

IERS COL-WG project GRGS COMBINATION CENTRE

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Pole coordinates AIUB with Dynamo

GPS
daily

Continuity constraints on

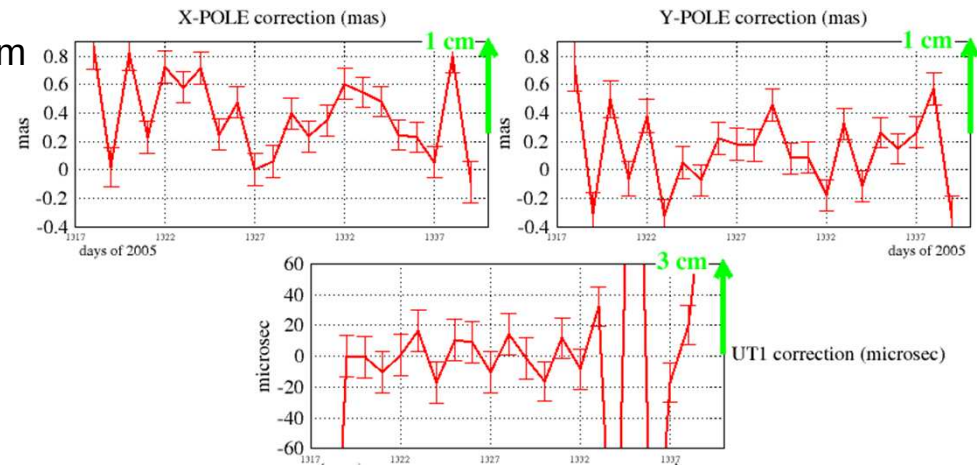
Pole coordinates corrections: $\sigma=1\text{m}$

UT corrections: $\sigma=1\text{ms}$

XPO bias = 389 uas, $\sigma=265$ uas

YPO bias = 138 uas, $\sigma=257$ uas

UT bias = -3 us, $\sigma=100$ us



Continuity constraints on

Pole coordinates corrections: $\sigma=1\text{m}$

Stations: stability constraint 1m

Minimal constraints $\sigma=1\text{mm}$

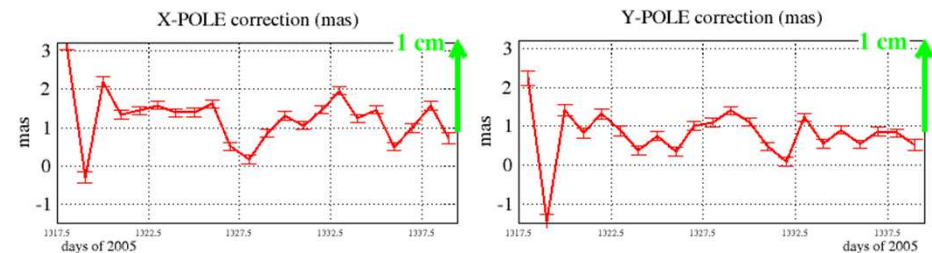
Troposphere $\sigma=5\text{cm}$

XPO bias = 1,25 mas, $\sigma=602$ uas

YPO bias = 0,78 mas, $\sigma=540$ uas

Geo Center and Satellite antenna unrecognized (eliminated)

