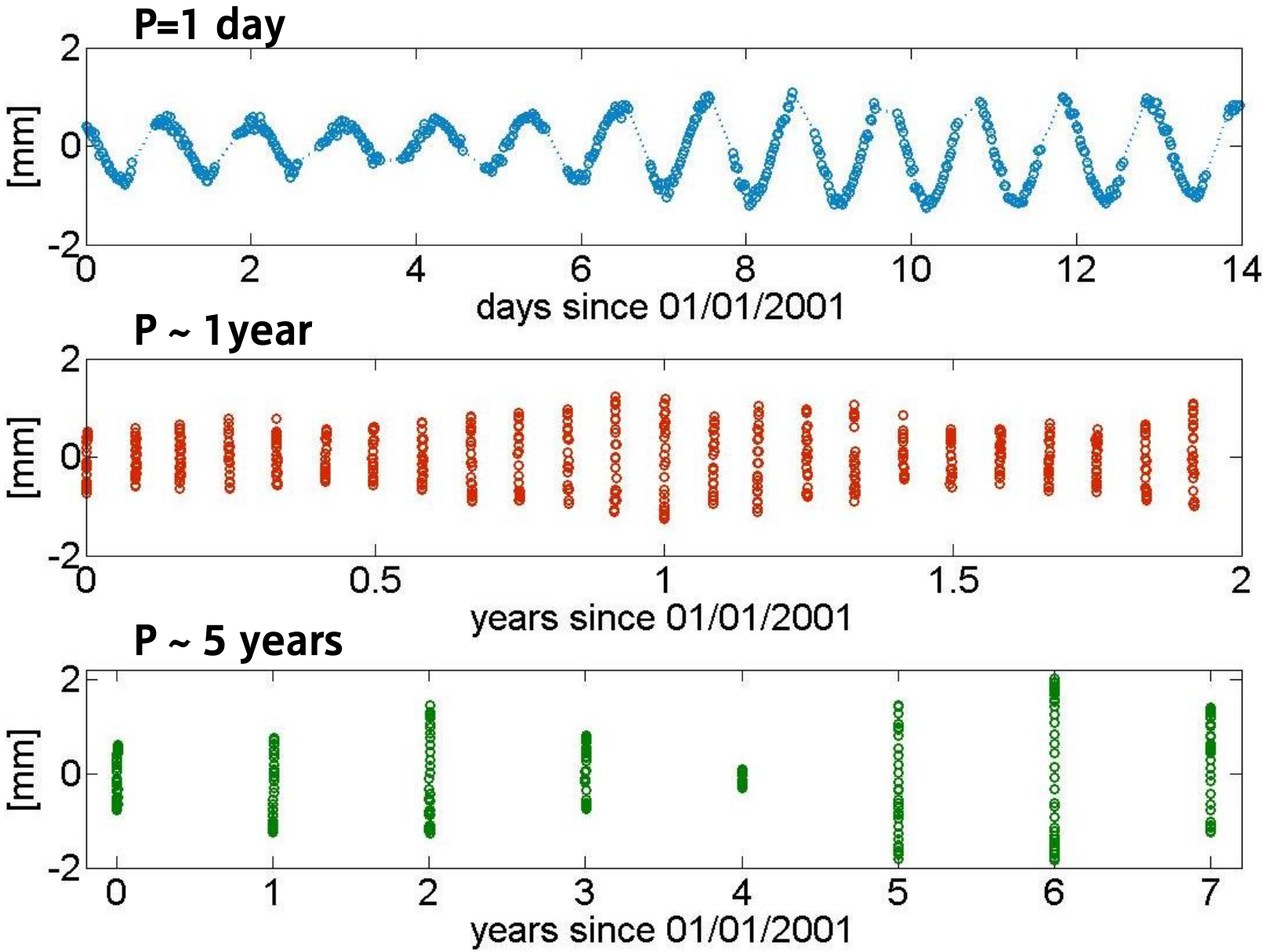
axis offset
grav_sun
solid Earth tides

ICRF2, grav_earth, thermal corr., ocean tides (Eanes), tidal ocean loading

Comparison

VieVS vs. Occam 6.1

VieVS – Occam 6.1 @ different time periods



14 days daily

2 years monthly

7 years yearly

sources of discrepancies

1 to 1 comparison of models (max. deviation):

