Bestimmung von Erdorientierungsparametern basierend auf VLBI-Daten mithilfe eines Kalman-Filters

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VLBI-ART: VLBI analysis in real time

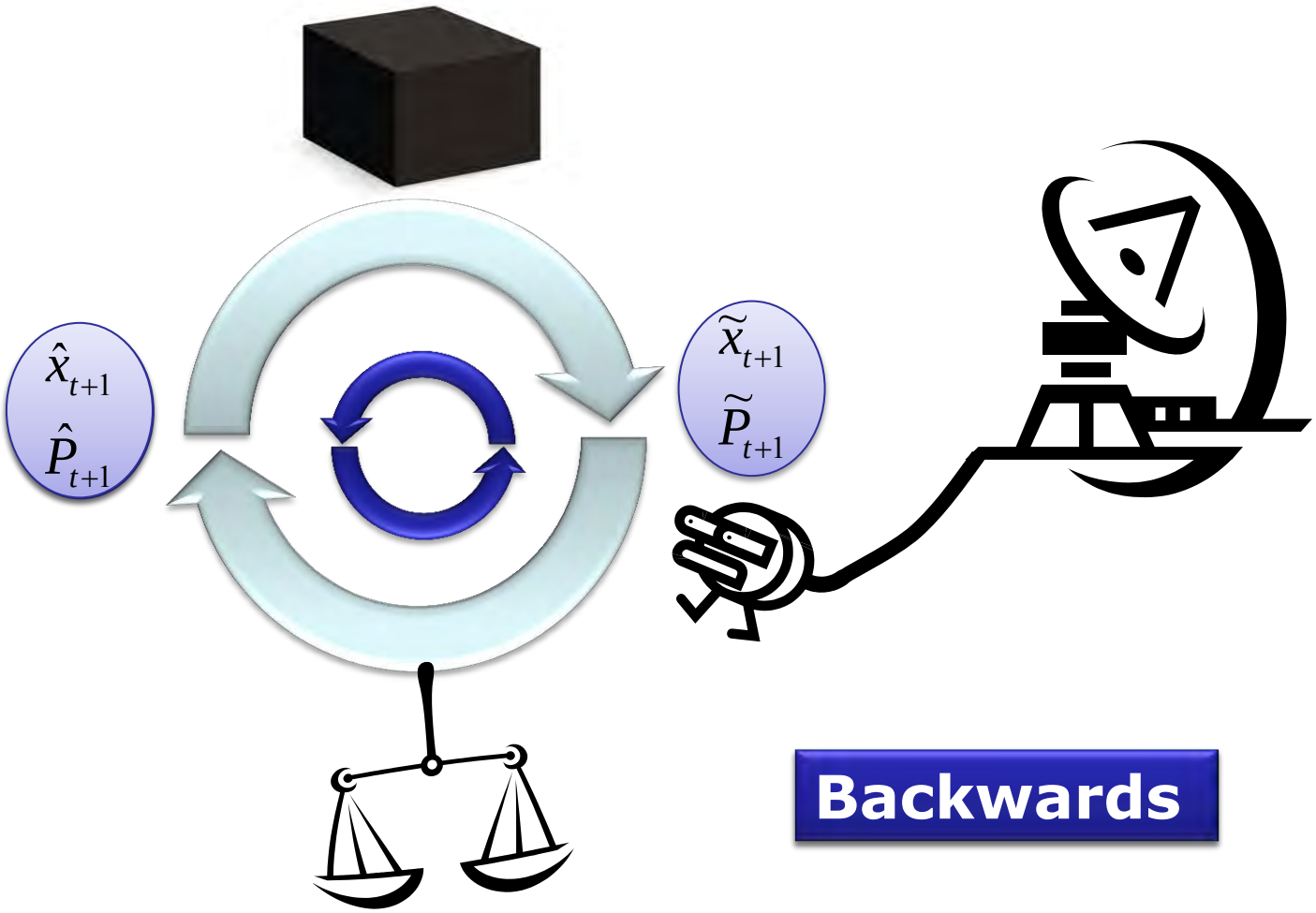
- PI: Tobias Nilsson
- Since ~2 years at GFZ
- Funded by the Austrian Science Fund

- **Aims:**
  - Getting reliable results within "near real-time"
  - Fully autonomous and automated

- **Why?**
  - Many applications need precise near real-time parameter, i.e. precise positioning and navigation, orbit determination, meteorological parameters, etc.
  - VGOS: continues data stream, LSM no longer suitable

- **How?**
  - Implementation of a Kalman filter in the VLBI analysis software VieVS

