Impact of the Antenna Model Change on IGS Products

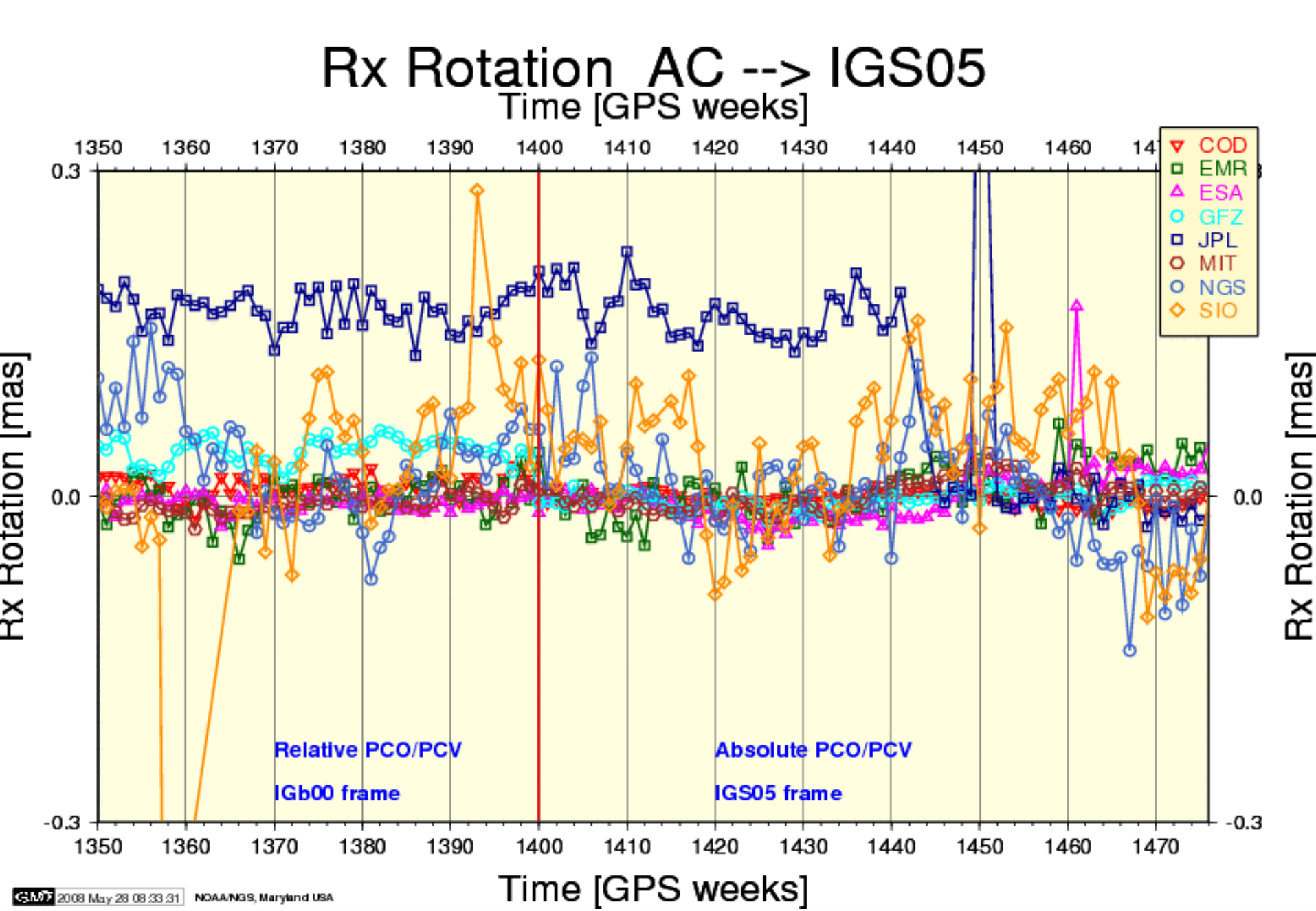
Neil D. Weston and Stephen A. Hilla
Geosciences Research Division
National Geodetic Survey, NOAA
Silver Spring, MD

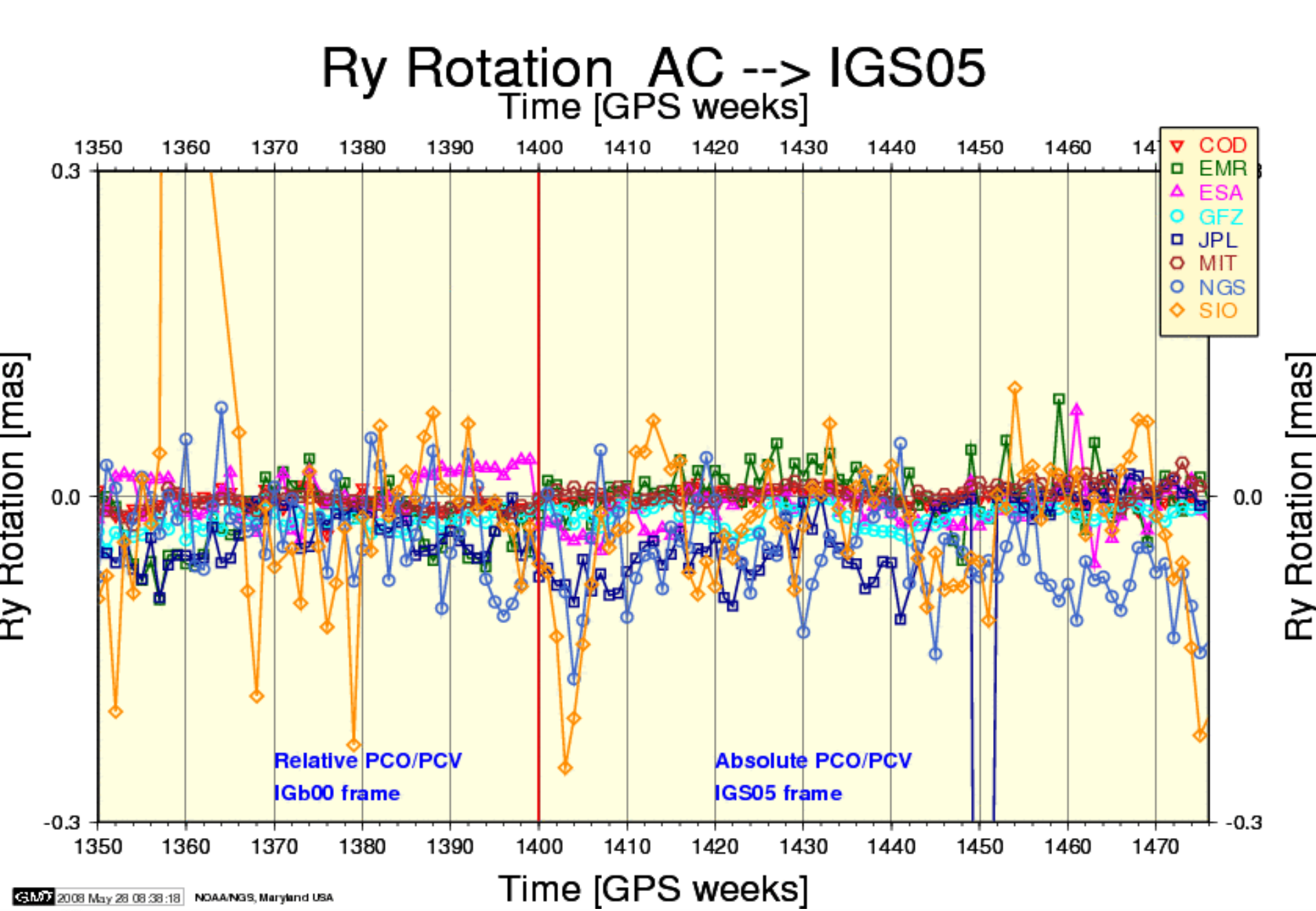
Background

- IGb00 scale was fixed to determine satellite antenna PCOs/PCVs
- Improved consistency between IGS and VLBI/SLR scales
- Reduced spurious scale drift in IGS coordinates
- Improved internal consistency of IGS products
- Model change implemented at week 1400

