

COL Analysis Center DGFI: VLBI

R. Heinkelmann



Overview

- IVS VLBI-sessions during the COL test period (10 – 30 August 2008)
- Specification of the VLBI-contribution of DGFI
- Optional: validation/ some results

IVS VLBI data during 2008-08-10/30

LBA-V271AL V271AL AUG10 223 00:00 24 AtMp	NASA BONN 08NOV19 1.0 XL NASA
LBA-V271AR V271AR AUG10 223 00:00 24 45AtCdHhHoMpPa	NASA BONN 08NOV19 1.0 XR NASA
CONT0801 C0801 AUG12 225 00:00 24 HhKkMcNyOnSvTcTswfwzZc	NASA WASH 09JAN30 3.0 XA NASA
CONT0802 C0802 AUG13 226 00:00 24 HhKkMcNyOnSvTcTswfwzZc	NASA WASH 09JAN30 3.0 XA NASA
CONT0803 C0803 AUG14 227 00:00 24 HhKkMcNyOnSvTcTswfwzZc	NASA WASH 09JAN30 3.0 XA NASA
CONT0804 C0804 AUG15 228 00:00 24 HhKkMcNyOnSvTcTswfwzZc	NASA WASH 09JAN30 3.0 XA NASA
CONT0805 C0805 AUG16 229 00:00 24 HhKkMcNyOnSvTcTswfwzZc	NASA WASH 09JAN30 3.0 XA NASA
CONT0806 C0806 AUG17 230 00:00 24 HhKkMcNyOnSvTcTswfwzZc	NASA WASH 09JAN30 3.0 XA NASA
CONT0807 C0807 AUG18 231 00:00 24 HhKkMcNyOnSvTcTswfwzZc	NASA WASH 09JAN30 3.0 XA NASA
CONT0808 C0808 AUG19 232 00:00 24 HhKkMcNyOnSvTcTswfwzZc	NASA WASH 09JAN30 3.0 XA NASA
CONT0809 C0809 AUG20 233 00:00 24 HhKkMcNyOnSvTcTswfwzZc - Tc	NASA WASH 09JAN30 3.0 XA NASA
CONT0810 C0810 AUG21 234 00:00 24 HhKkMcNyOnSvTcTswfwzZc	NASA WASH 09JAN30 3.0 XA NASA
CONT0811 C0811 AUG22 235 00:00 24 HhKkMcNyOnSvTcTswfwzZc	NASA WASH 09JAN30 3.0 XA NASA
CONT0812 C0812 AUG23 236 00:00 24 HhKkMcNyOnSvTcTswfwzZc	NASA WASH 09JAN30 3.0 XA NASA
CONT0813 C0813 AUG24 237 00:00 24 HhKkMcNyOnSvTcTswfwz - Zc	NASA WASH 09JAN30 3.0 XA NASA
CONT0814 C0814 AUG25 238 00:00 24 HhKkMcNyOnSvTcTswfwzZc	NASA WASH 09JAN30 3.0 XA NASA
CONT0815 C0815 AUG26 239 00:00 24 HhKkMcNyOnSvTcTswfwzZc	NASA WASH 09JAN30 3.0 XA NASA
IVS-CRMS05 CRMS05 AUG26 239 17:30 24 13Ft	USNO WASH 08SEP17 1.0 XN USNO
IVS-CRDS48 CRDS48 AUG27 240 17:30 24 HhHo	USNO WASH 08OCT20 1.0 XN USNO
JADE-0808 JD0808 AUG28 241 02:00 24 AiCcS3Ts	GSI GSI 08SEP30 1.7 XF GSI
IVS-R4341 R4341 AUG28 241 18:30 24 BdFtHoKkMaSvTcWz	USNO WASH 08SEP29 1.0 XE USNO

■ Summary: 15 CONT08 + 1 IVS-R4

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VLBI Software

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- OCCAM 6.1 (LSM) LINUX [Titov et al., 2004]
for VLBI analysis + NGL-file generation
- DOGS-CS [Gerstl et al., 2000]
for SINEX generation

VLBI Analysis (1)

OCCAM:

- Apriories

- TRF: ITRF2008 (DGFI version)
- EOPs: IERS C04-05
- CRF: ICRF2 (full: non VCS + VCS)

VLBI Analysis (2)

OCCAM:

- Station coordinates
 - Permanent tide: no correction (this is not conform with IAG resolution but common practice)
 - Earth tides: IERS Conventions 2003
 - Pole tides: linear trend for mean pole offsets IERS Conventions 2003
 - Ocean loading: FES2004
 - Atmospheric loading: Petrov & Boy, 2004
 - Correction of axis offsets (official IVS numbers)
 - Antenna thermal expansion (Nothnagel, 2008)
 - Station eccentricities (official IVS table)

VLBI Analysis (3)

OCCAM:

■ EOP:

- Nutation model: IAU2000A disregarding the free core nutation part
- Subdaily EOP model, tidal variations in x , y , $dUT1$: Eanes, IERS Conventions 2003

VLBI Analysis (4)

OCCAM:

- Relativistic scale and Shapiro effect
 - **Wrong** scale according to IAU!
$$X = X_{\text{GCRS}} * (1 - L_G)$$
 - New version using the model without scaling of observed time delays: „consensus model“, IERS Conventions 2003 (updates available)
 - Sun and Earth's gravity effect on signal propagation applied

VLBI Analysis (5)

OCCAM:

- Troposphere model

- Hydrostatic delay model: Modified Saastamoinen (Davis et al., 1985), pressure from log files (NGS files)
- Mapping functions: VMF1 (Böhm et al., 2006)
- Atmosphere gradients' model: MacMillan (1995)
- Apriori total atmosphere gradients: MacMillan & Ma (1997) DAO

VLBI Analysis (6)

OCCAM:

■ Parameterization

- No estimation of radio source positions; coordinates fix at ICRF2 (J2000.0) positions
- All EOP (x_p , y_p , $dUT1=UT1-TAI$, x_p -rate, y_p -rate, LOD, $dpsi$, $deps$), per session
- All (X, Y, Z) components of all sites, per station
- Atmosphere gradients (G_N , G_E), per station
- Atmosphere zenith delays (ZWD), 1 offset + 1h-rates of a PWLF, per station
- Coefficients of a quadratic clock model, 1 offset + 1h-rates of a PWLF, per station

VLBI Analysis (6)

OCCAM:

- Clock offsets and clock breaks (optional) are determined by first LSM
- „o-c“-vector gets reduced by clock model
- Apriories, normal equation ($N=A^T P A$) and vector of right hand side ($n=A^T P l$) without datum are written in DOGS-CS format (NGL)

VLBI Analysis (6)

DOGS-CS:

- Atmosphere parameters are reduced
- Apriori values, station coordinates and EOP are written into SINEX format (SNX)
- **Wrong** EOP-epoch! (version updated)