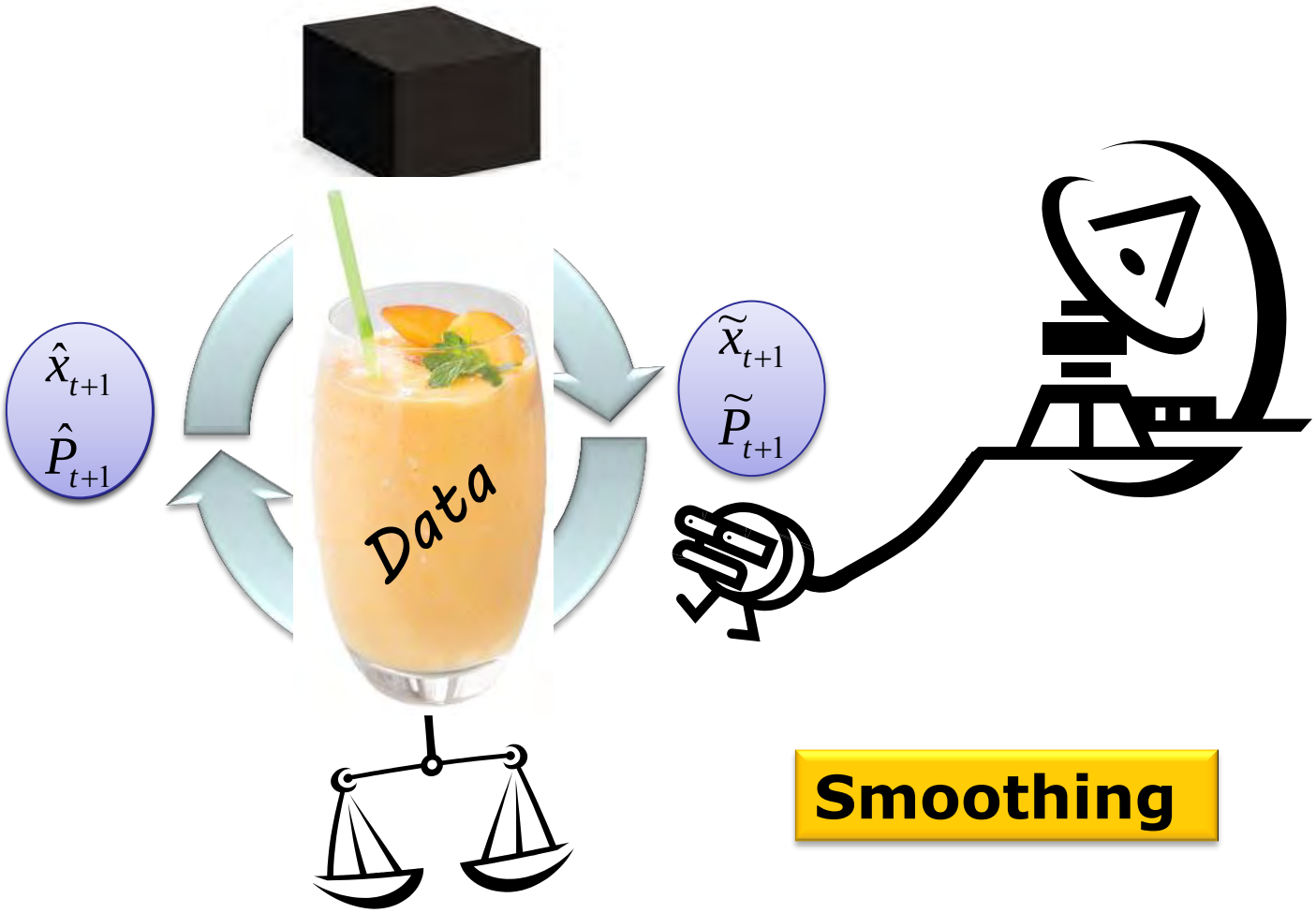
Basics of the Kalman filter



~..a priori
^..a posteriori

Backwards

Basics of the Kalman filter



~..a priori
^..a posteriori

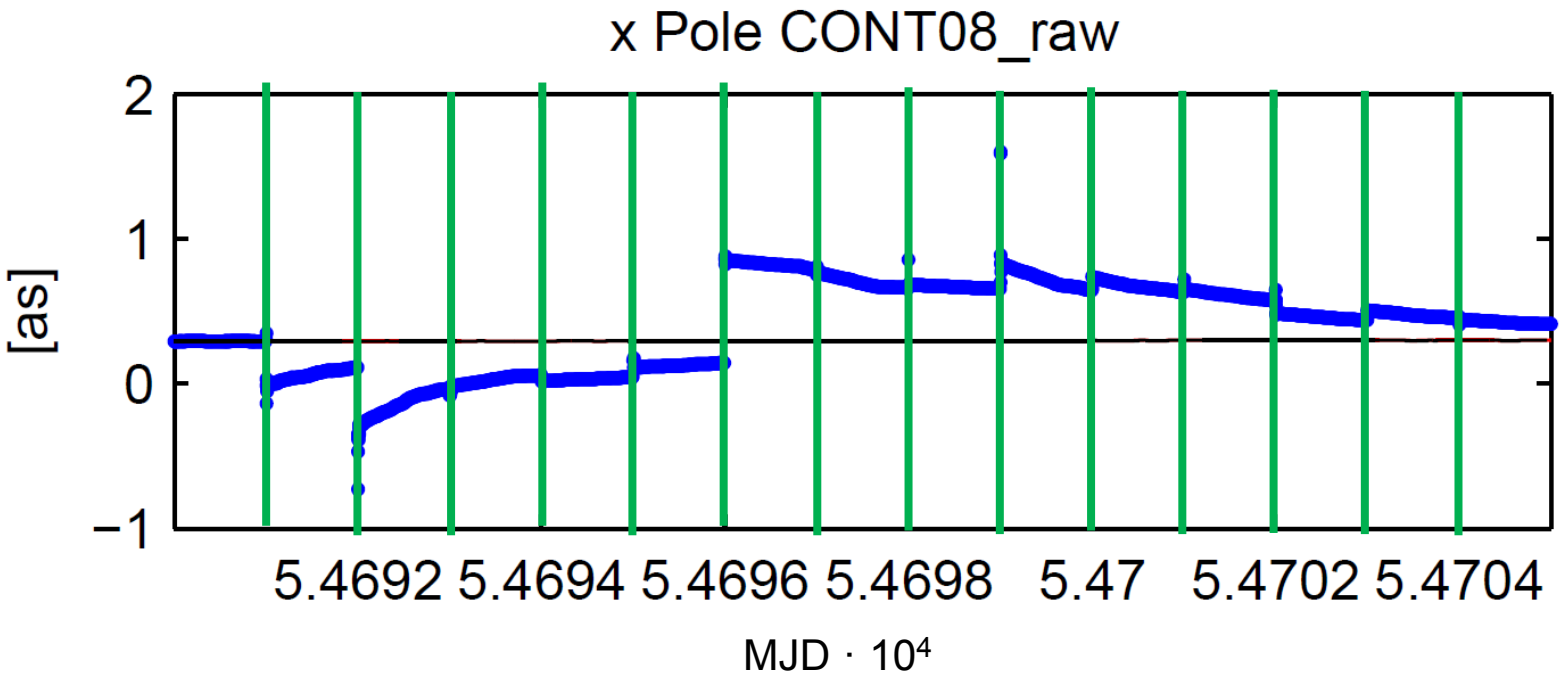
Smoothing

Demonstration data set

- CONT08
  - 12.-26.08.2008
  - 11 stations
  - 15 sessions á 24 hours
  - Combined to **ONE** big session

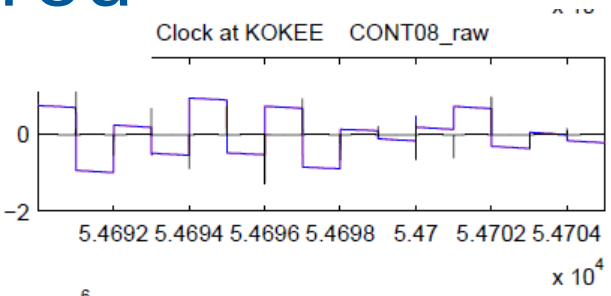
- ERP from GPS
  - Hourly
  - Used for validation