Terrestrial Frame Comparison 7-parameter transformation

- Compare weekly averages for frame Helmert parameters from each AC
- Before and after antenna model change
- Use weekly SINEX Tables 5-3-1 (Ferland)
- Weeks 1350 to 1476


Rx Rotation AC --> IGS05
Time [GPS weeks]
1350 1360 1370 1380 1390 1400 1410 1420 1430 1440 1450 1460
COD
EMR
ESA
GFZ
JPL
MIT
NGS
SIO
0.3
0.0
-0.3
Rx Rotation [mas]
Relative PCO/PCV
IGb00 frame
Absolute PCO/PCV
IGS05 frame
1350 1360 1370 1380 1390 1400 1410 1420 1430 1440 1450 1460 1470
Time [GPS weeks]
2008 May 28 08:33:31
NOAA/NGS, Maryland USA


Ry Rotation AC --> IGS05
Time [GPS weeks]
1350 1360 1370 1380 1390 1400 1410 1420 1430 1440 1450 1460
COD
EMR
ESA
GFZ
JPL
MIT
NGS
SIO
0.3
0.0
-0.3
Ry Rotation [mas]
Relative PCO/PCV
IGb00 frame
Absolute PCO/PCV
IGS05 frame
1350 1360 1370 1380 1390 1400 1410 1420 1430 1440 1450 1460 1470
Time [GPS weeks]
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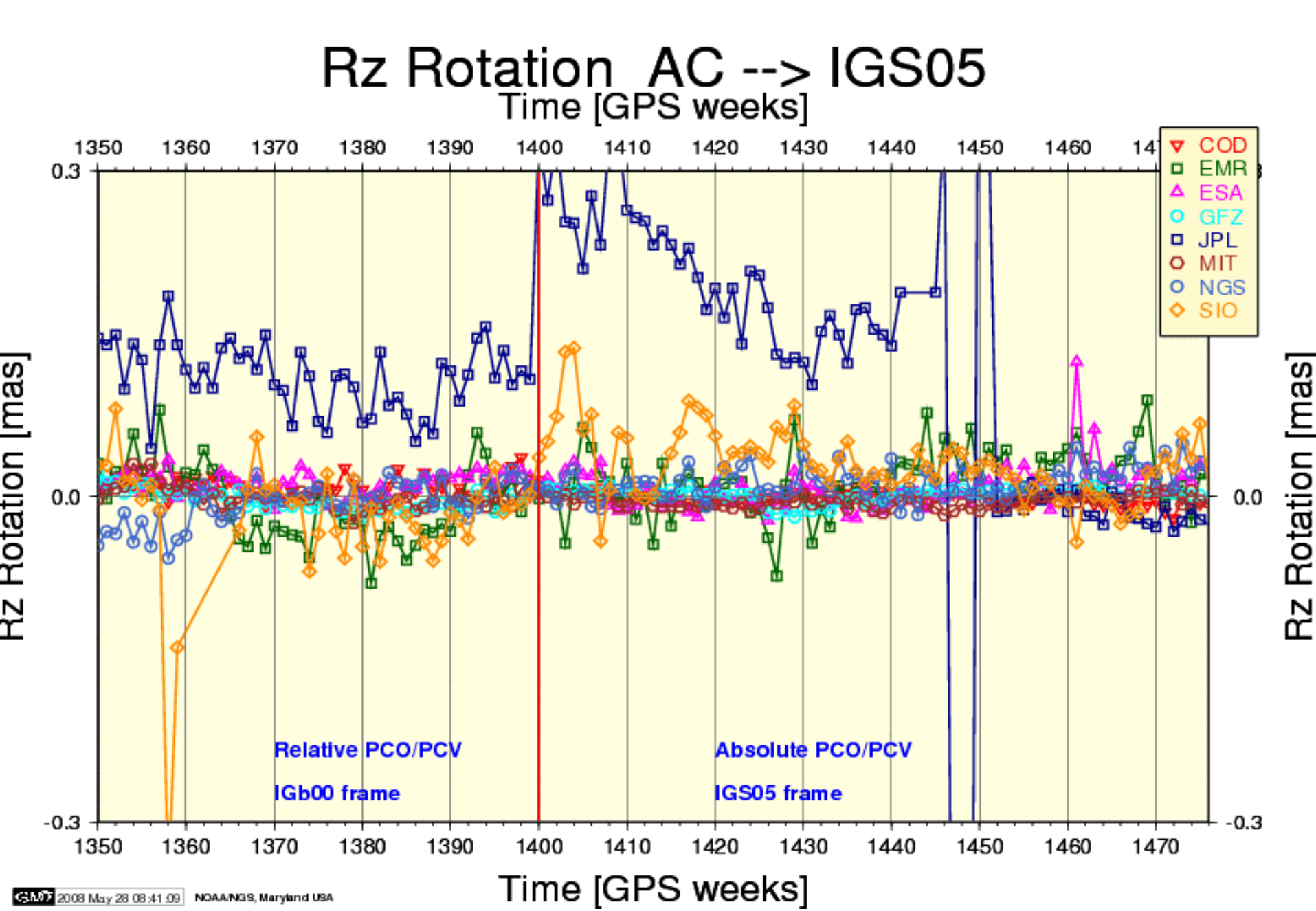
NOAA/NGS, Maryland USA