SIGMA2 NEGATIV



Pole coordinates AIUB with Dynamo

SLR
weekly

Pole coordinates Offset+Drift

UT + LOD

Continuity constraints on

Pole coordinates corrections: $\sigma=1\text{m}$

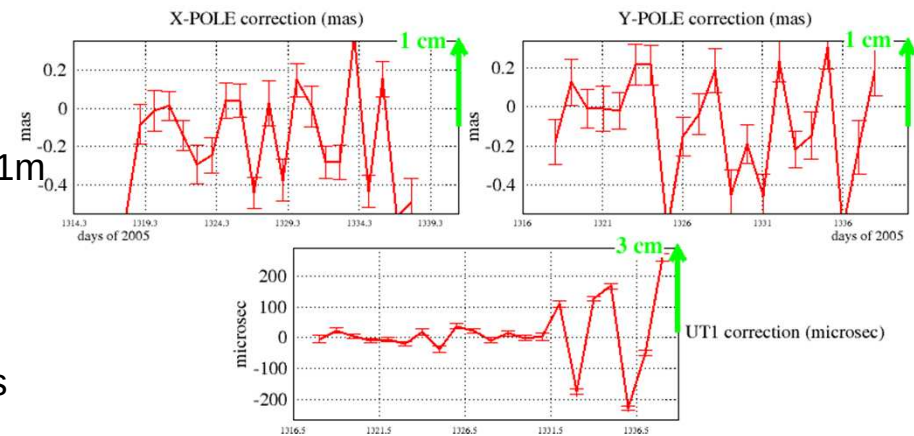
UT corrections $\sigma=1\text{ ms}$

Stations: stability constraint and
Minimal constraints

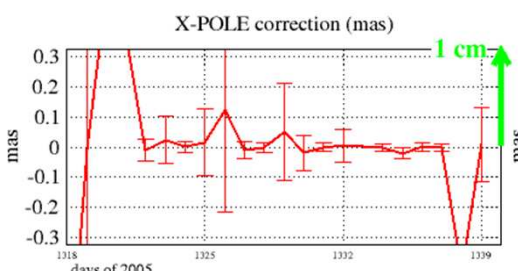
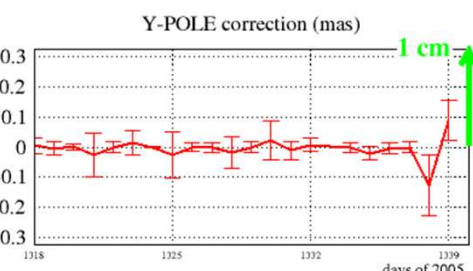
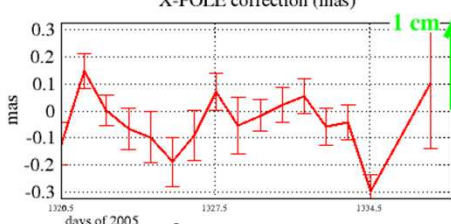
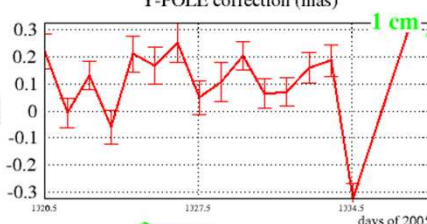
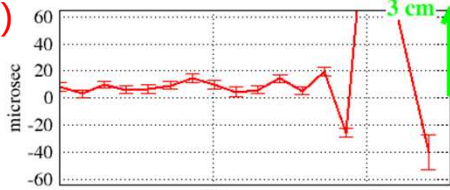
XPO bias = -157 uas , $\sigma= 253\text{ uas}$

YPO bias = -84 uas , $\sigma= 268\text{ uas}$

UT bias = 2 us , $\sigma= 97\text{ us}$



Pole coordinates DGFI with Dynamo

SLR weekly	Continuity constraints on Pole coordinates Corrections: $\sigma=2\text{cm}$ UT held fixed Stations held fixed WRMS XPO = 15 uas WRMS YPO = 3.6 uas UT FREE with continuity constraint $\rightarrow \sigma^2$ negative !!!  
VLBI daily EOP at 12h O+D	Continuity constraints on Pole coordinates corrections $\sigma=2\text{cm}$ UT corrections $\sigma=100\text{us}$ Pole rate and LOD fixed Nutation fixed (a priori nul $\rightarrow$ estimation with $\sigma^2<0$) Stations held fixed to their a-priori WRMS XPO = 118 uas WRMS YPO = 171 uas WRMS UT = 49 us Same results with stations + NNR conditions (1mm)    UT1 correction (microsec)

Pole SLR GRGS with dynamo

EOP are in Offset + Drift format → transformed in Piece Wise Linear Offset

Continuity constraints on

Pole coordinates Corrections: $\sigma=2\text{cm}$

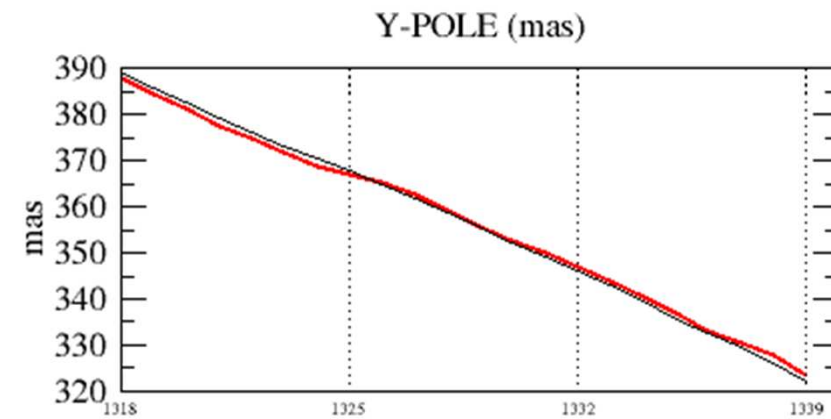
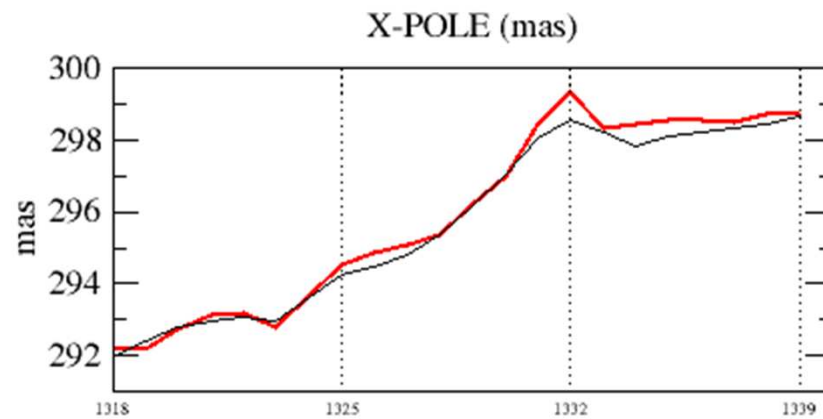
Stability constraints on Stations $\sigma=10\text{cm}$ + minimal constraints