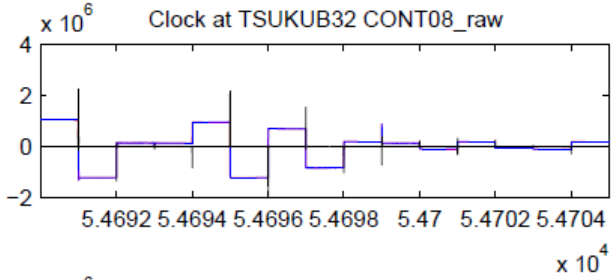
CONT08 gets filtered

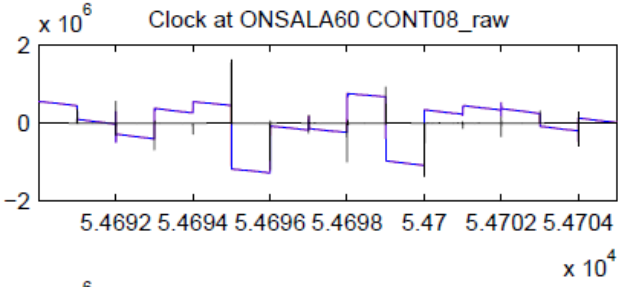


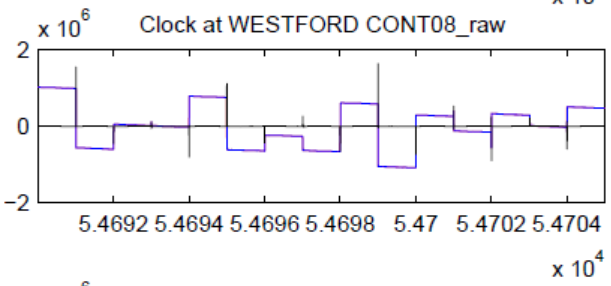
➡ “day breaks” ➡ Look like clock breaks

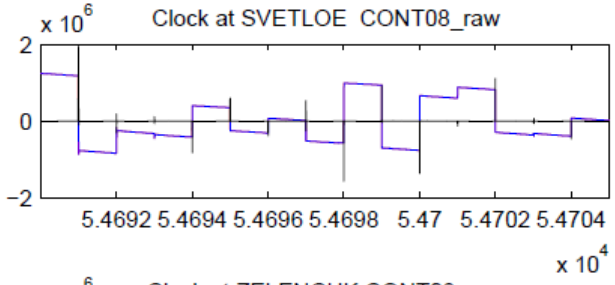
CONT08 gets filtered

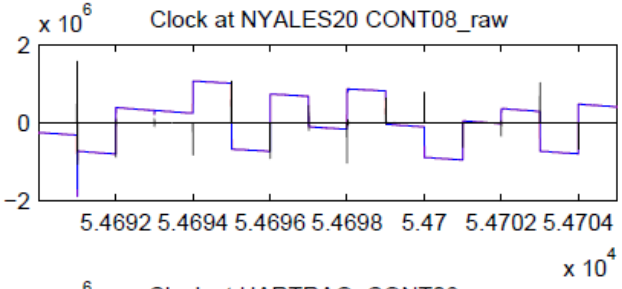


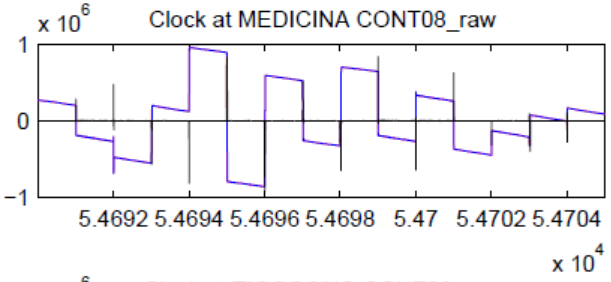


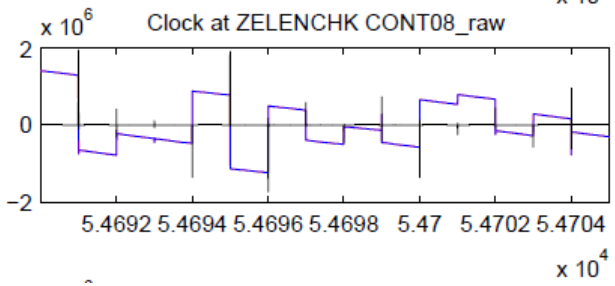


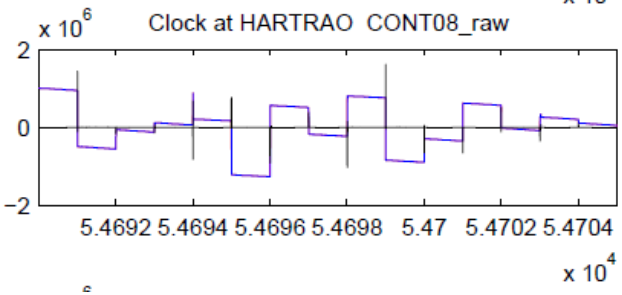


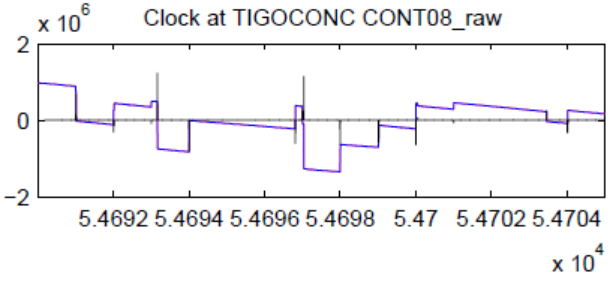










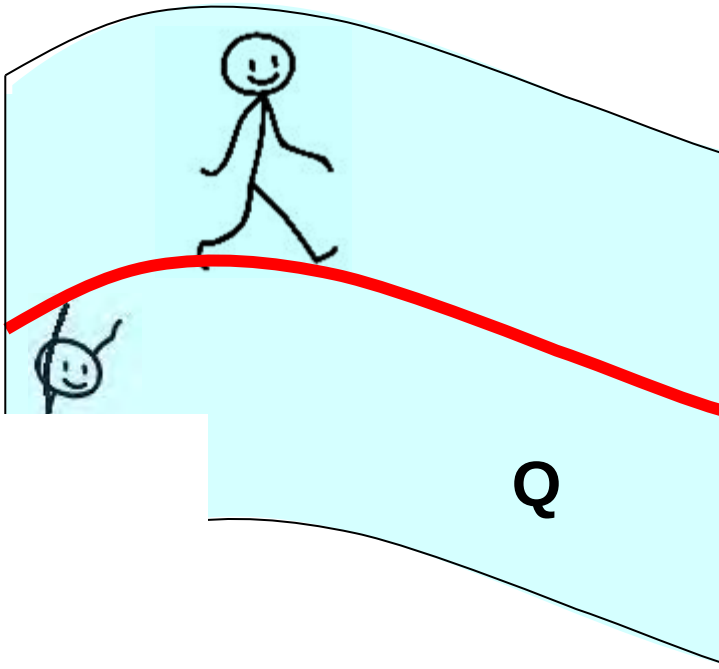


What to do??

process noise
covariance matrix

Q

What to do?