Rz Rotation AC --> IGS05
Time [GPS weeks]
1350 1360 1370 1380 1390 1400 1410 1420 1430 1440 1450 1460
COD
EMR
ESA
GFZ
JPL
MIT
NGS
SIO
0.3
0.0
-0.3
Rz Rotation [mas]
Relative PCO/PCV
IGb00 frame
Absolute PCO/PCV
IGS05 frame
1350 1360 1370 1380 1390 1400 1410 1420 1430 1440 1450 1460 1470
Time [GPS weeks]
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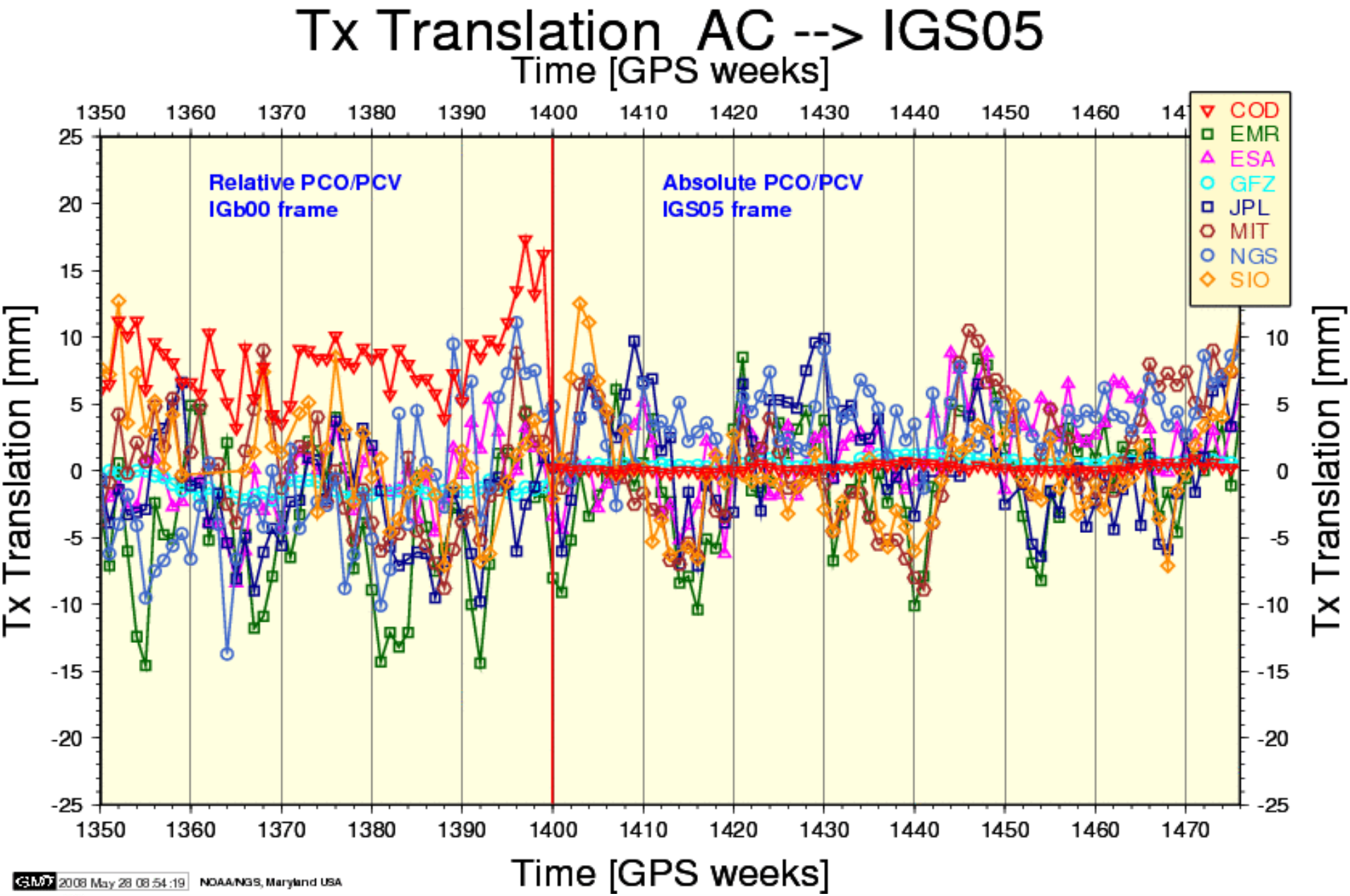
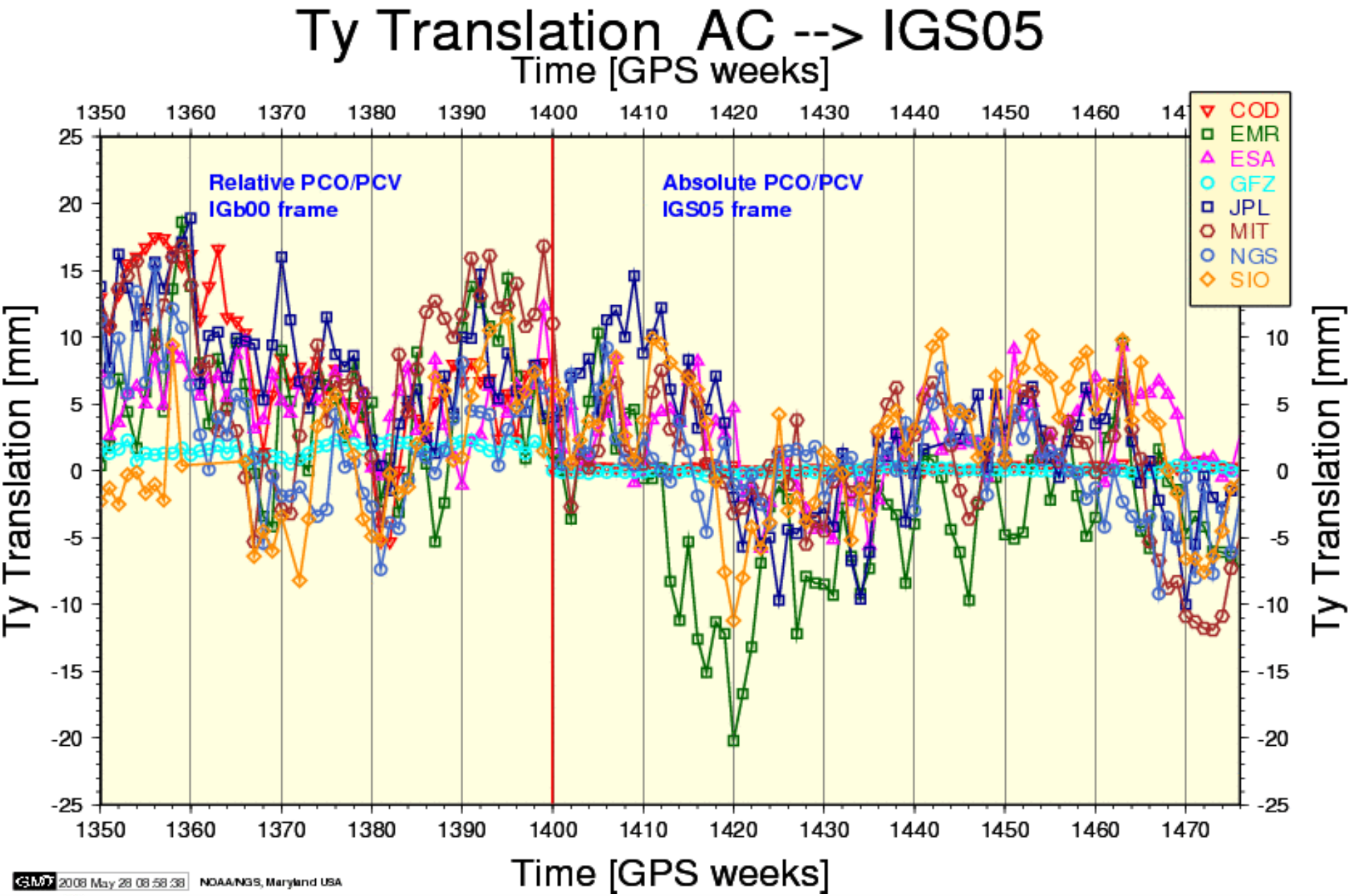
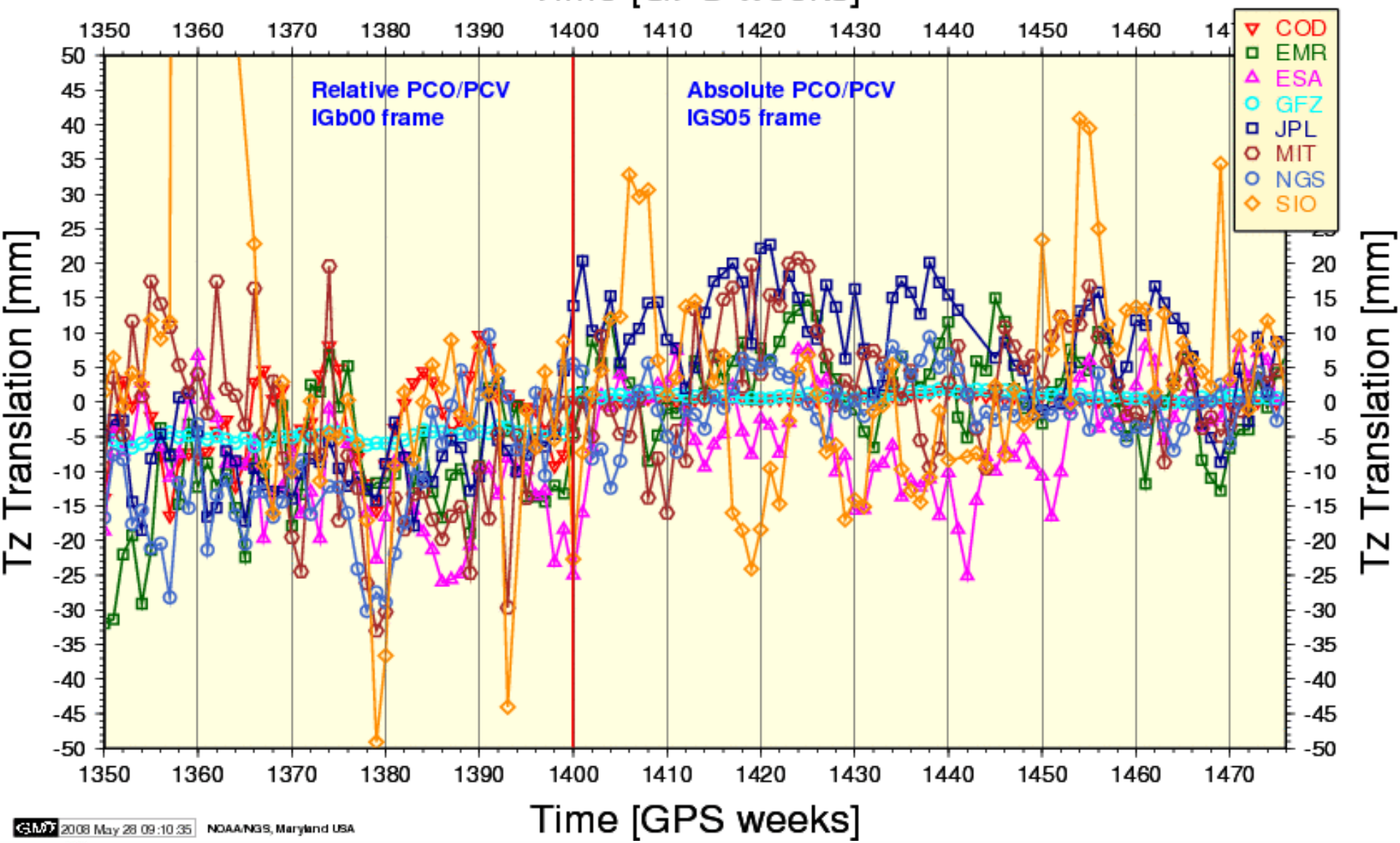
NOAA/NGS, Maryland USA