UT held fixed to their apriori

Nutation held fixed to their apriori

WRMS XPO = 0,234 mas

WRMS YPO = 1,129 mas



EOP DORIS GRGS with dynamo

Continuity constraints on

Pole coordinates Corrections: $\sigma=2\text{cm}$

UT corrections: $\sigma=100\mu\text{s}$

Troposphere corrections $\sigma=2\text{cm}$

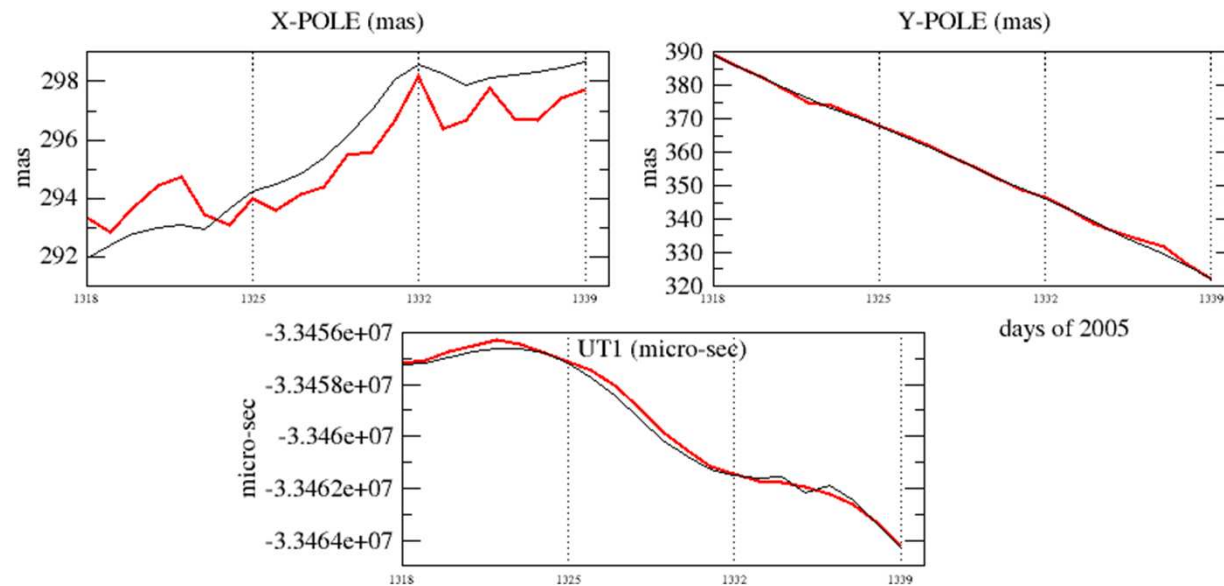
Stability constraints on Stations, 10cm

Nutation held fixed to their apriori

WRMS XPO = 0,783 mas

WRMS YPO = 0,700 mas

WRMS UT = 185 μs



GPS GRGS with dynamo

Pole determination

Continuity constraints on

Pole coordinates Corrections: $\sigma=2\text{cm}$

UT help FIXED to their a-priori

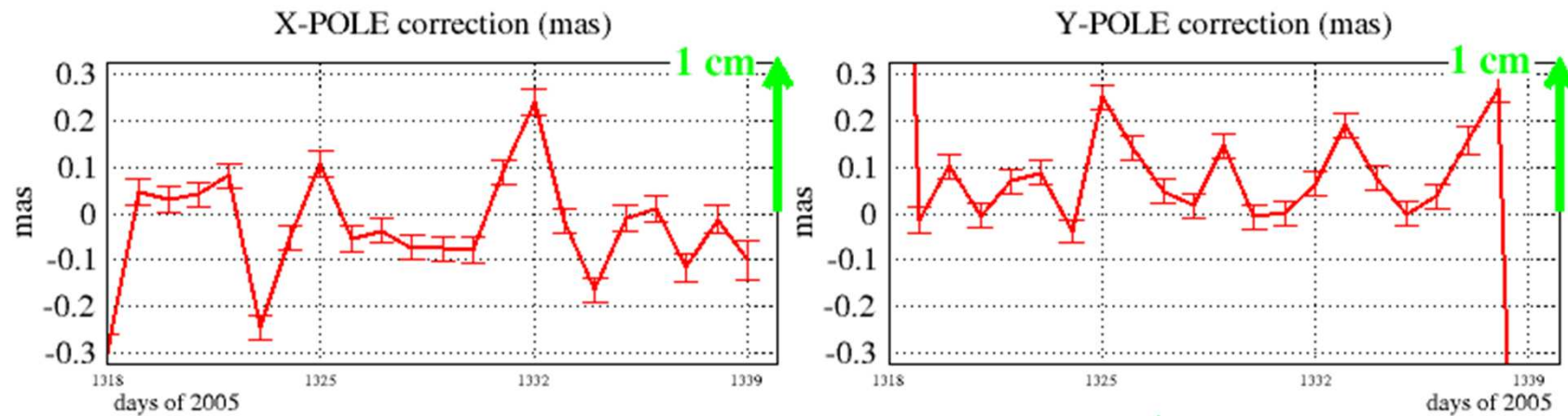