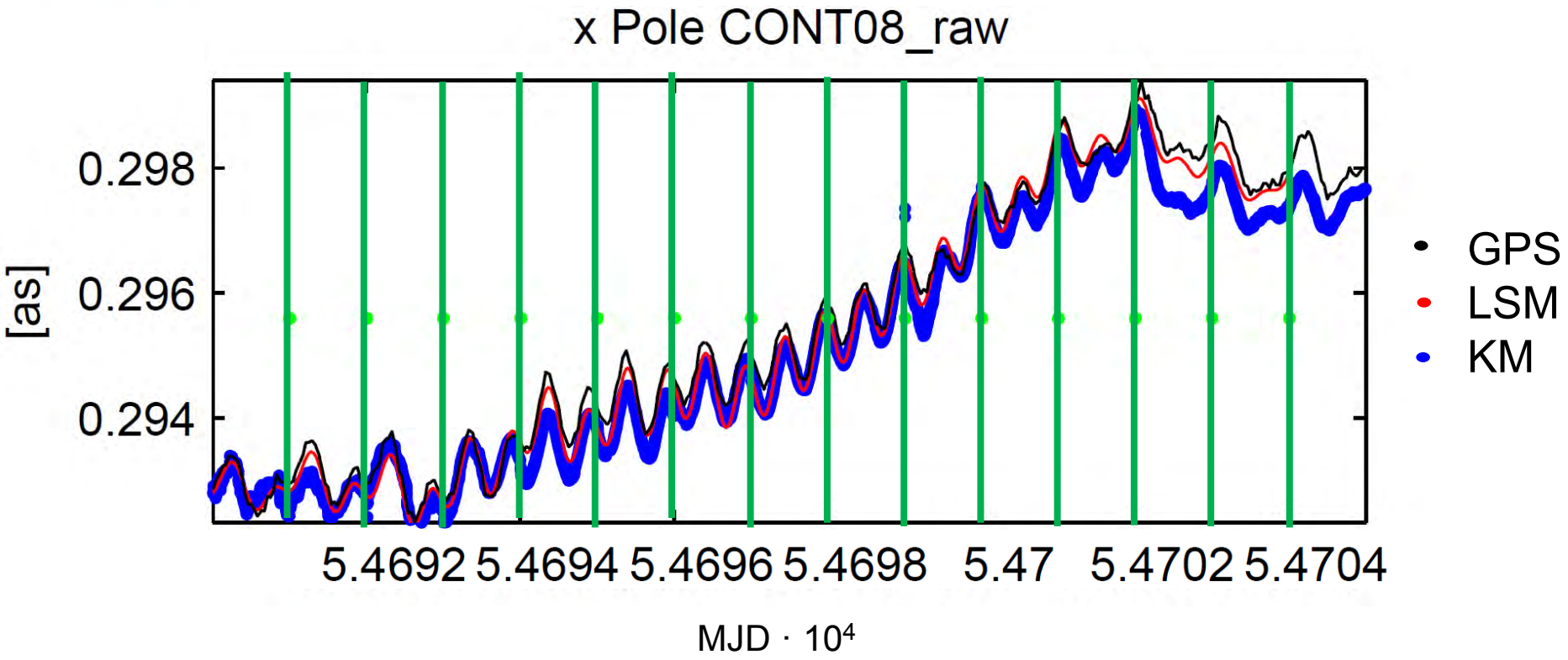


x_{t0}

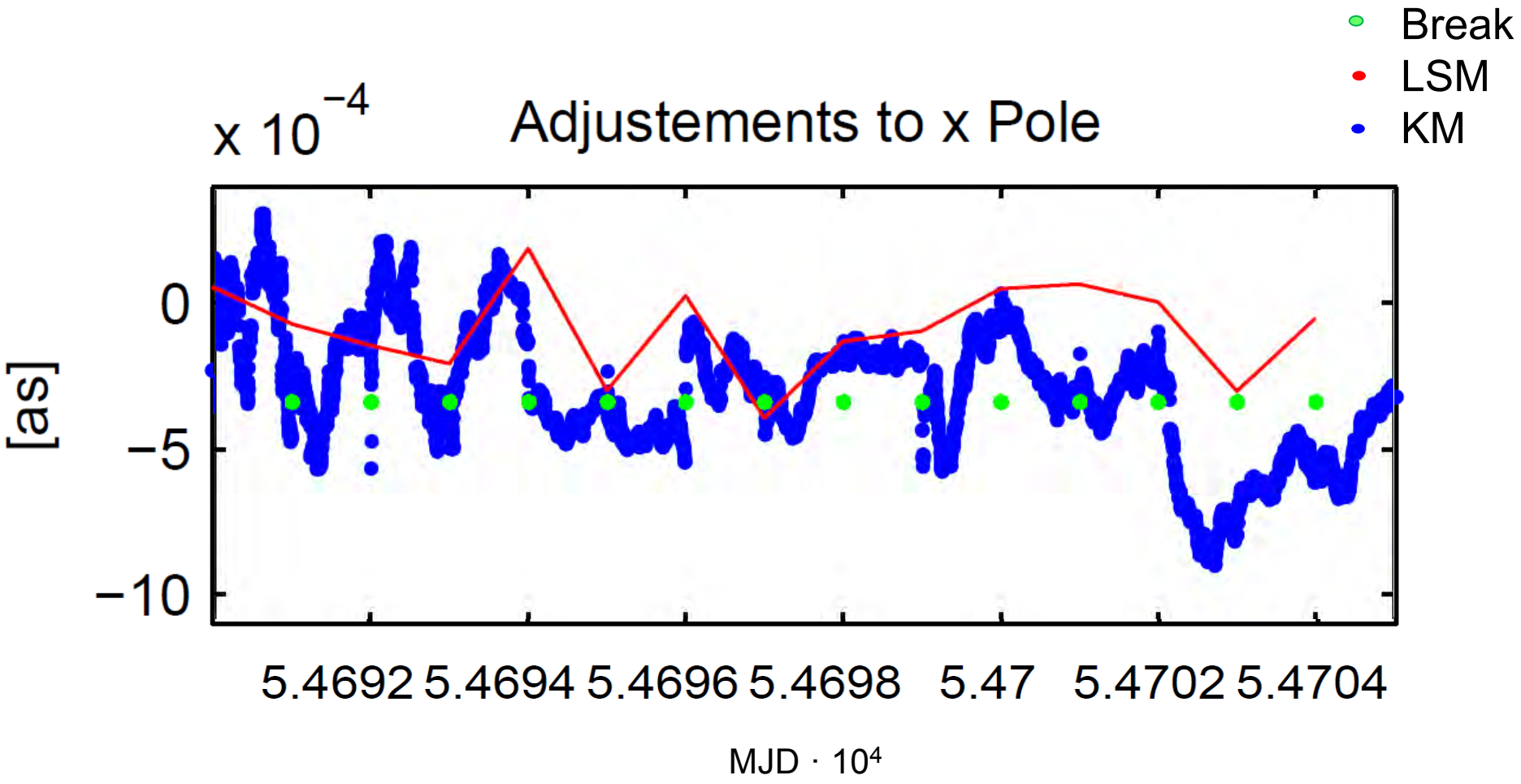
P_{t0}

Q

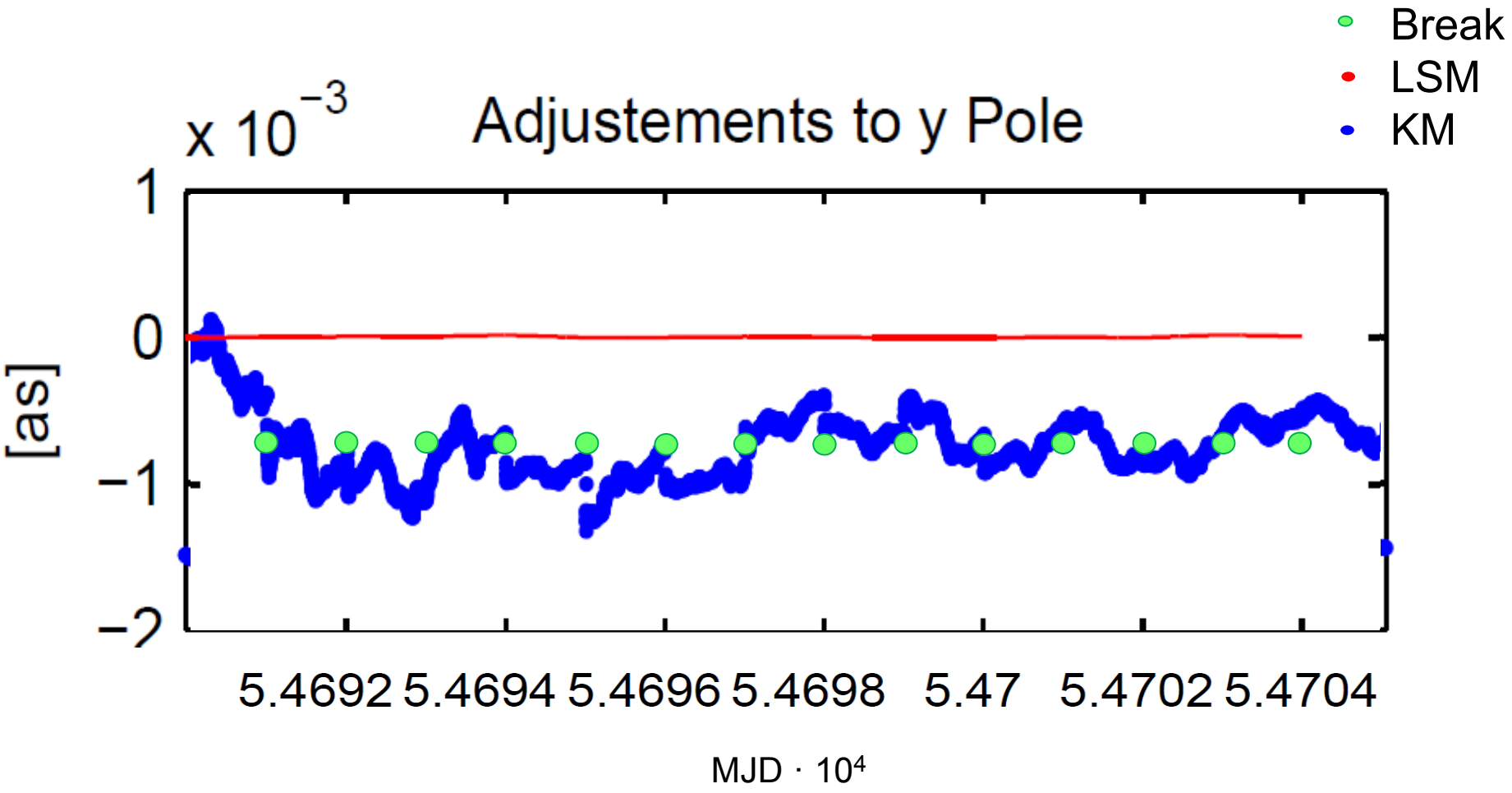