Tx Translation AC --> IGS05
Time [GPS weeks]
Relative PCO/PCV
IGb00 frame
Absolute PCO/PCV
IGS05 frame
COD
EMR
ESA
GFZ
JPL
MIT
NGS
SIO
Tx Translation [mm]
Time [GPS weeks]
2008 May 28 08:54:19
NOAA/NGS, Maryland USA


Ty Translation AC --> IGS05
Time [GPS weeks]
Relative PCO/PCV
IGb00 frame
Absolute PCO/PCV
IGS05 frame
COD
EMR
ESA
GFZ
JPL
MIT
NGS
SIO
Ty Translation [mm]
Time [GPS weeks]
2008 May 28 08:58:38
NOAA/NGS, Maryland USA

Tz Translation AC --> IGS05



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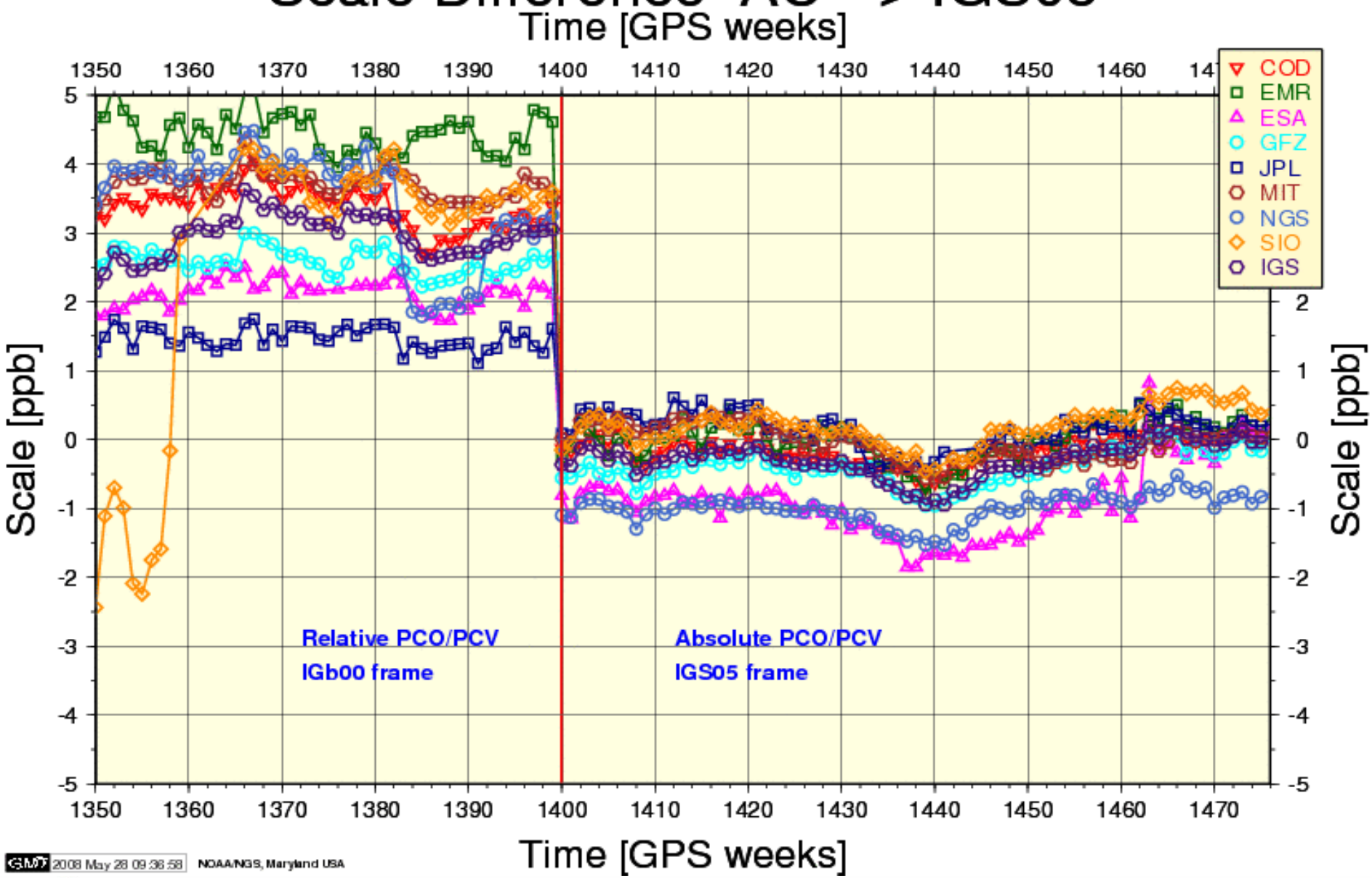
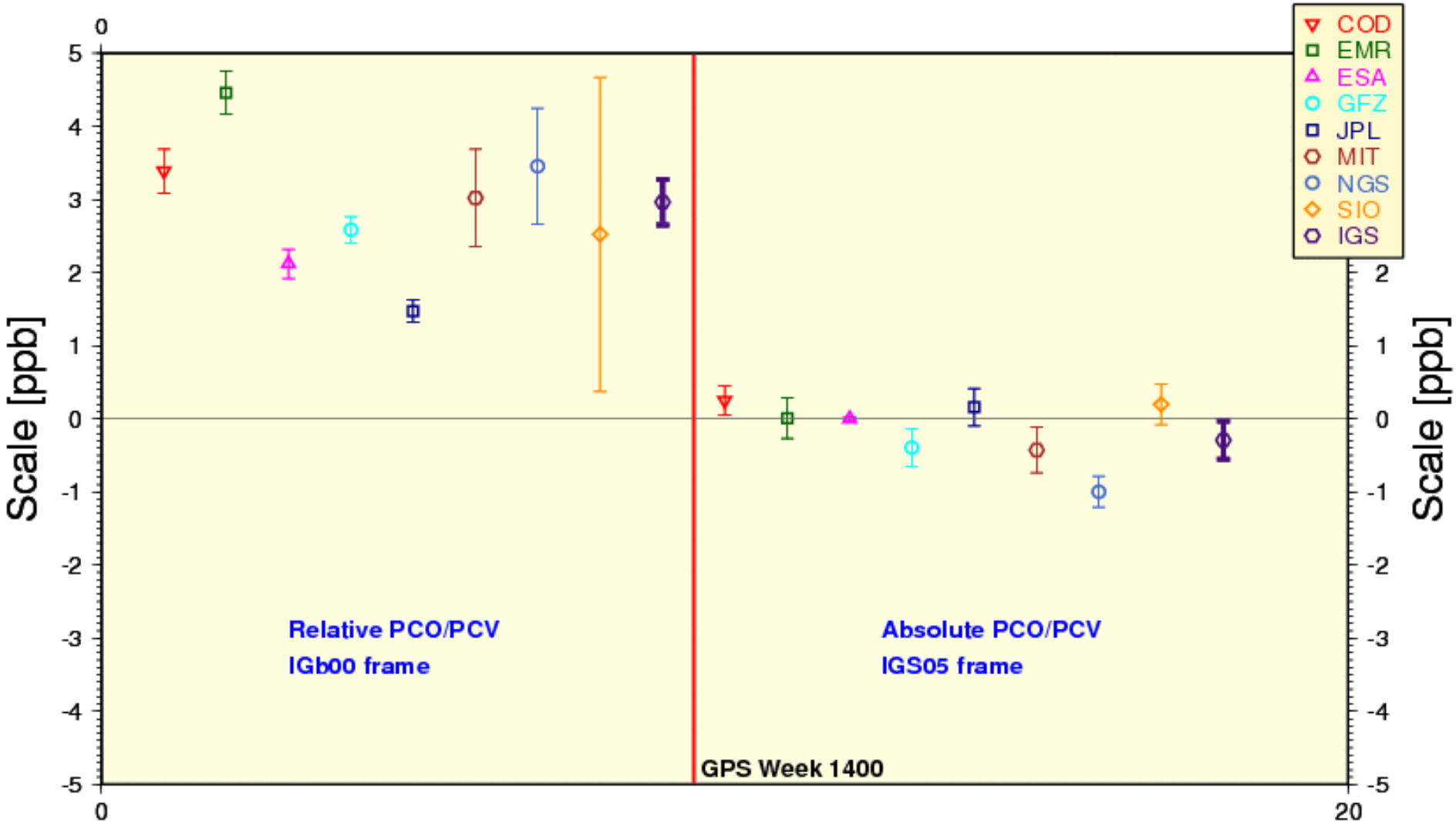
Scale Difference AC --> IGS05