STATIONS help FIXED to their a-priori

Troposphere held FIXED to their a-priori

Nutation held fixed to their a-priori

WRMS XPO = 111 uas

WRMS YPO = 365 uas due to high values at the beginning and ending of the time interval



GPS GRGS with dynamo

Pole Stations Troposphere

Continuity constraints on

Pole coordinates Corrections: $\sigma=2\text{cm}$

UT corrections $\sigma=100\mu\text{s}$

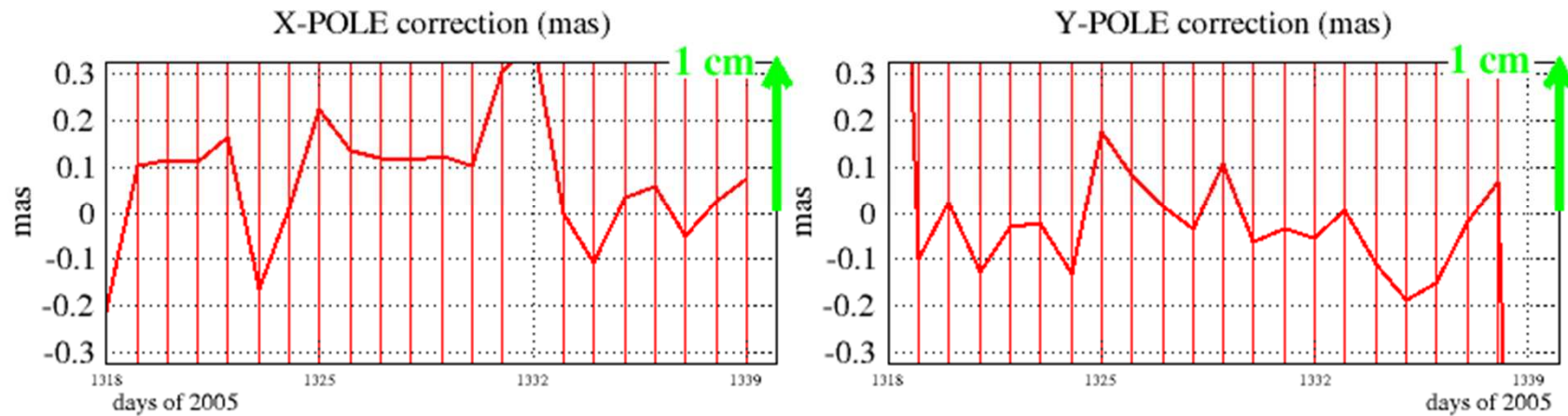
Stability constraints on Stations, $\sigma=10\text{cm}$ + minimal constraints

Troposphere corrections $\sigma=5\text{cm}$

Nutation held fixed to their apriori

WRMS XPO = 133 μs

WRMS YPO = 576 μs due to high values at the beginning and ending of the time interval



