An Investigation of EOP Combination Solutions Produced Using Intra-Technique Combinations

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Outline

- IERS Rapid Service/Prediction Center's (RS/PC) Combination Process
- Data: Intra-Technique Combinations
  - Complimentary Series
- Preliminary Inter-Techniques Using New Series
- What's Next?
- Items to consider

Data

- GPS - IGS Finals & Rapids
  - igs00p02.erp & igs96p02.erp
    - PM-X, PM-Y, LOD Daily sample rate at 12hr
- VLBI - IVS 24 Hour
  - ivs03r1e.eops
    - PM-X, PM-Y, UT1-UTC, dPsi, dEpsilon
    - Twice a week at Experiment Time
- SLR - ILRS Series B
  - ilrsbpos+eop.YYMMDD.v#.snx
    - PM-X, PM-Y, LOD Daily sample rate at 12hr
- DORIS - IDS
  - ign03wd01.eop
    - PM-X, PM-Y, LOD Daily sample rate at 12 hr

RS/PC EOP Combination

- Data Combined
  - GPS - IGS Finals & Rapids
  - VLBI 24 hr - IAA, GSFC, USNO, IVS-Comb.
  - VLBI Intensives - St.Peterburg, GSFC, USNO
  - SLR - CSR, Delft, IAA, MCC
- Frequency
  - Daily and Weekly solutions with predictions

IERS EOP Technique

- Weighted Cubic Spline for irregularly spaced data
  - Aligning the different series for period of combination
  - Weight

Alignment

Bias	Rate	Data Type
.1956D-02	-.1292D-05	ILRS B X
.9398D-03	-.7715D-06	ILRS B Y
.8814D-02	.3470D-05	ILRS B UT
-.1386D-02	.8244D-06	DORIS X
.8336D-04	.1935D-06	DORIS Y
.9229D+00	.1127D-02	DORIS UT
-.2636D-03	.1966D-06	IVS VLBI X
-.1365D-03	-.4043D-08	IVS VLBI Y
-.1357D-04	.1354D-08	IVS VLBI UT
.7193D-04	-.4673D-07	IGSF GPS X
-.1792D-03	-.6039D-08	IGSF GPS Y
.1340D+00	-.3349D-03	IGSF GPS UT