2008 May 28 09:36:58 NOAA/NGS, Maryland USA

National Oceanic and Atmospheric Administration

Mean Scale w/ STD AC --> IGS05



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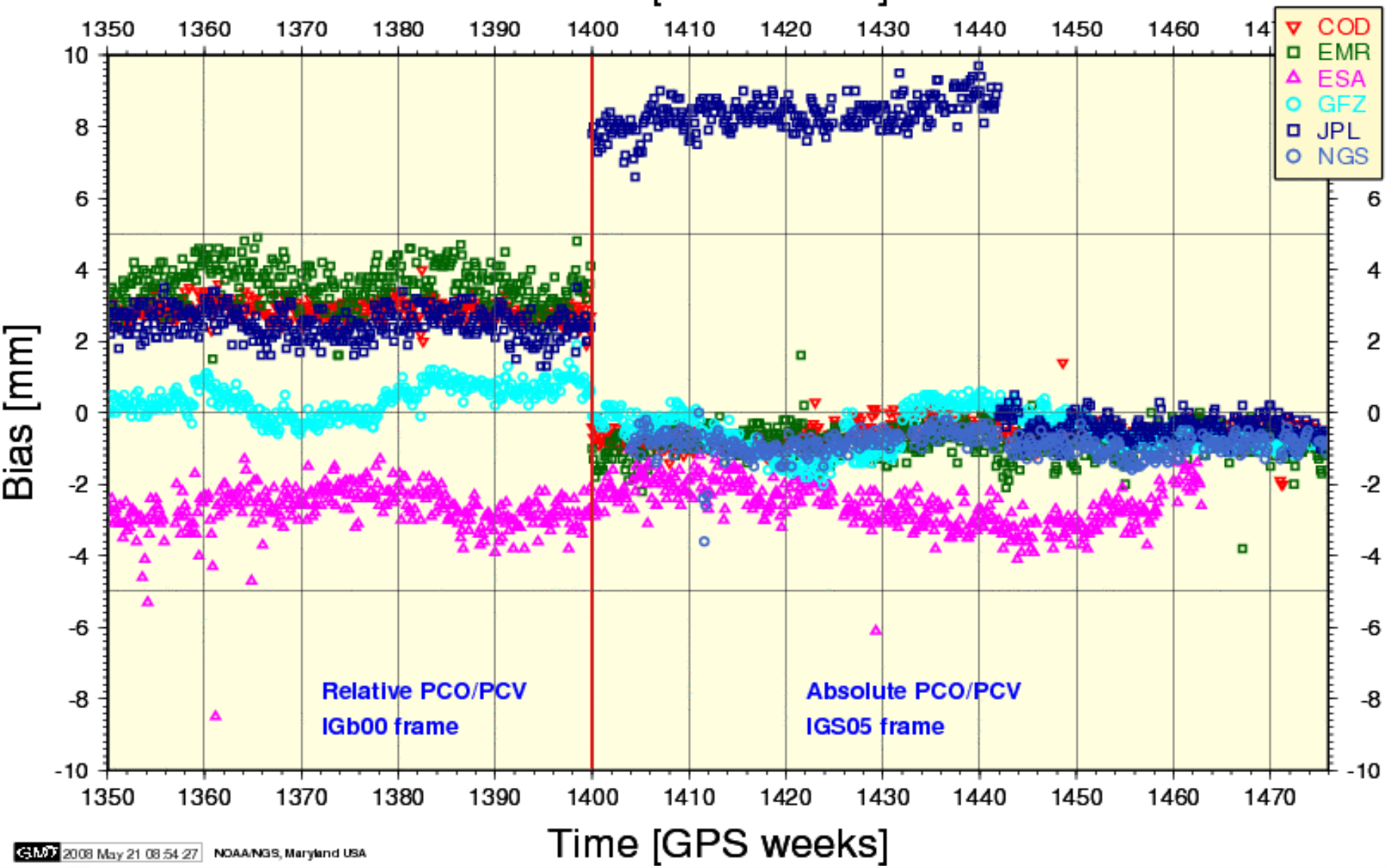
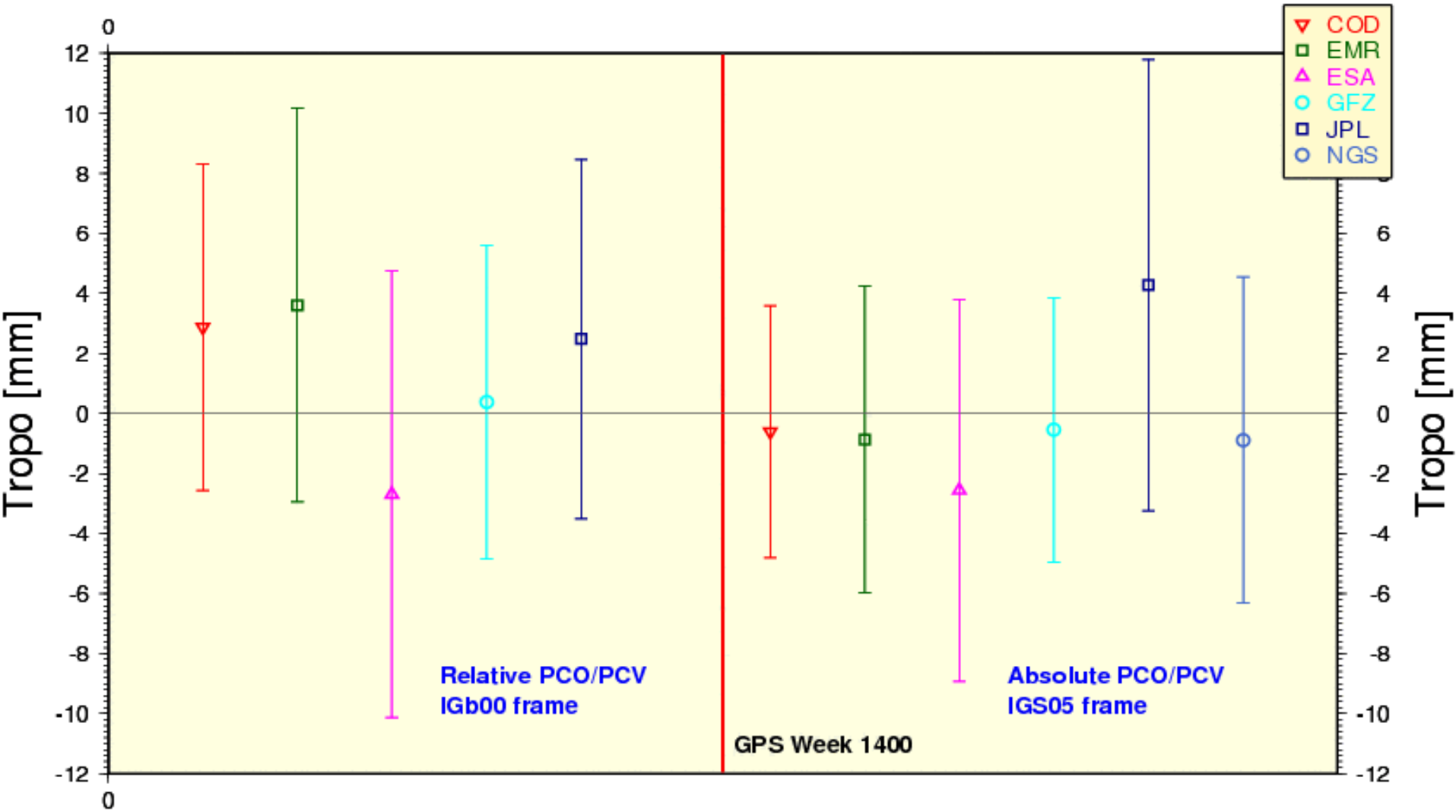
Tropo Biases AC --> Combination