EOP VLBI GRGS with dynamo

Continuity constraints on Pole coordinates Corrections: $\sigma=3\text{cm}$

Stations, Quasars, Troposphere held fixed to their apriori

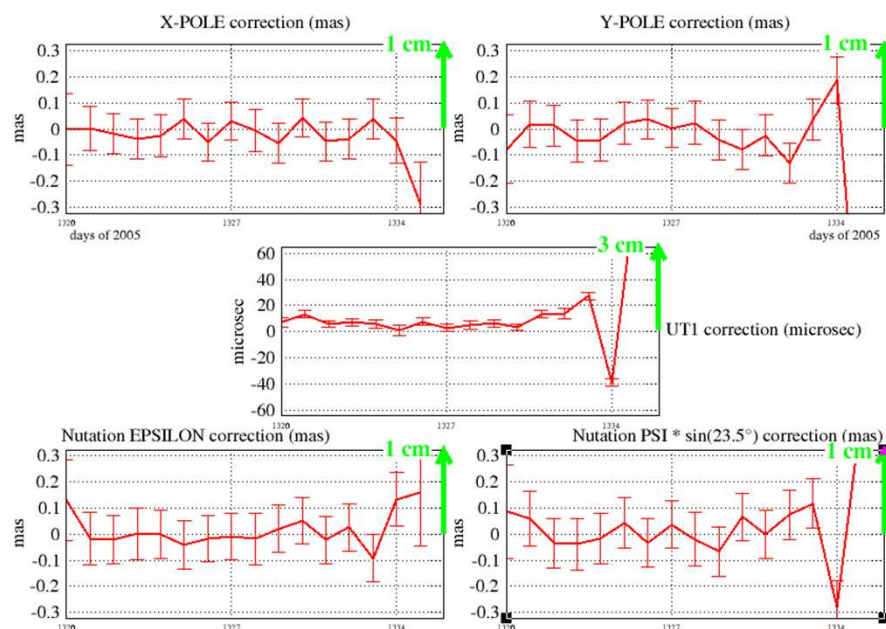
WRMS XPO = 51 uas

WRMS YPO = 156 uas

WRMS UT = 21 us

WRMS Eps = 54 uas

WRMS Psi = 109 uas



Continuity constraints on Pole coordinates Corrections: $\sigma=3\text{cm}$

Stations : stability constraint 1cm + minimal constraint 0 +/-1mm

Quasars: continuity constraint on corrections 1E-09 rad **RS_DA**
1E-08 rad **RS_DE**

Troposphere held fixed to their apriori

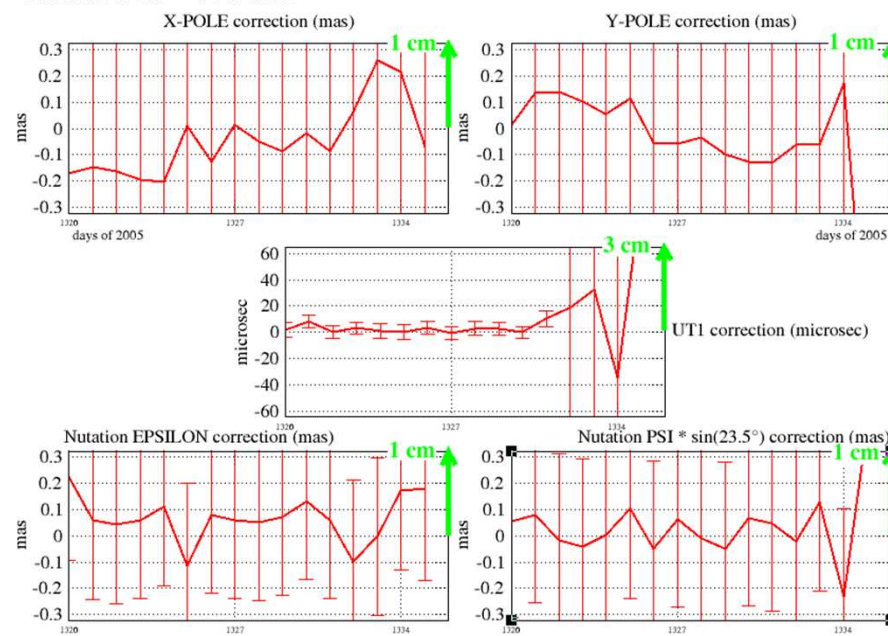
WRMS XPO = 140 uas

WRMS YPO = 258 uas

WRMS UT = 4 us

WRMS Eps = 107 uas

WRMS Psi = 131 uas



EOP VLBI GRGS with Dynamo

Continuity constraints on Pole coordinates Corrections: $\sigma=3\text{cm}$

Stations : stability constraint 1cm + minimal constraint 0 +/-1mm

Quasars: continuity constraint on corrections $1\text{E-}09$ rad **RS_DA** $1\text{E-}08$ rad **RS_DE**