- End -

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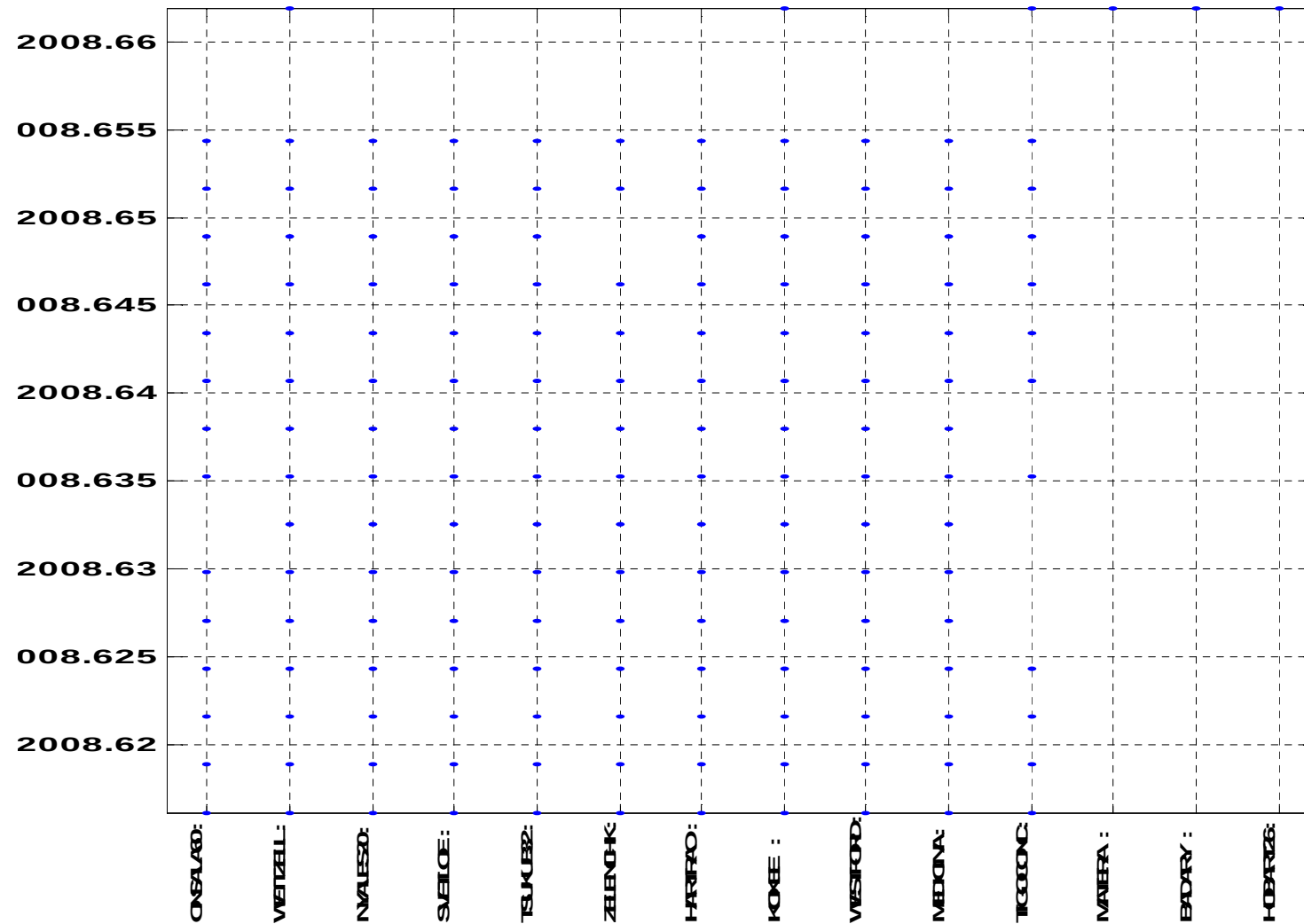


Thank you for your attention!

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IVS VLBI data during 2008-08-10/30

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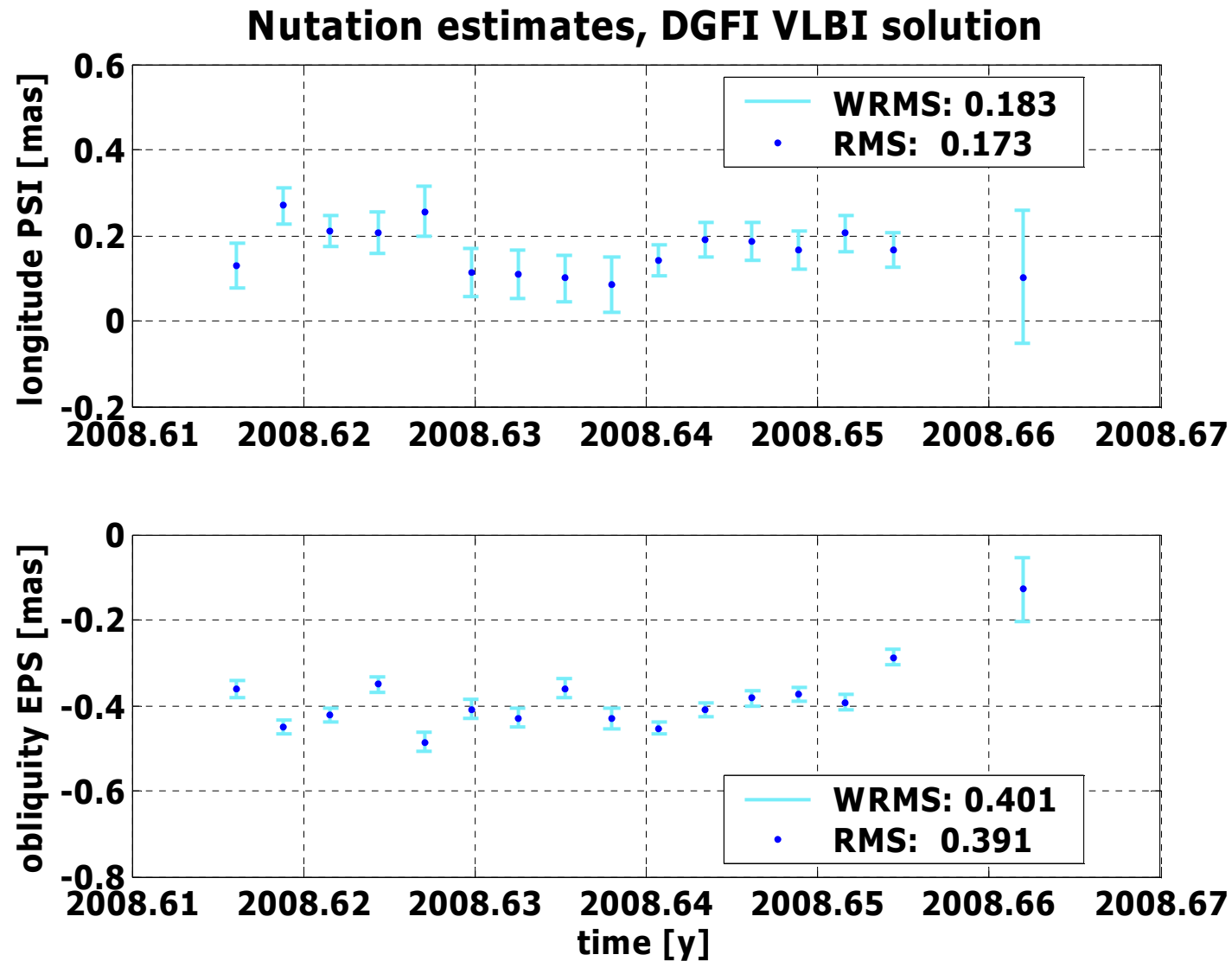