Units: PM: arcseconds or UT1: seconds

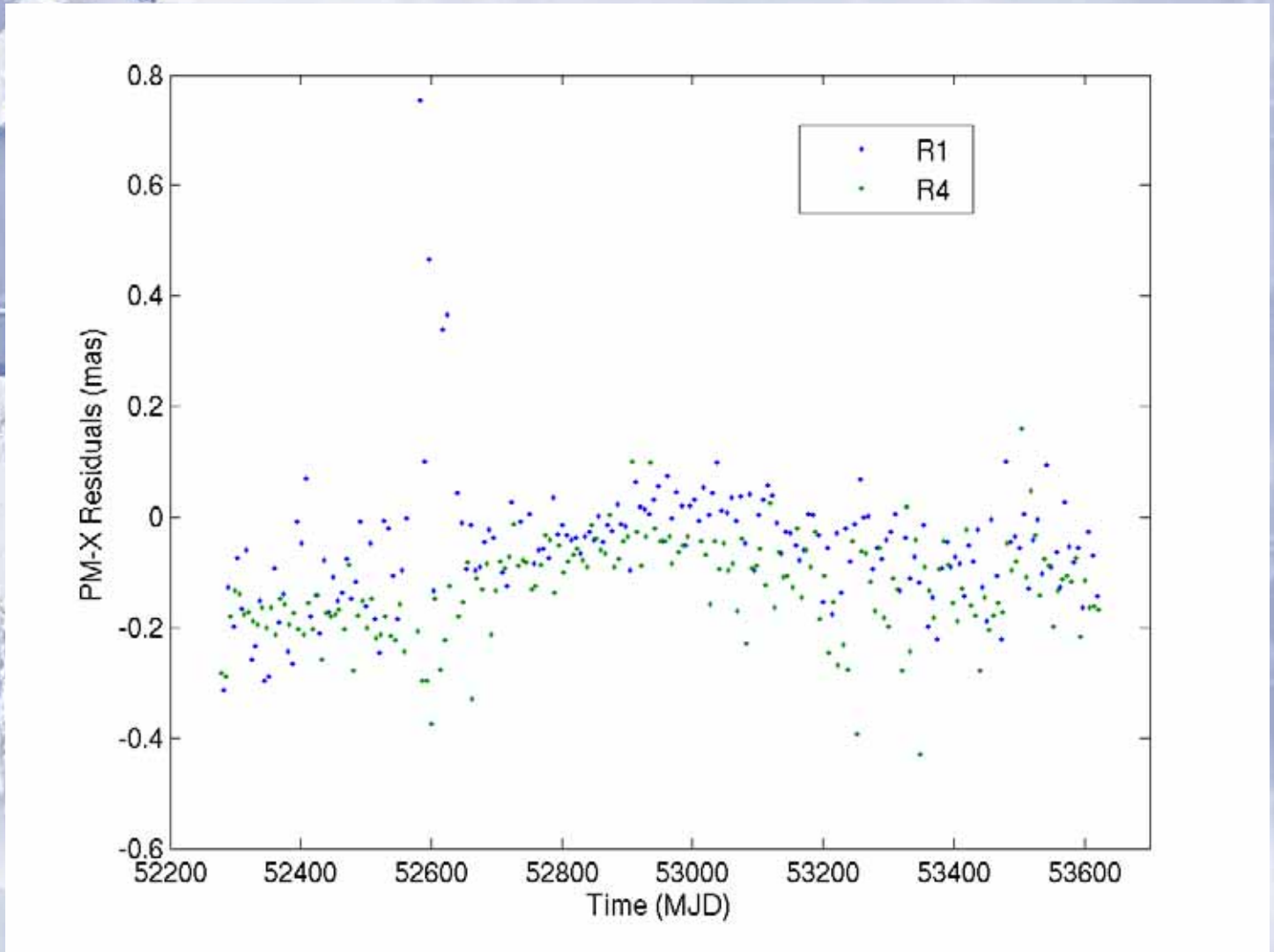
IERS EOP Technique

- Weighted Cubic Spline for irregularly spaced data
  - Aligning the different series for period of combination
  - Editing
  - Weighting Each Observation
    - Series Statistical Performance
    - Formal Error

Examination of New Series

- See Poster in Session 4, "A comparison of SLR and Doris Techniques to Space Geodetic Observations Currently Used in the IERS Bulletin A" by T. Johnson and J. Murphy