Troposphere: continuity constraint 2 cm

Clock bias: continuity constraint 50 us

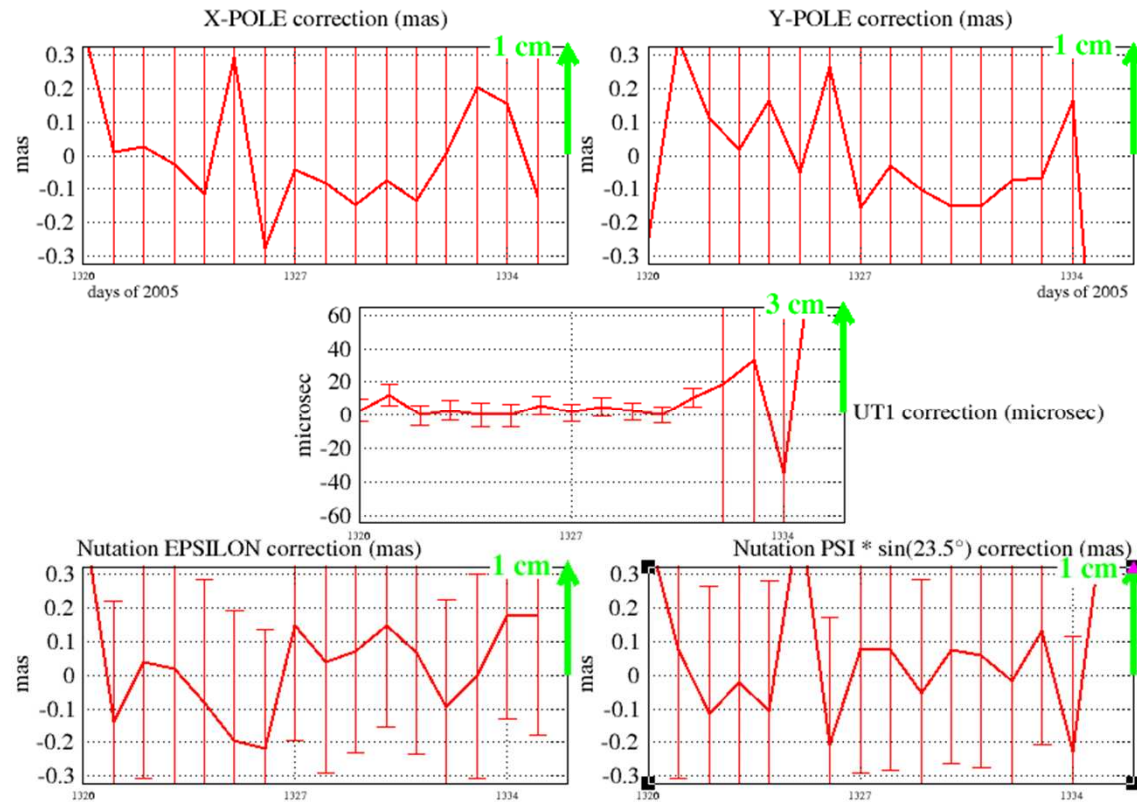
WRMS XPO = 167 uas

WRMS YPO = 289 uas

WRMS UT = 5 us

WRMS Eps = 172 uas

WRMS Psi = 199 uas



EOP VLBI TUW with Dynamo

EOP + Stations + Troposphere + Quasars estimation with constraint:

Continuity constraints on Pole coordinates Corrections: $\sigma=2\text{cm}$

on Nutation Corrections: $\sigma=3\text{cm}$ equivalence on Earth surface

on UT Corrections $\sigma=100\mu\text{s}$

Stations : stability constraint 1cm + minimal constraint 0 +/-1mm

Quasars: continuity constraint on corrections $1\text{E-}09\text{ rad}$ **RS_DA** $1\text{E-}08\text{ rad}$ **RS_DE**