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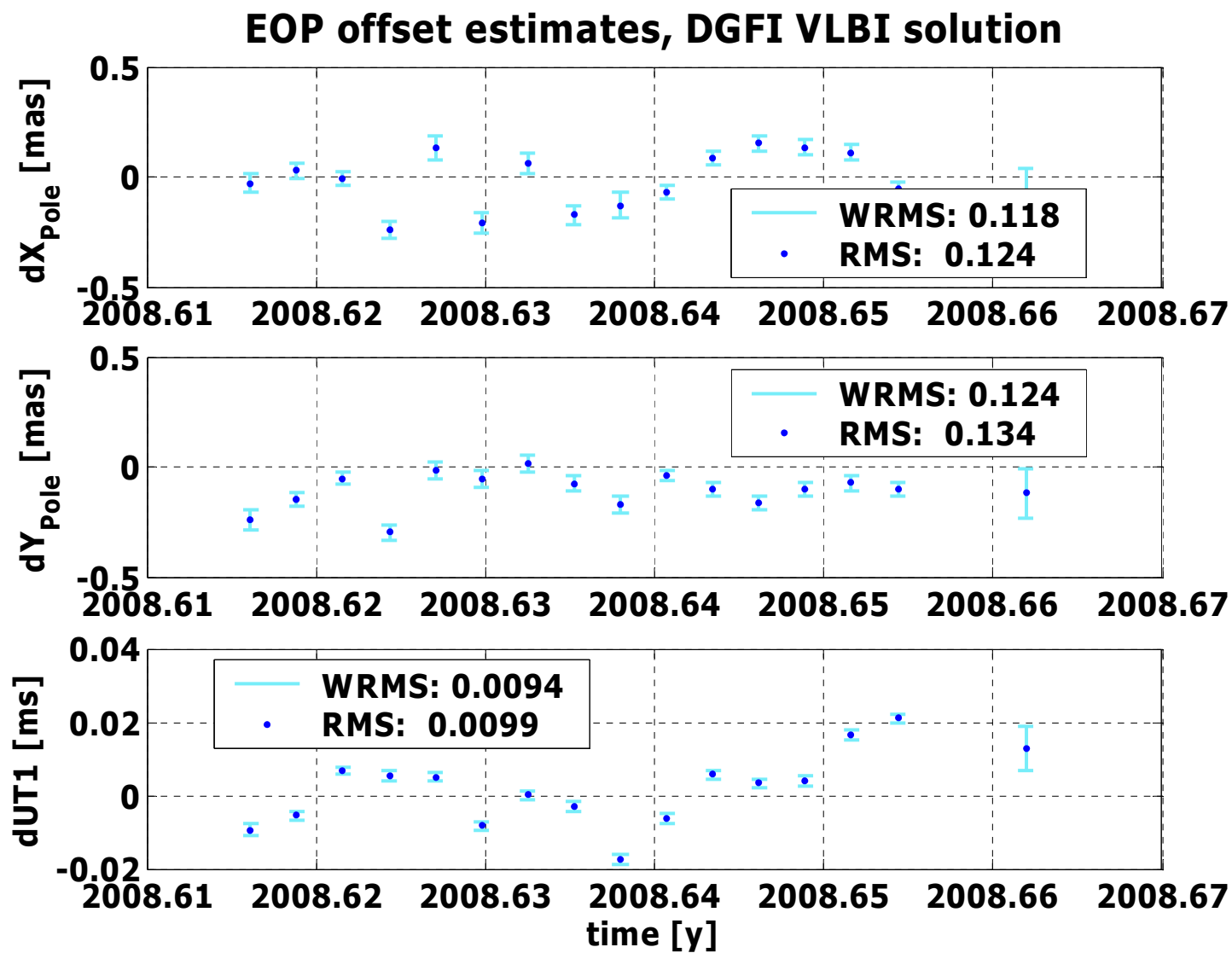