CONT08 gets filtered



CONT08 gets smoothed



CONT08 gets smoothed



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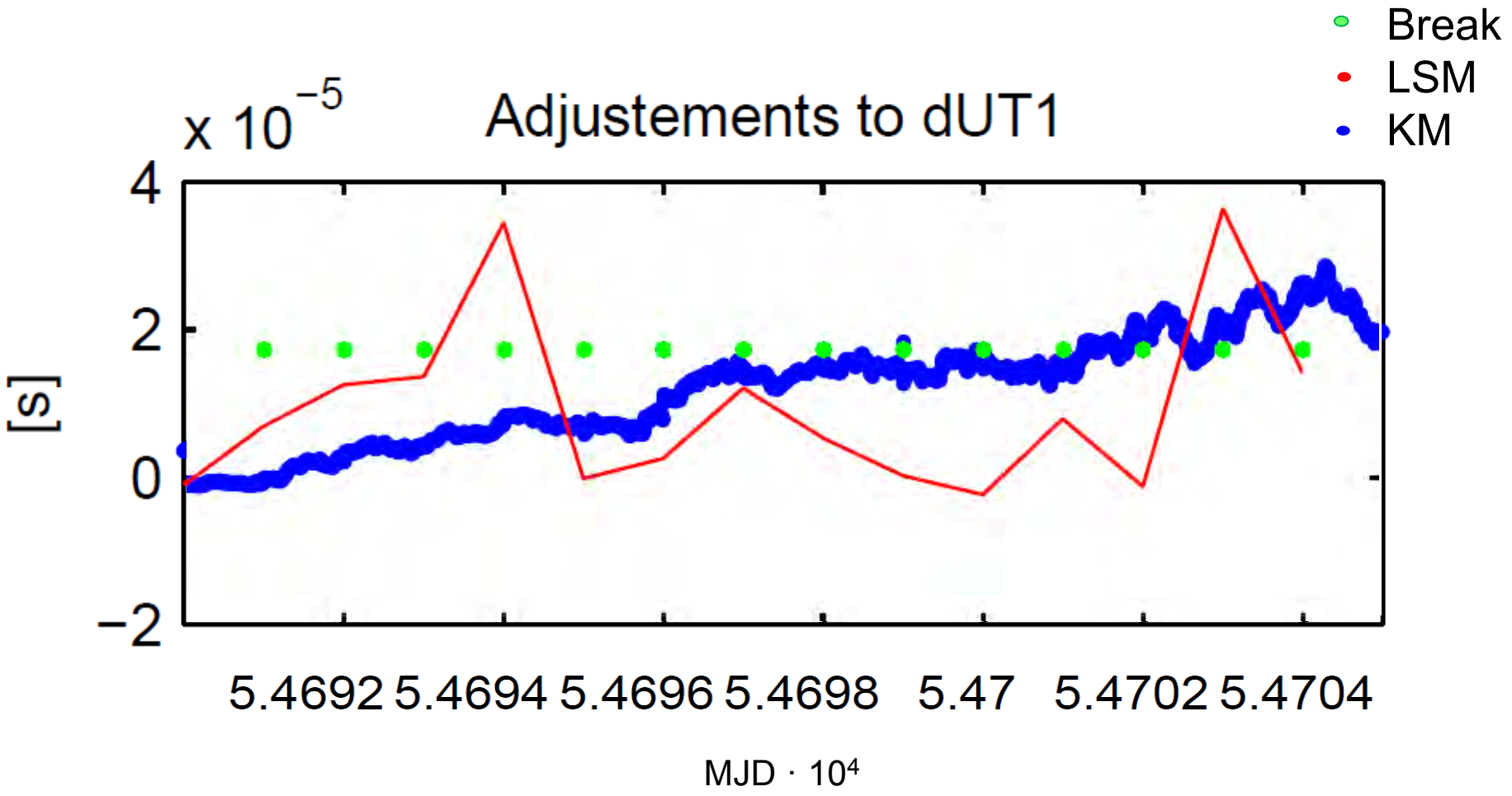

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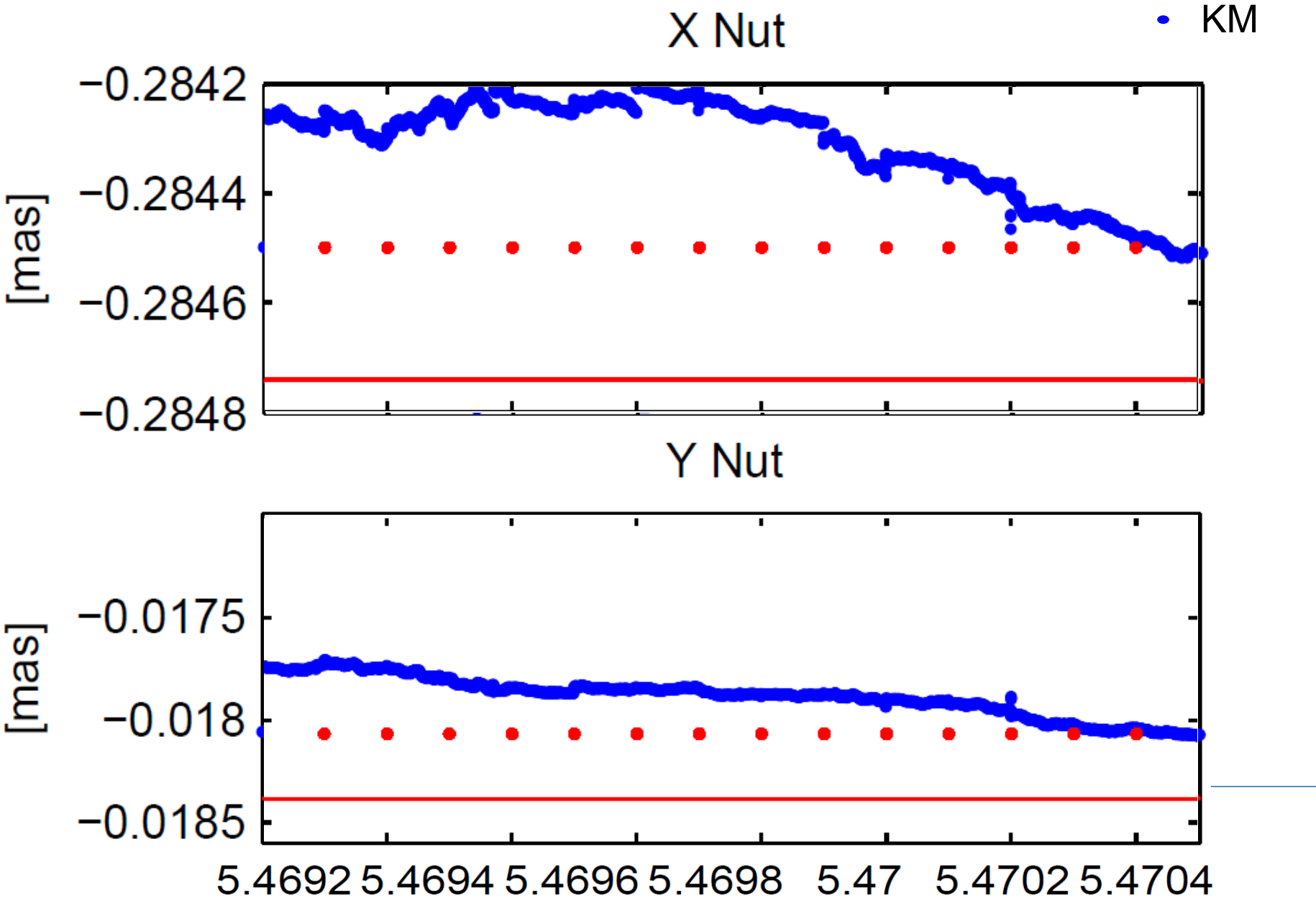