Troposphere: continuity constraint 2 cm

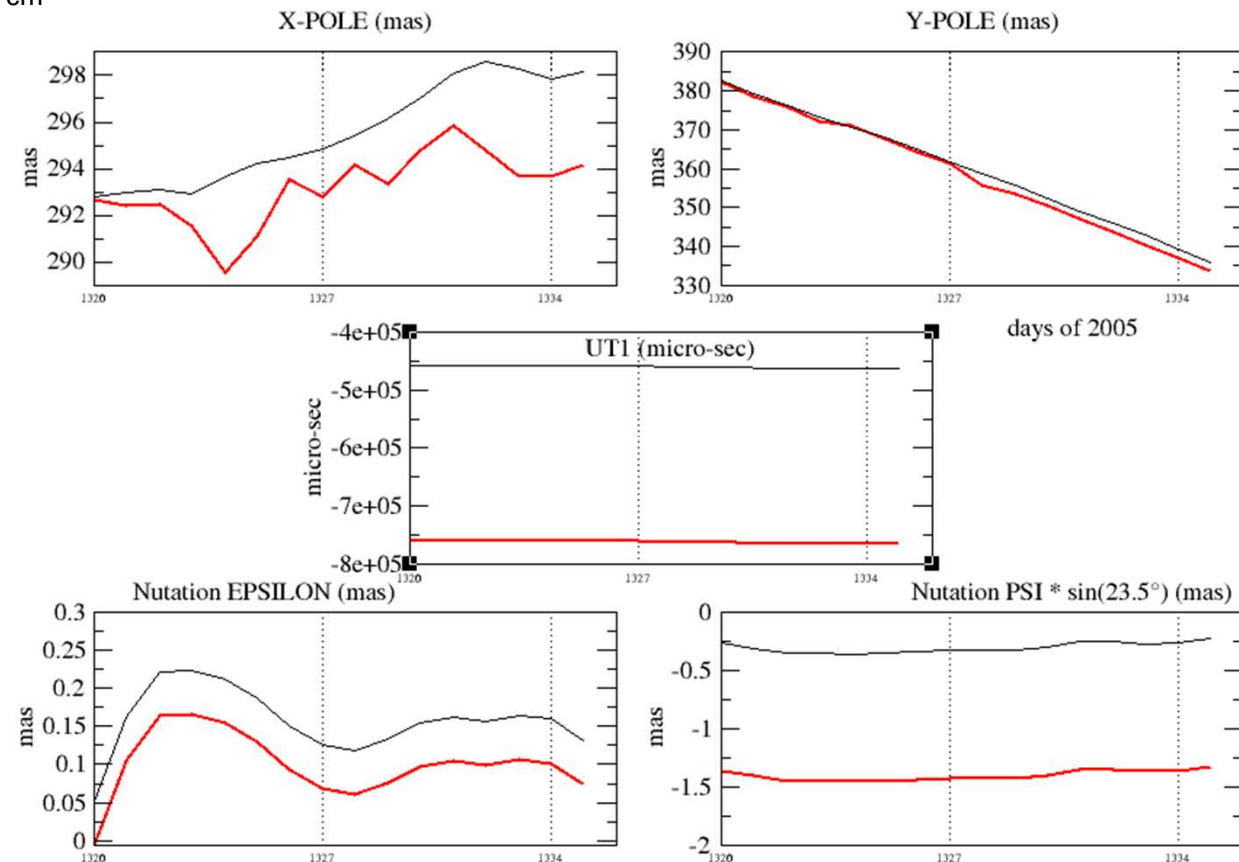
WRMS XPO = 2,863 mas

WRMS YPO = 1,776 mas

WRMS UT = 301 ms

WRMS Eps = 57 uas

WRMS Psi = 1,094 mas



GRGS Selected Stations

- Stations with troposphere measurements: gradients, zenithal biases

Station	Tectonic plate	Domes number	Code GPS	Code DORIS	Code SLR without tropo	Code VLBI
NyAlesund	EURA	10317	NYAL NYA1	SPJB		7331
Hartebeesthoek	AFRC	30302	HRAO	HBMB	7501	7232
Kokee Park	PCFC	40424	KOKB	KOLB		7298
Washington	NOAM	40451	GODE USN3	GREB	7105	
Conception	SOAM	41719	CONZ		7405	7640
Mount Stromlo	AUST	50119	STR1	MSPB	7825	
Papeete Tahiti	PCFC	92201	THTI	PATB	7124	

AIUB Selected Stations

Stations with troposphere measurements: gradients,
zenithal biases

Station	Tectonic plate	Domes number	Code GNSS	Code DORIS	Code SLR	Code VLBI
NyAlesund	EURA	10317	NYA1			
Hartebeesthoek	AFRC	30302	HARB HARO		7501	
Kokee Park	PCFC	40424	KOKB			
Washington	NOAM	40451	USNO WDC3 WDC4		7105	
Conception	SOAM	41719	CONZ		7405	
Mount Stromlo	AUST	50119			7825	
Papeete Tahiti	PCFC	92201	FAA1 TAH1 TAH2 THTI		7124	