Celestial pole offsets

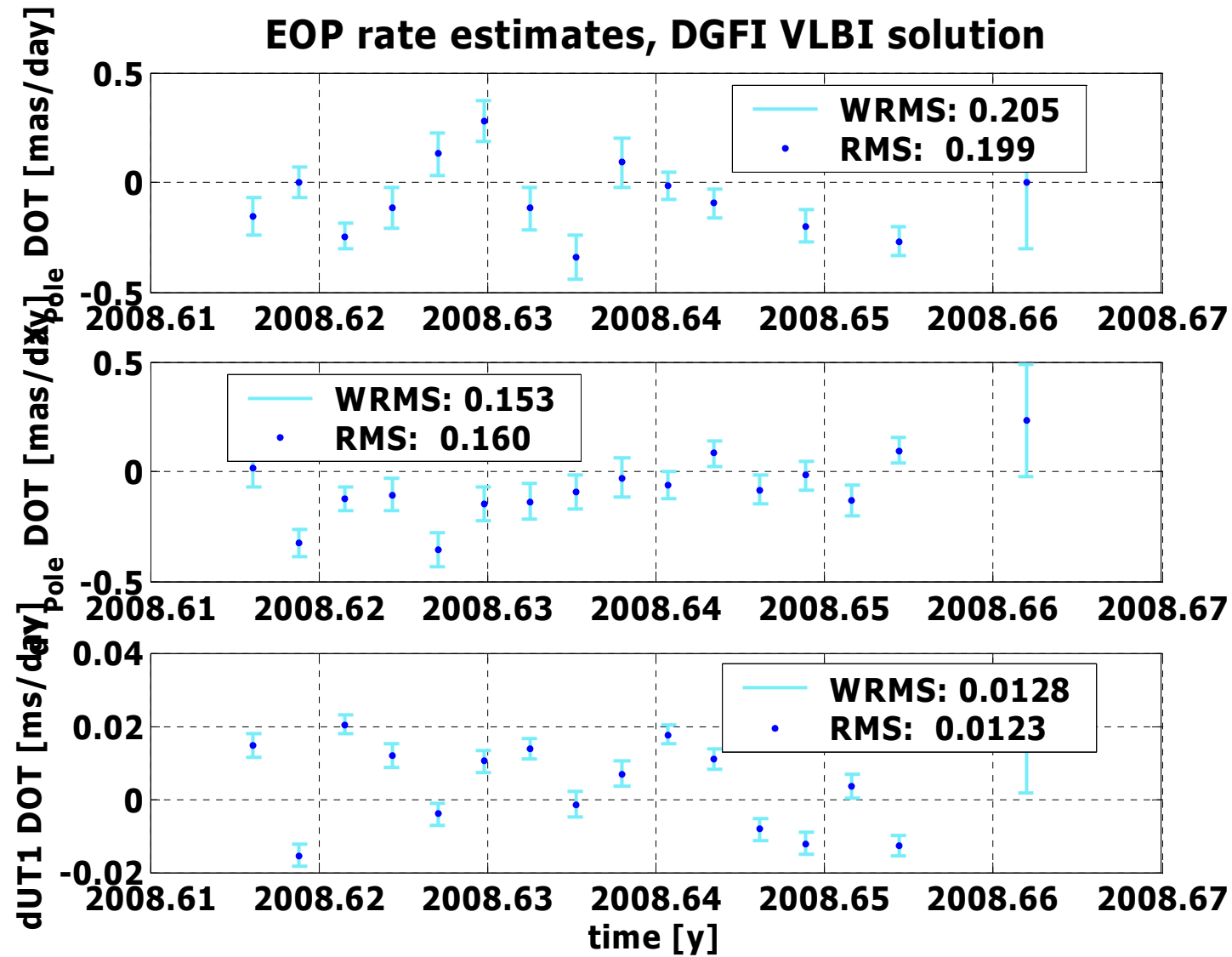
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EOP