2008 May 21 08:54:27 NOAA/NGS, Maryland USA

Mean Tropo w/ STD AC --> Combination



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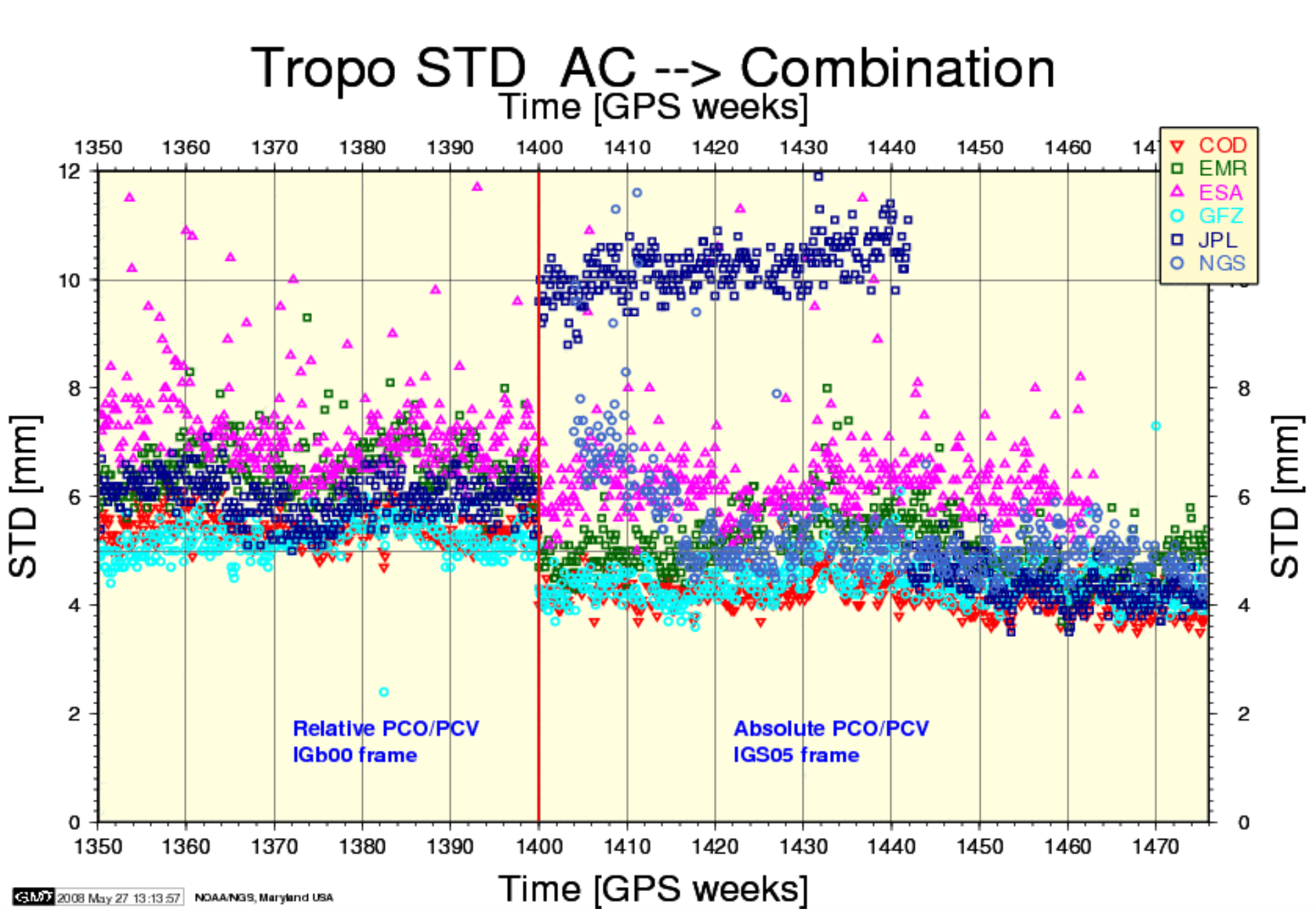
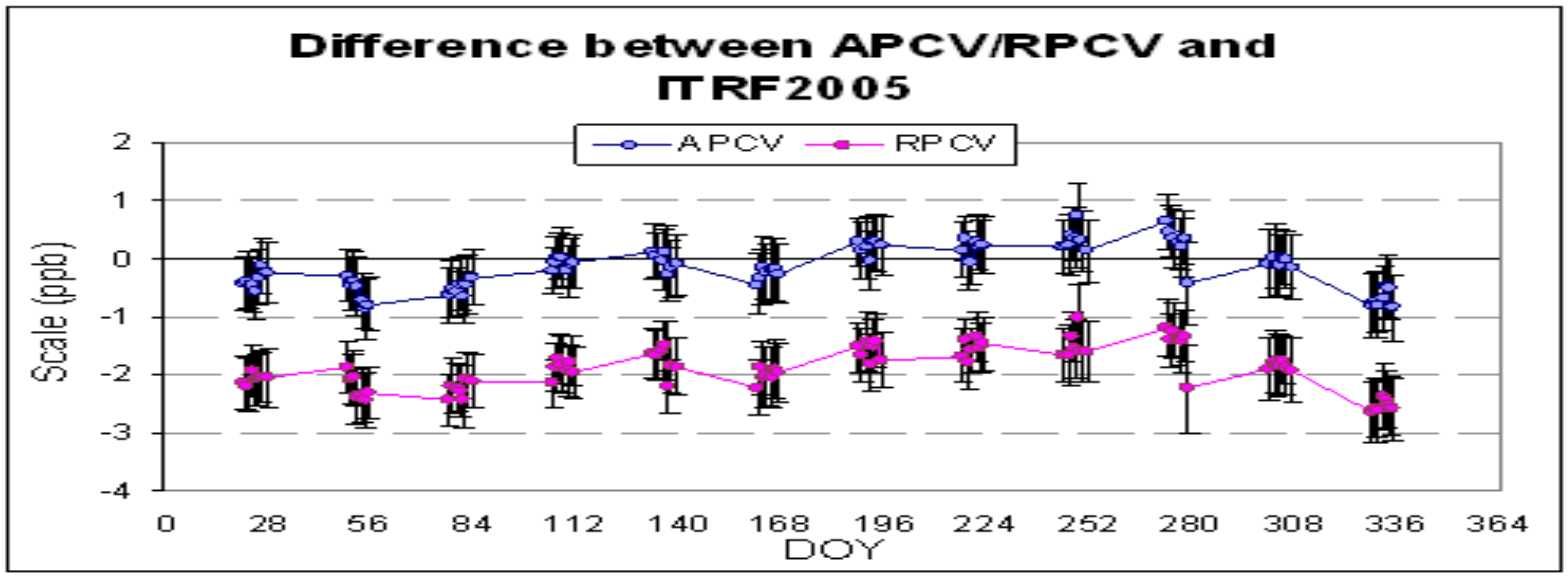