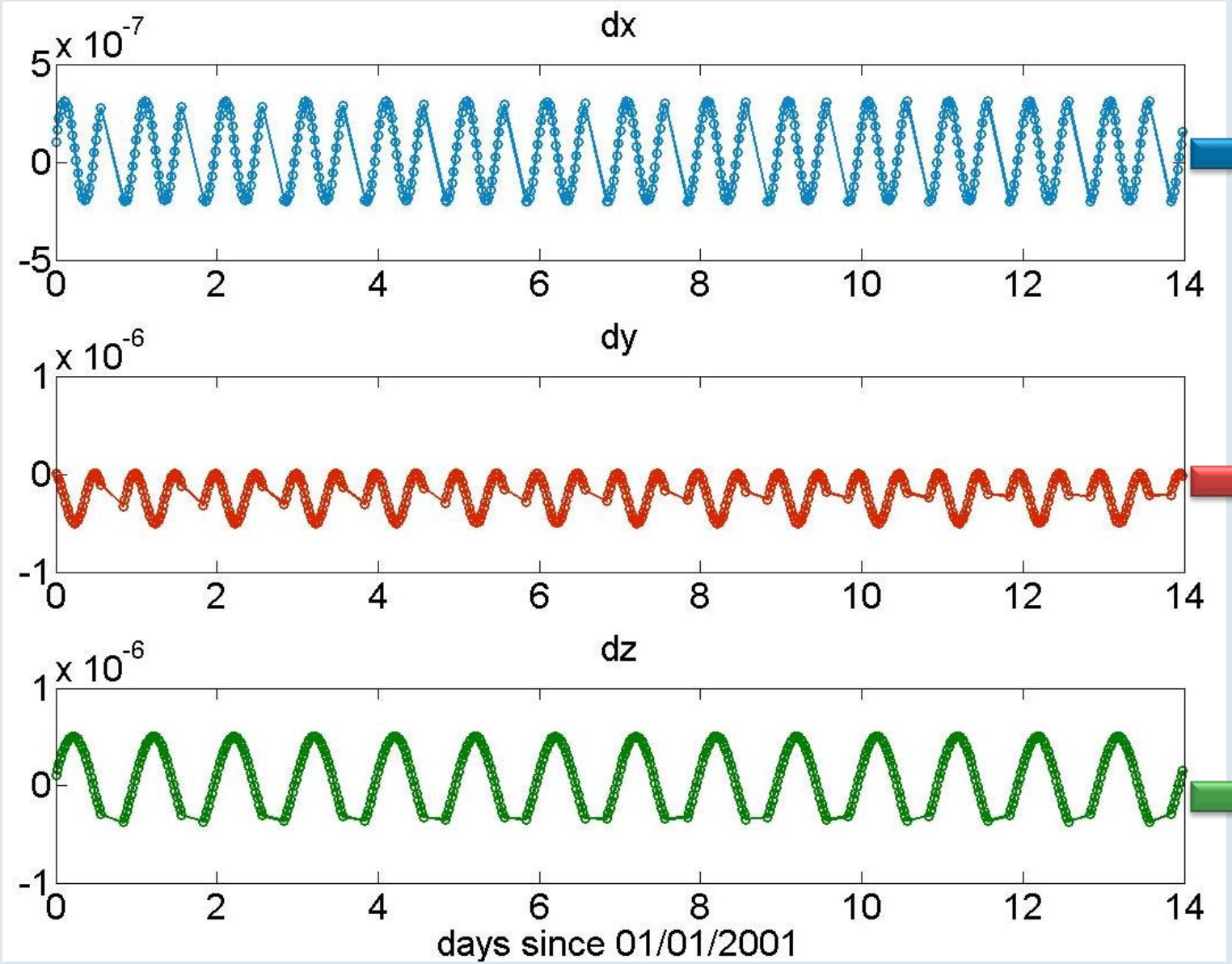
solid Earth tides	40 µm
ocean loading	60 µm
troposphere	8 µm
pole tide	40 nm
thermal correction	2 nm
axis offset	3 nm

disagreement
< 75 µm
0.3 ps

remaining reasons:

- different calculation systems (BCRS vs. "mean system")
- diverse calculation of the Earth rotation angle
- UTC / TT time in Occam 6.1

partial derivatives dτ/d(xyz)



semi-diurnal

semi-diurnal

diurnal

first results

- With the help of DeDeCC, two small **bugs** in VieVS could be detected and **removed**.
- Concerning the absolute value of the delay, **VieVS and Occam 6.1 agree at the 1-2 mm level**.
- **Check-up** of various **separate models** in VieVS (disagreement **< 0.075 mm**).
- Remaining discrepancies presumably due to **diverse modelling of the Earth rotation**.
- **Main period of** discrepancies is **1 day**. Additional signal at **0.5 days** for partial derivatives w.r.t. xp, yp and at **longer periods (1y, several years)**.

partners

- DGFI Munich, R. Heinkelmann (Occam)

  poster:

  OCCAM-LSM for Linux: New Developments at DGFI

- NICT Japan, T. Hobiger (c5++)

  poster:

  c5++ Multi-technique Analysis Software for Next Generation Geodetic Instruments

more partners

- DGFI Munich, R. Heinkelmann
- NICT Japan, T. Hobiger
- ?
- CALC ???

interested? ➡ please contact me!

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THE END

Thank You for listening!

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http://mars.hg.tuwien.ac.at/~vievs/