DGFI Selected Stations

Stations with troposphere measurements: gradients,
zenithal biases

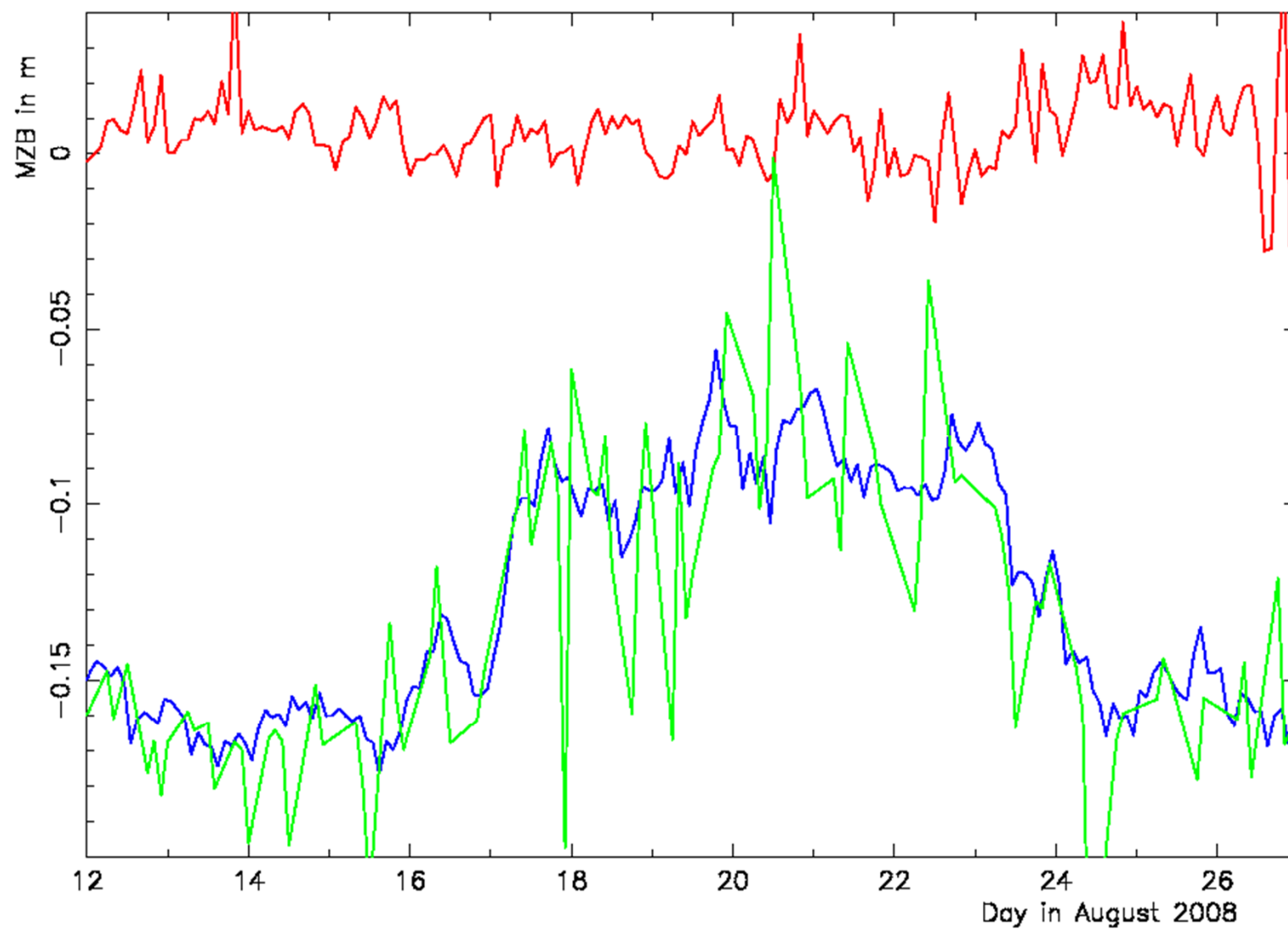
Station	Tectonic plate	Domes number	Code GNSS	Code DORIS	Code SLR	Code VLBI
NyAlesund	EURA	10317				7331
Hartebeesthoek	AFRC	30302				7232
Kokee Park	PCFC	40424				7298
Washington	NOAM	40451			7105	
Conception	SOAM	41719			7405	7640
Mount Stromlo	AUST	50119			7825	
Papeete Tahiti	PCFC	92201			7124	

TUW Selected Stations

Stations with troposphere measurements: gradients,
zenithal biases

Station	Tectonic plate	Domes number	Code GNSS	Code DORIS	Code SLR	Code VLBI
NyAlesund	EURA	10317				7331
Hartebeesthoek	AFRC	30302				7232
Kokee Park	PCFC	40424				7298
Washington	NOAM	40451				
Conception	SOAM	41719				7640
Mount Stromlo	AUST	50119				
Papeete Tahiti	PCFC	92201				

MZB, station Hartebeesthoek (30302)
VLBI (Red) GPS (Blue) and DORIS (Green)



MZB, station Kokee Park (40424)
VLBI (Red) GPS (Blue) DORIS (Green)