Tropo STD AC --> Combination
Time [GPS weeks]
1350 1360 1370 1380 1390 1400 1410 1420 1430 1440 1450 1460
COD
EMR
ESA
GFZ
JPL
NGS
STD [mm]
0 2 4 6 8 10 12
Relative PCO/PCV
IGb00 frame
Absolute PCO/PCV
IGS05 frame
1350 1360 1370 1380 1390 1400 1410 1420 1430 1440 1450 1460 1470
Time [GPS weeks]
2008 May 27 13:13:57
NOAA/NGS, Maryland USA

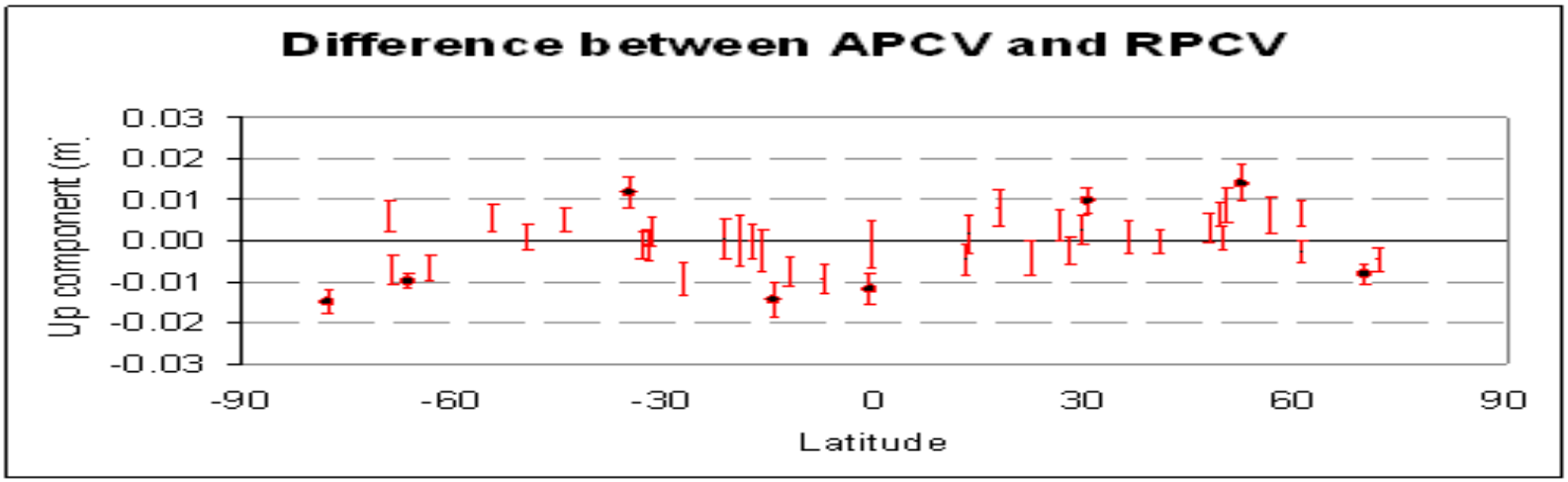
Phase Center Variation Test

Estimating the orbits in order to be consistent with each model, the impact of the switch from relative phase center variations (RPCV) to absolute phase center variations (APCV) on the reference frame is a:

- Scale change of 1.8 ppb (± 0.1) or 11.5 mm at the Equator, corroborating (Ferland 2006)
- Station specific vertical changes (local effects) up to 1.5 cm (black points are significant differences)