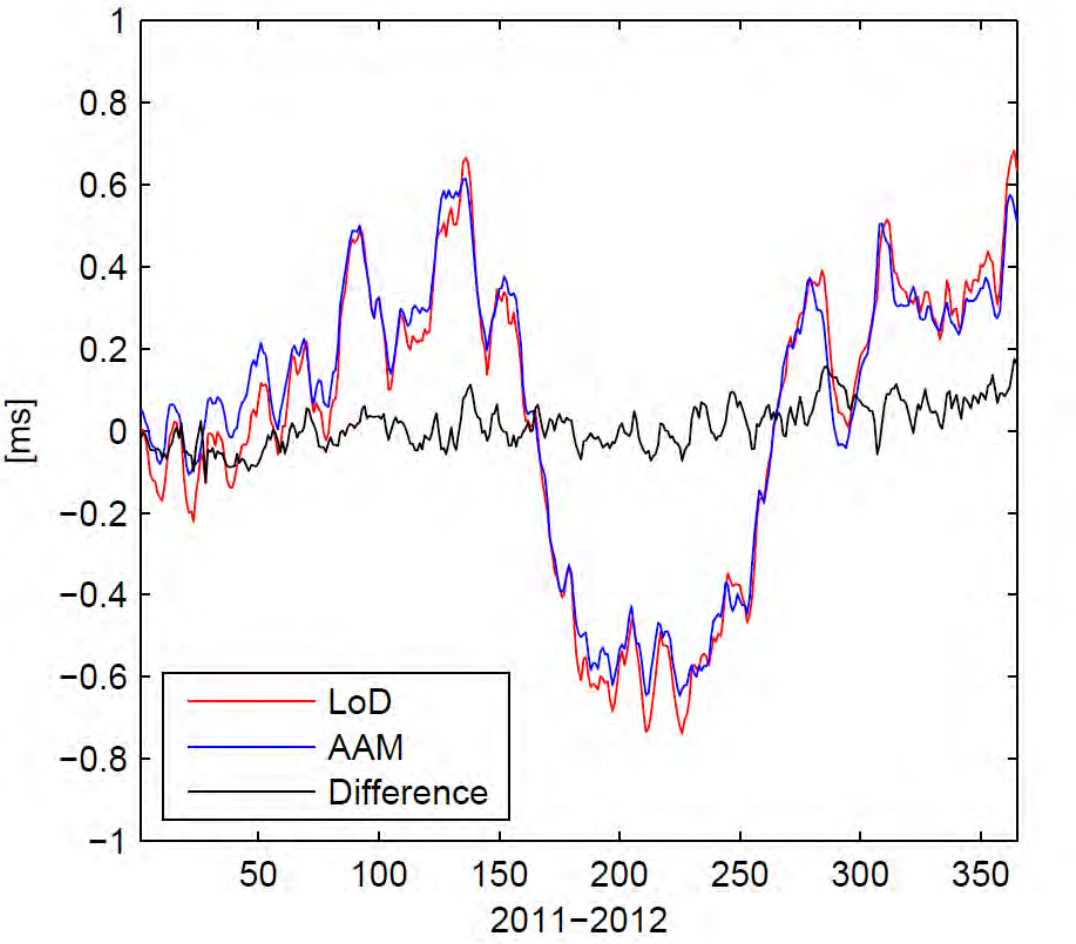
CONT08 gets smoothed

std	GPS -Least squares	GPS-Kalman
x Pole (*10^5)	1.753	1.471
y Pole (*10^4)	1.512	1.542
dUt1 (*10^4)	1.633	1.593

- Kalman filter results are comparable to the one from the least squares solution.
- Smoothing to strong, needs optimization
- EOP's with higher resolution than 1h would be preferable for further testing.

Current status and outlook

- VIE_Kalman
  - First version finished, now in tl
  - Fine tuning of process noise
  - Module implementation in VieV
  - **ERP prediction:**
    - Atmospheric angular mom
    - Investigation of the poten gyroscope observations ar
    - Implementation in VieVS



Thank you for your attention!

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