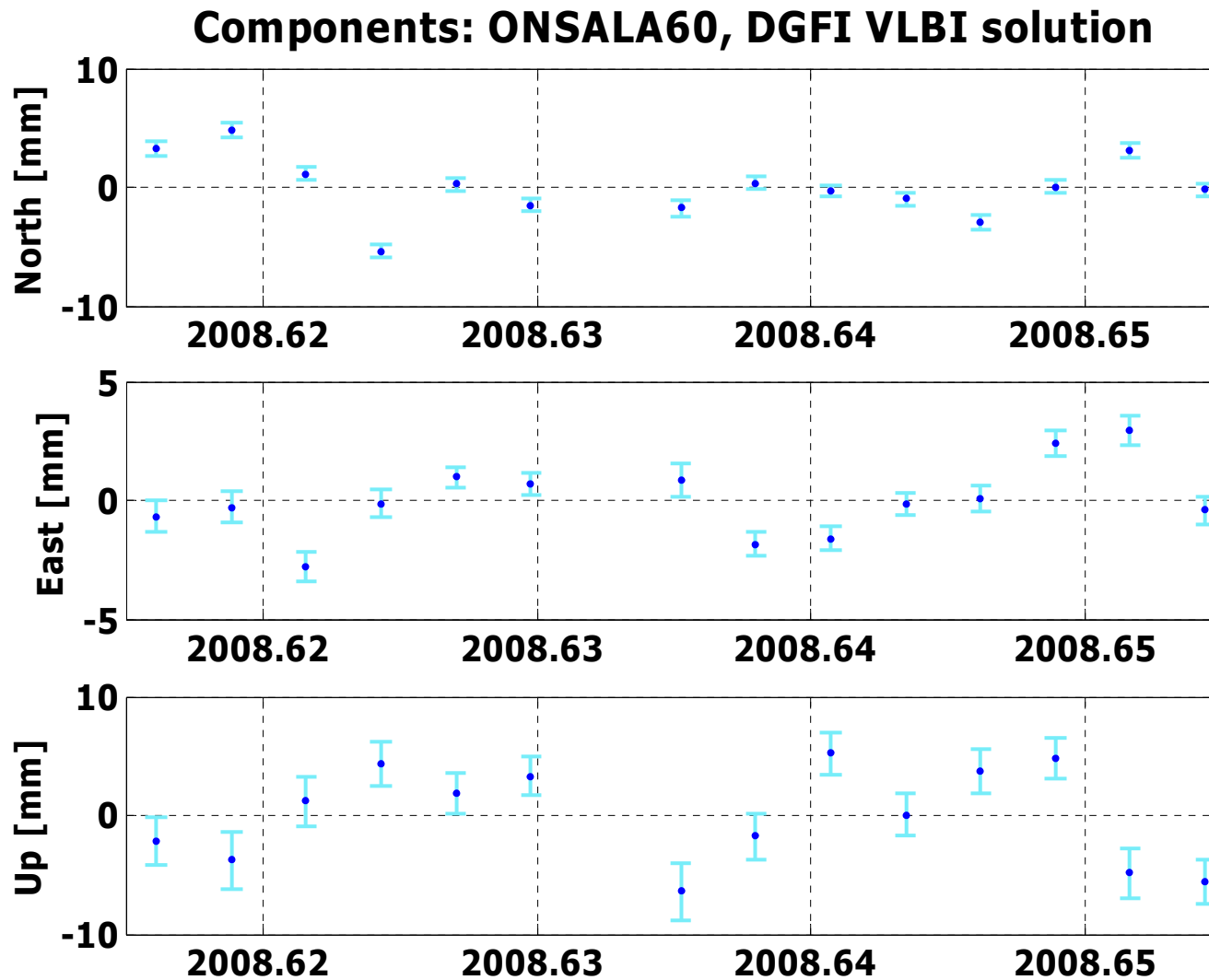


EOP-rates



Station coordinates, example: Onsala, Sweden

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