Courtesy – Álvaro Santamaria, Marie-Noëlle Bouin & Guy Wöppelmann





Courtesy – Álvaro Santamaria, Marie-Noëlle Bouin & Guy Wöppelmann

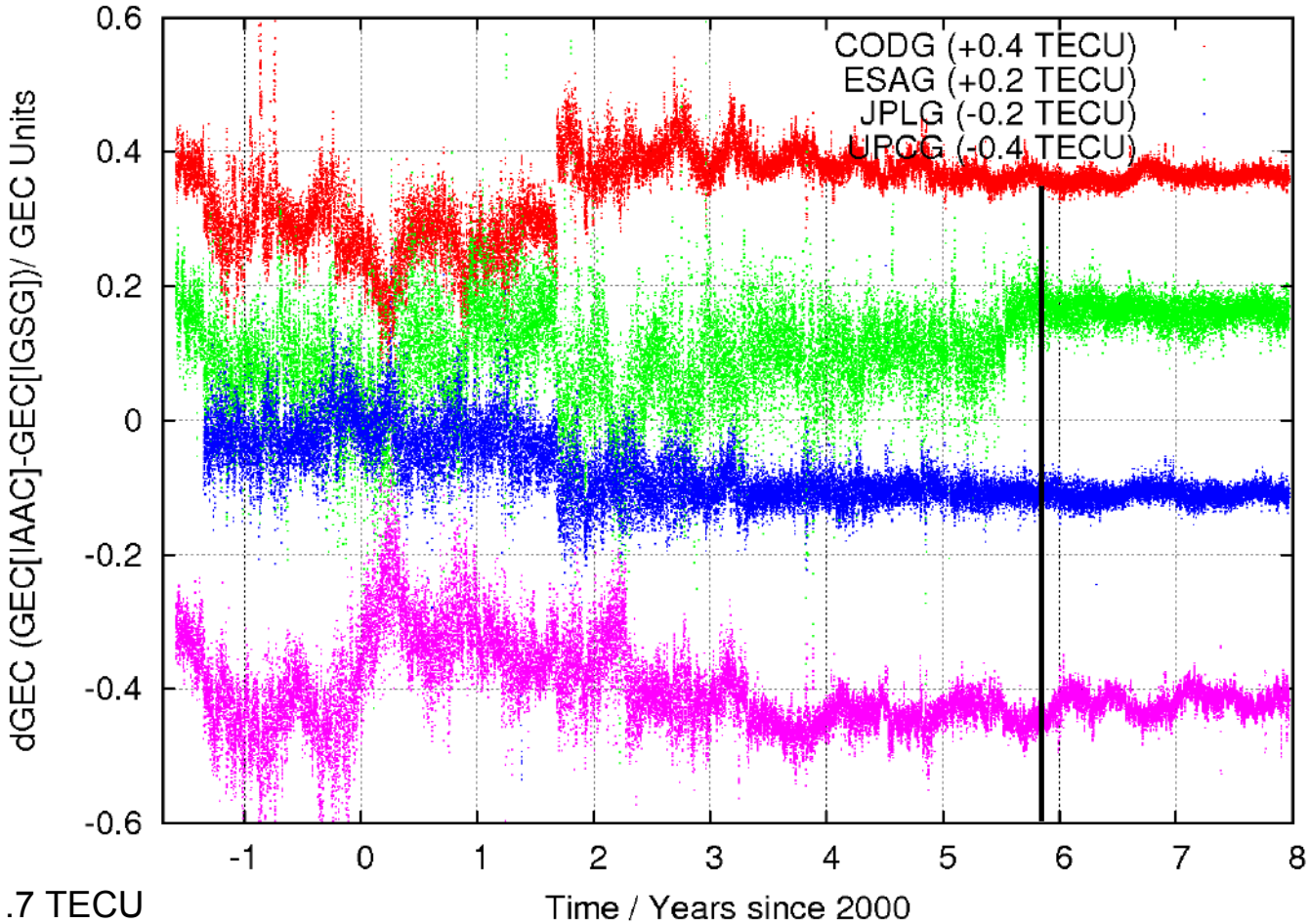
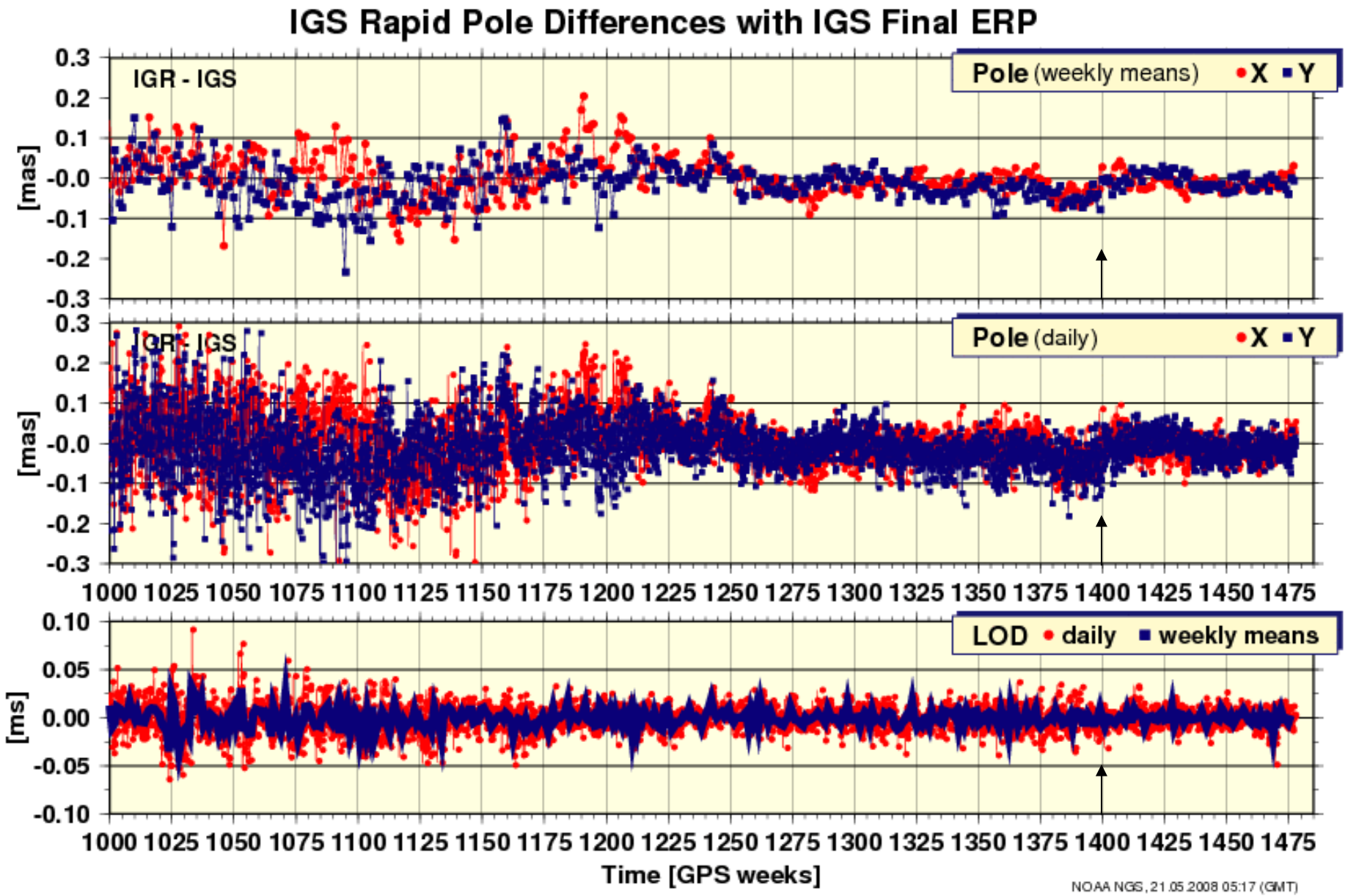


Fig. 19 Evolution of Global Electron Content referred to the IGSG one (source: Final IGS VTEC maps). Notice that the values are shifted for CODG (red), ESAG (green), JPLG (blue), UPCG (magenta) by +0.4, +0.2, -0.2 and -0.4 TECUs, respectively, to facilitate the comparisions.

Courtesy – Manuel Hernandez-Pajares, Miguel Juan-Zornoza & Jaume Sanz



Courtesy – Gerd Gendt

Conclusions

- At week 1400, an antenna model change (relative to absolute PCOs/PCVs) and a frame change (IGb00 to IGS05) took place
- TRF scale change of approximately 3.0 ppb for IGS; scale agreement among ACs improved by at least x 2
- No significant change in the evolution of the Global Electron Content except for possible reduction in scatter
- No significant change to the pole (daily and weekly means)
- No significant change to the LOD (daily and weekly means)