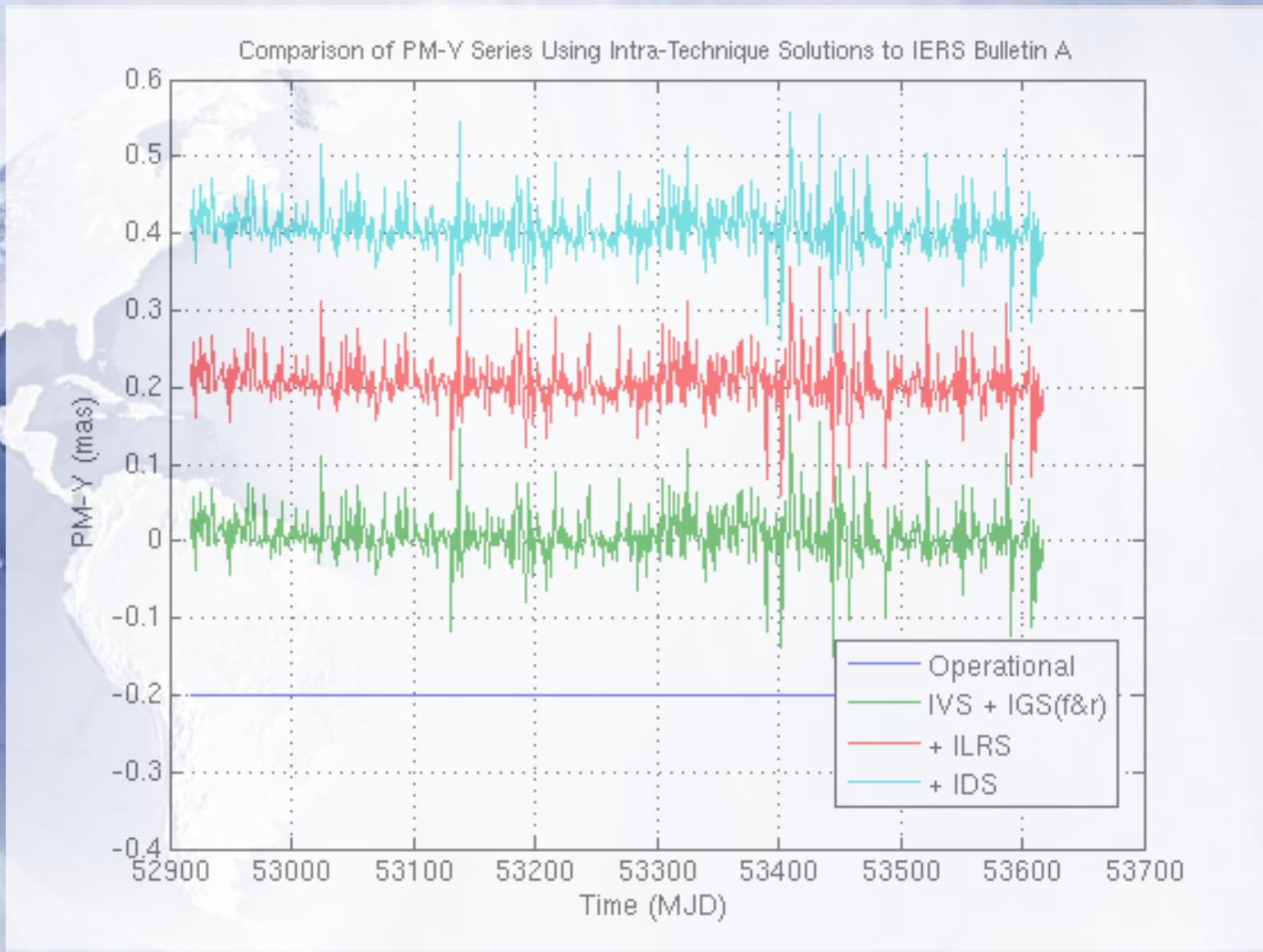
IVS R1 & R4 Experiments



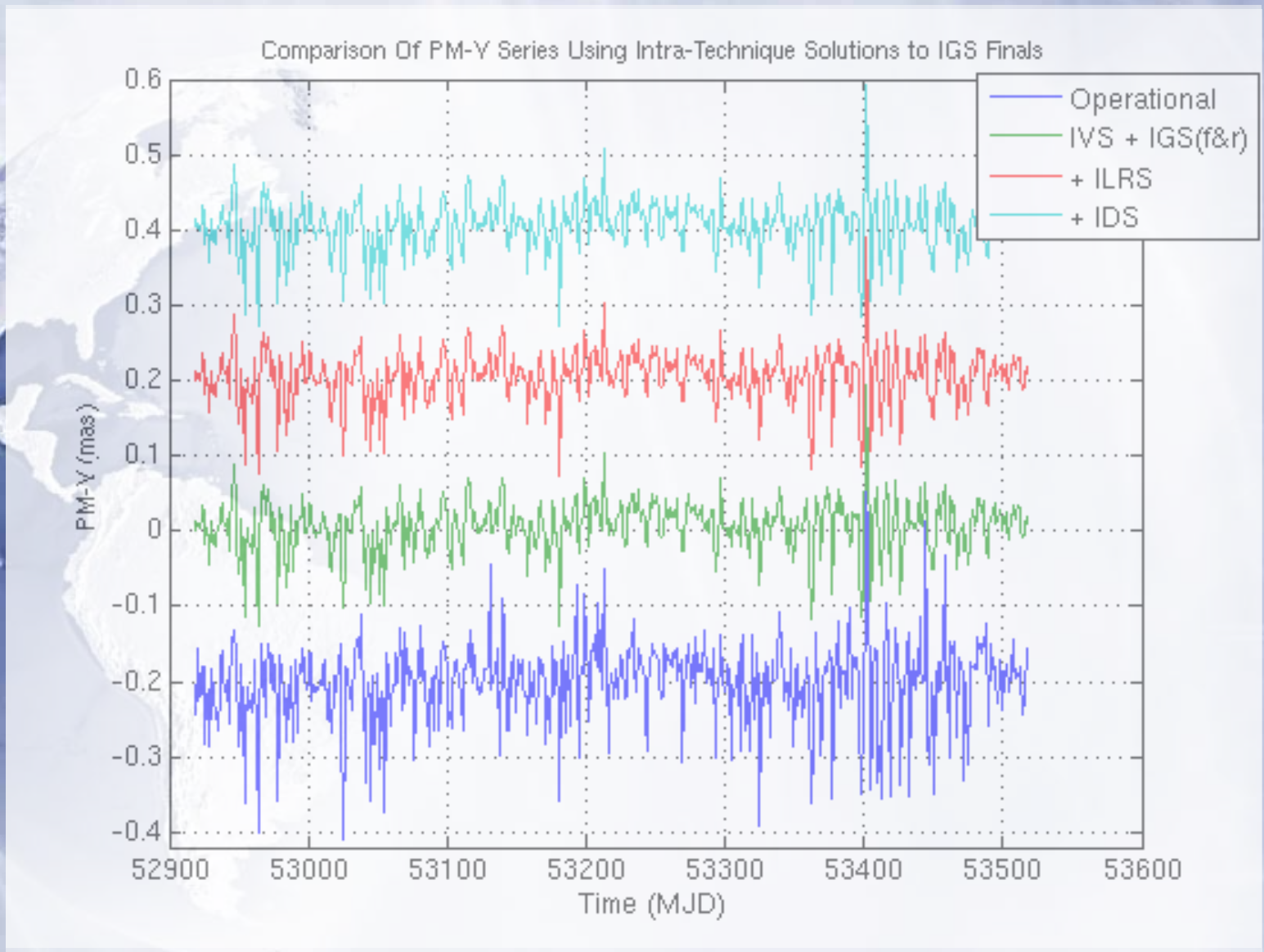
Standard Deviation of Residuals

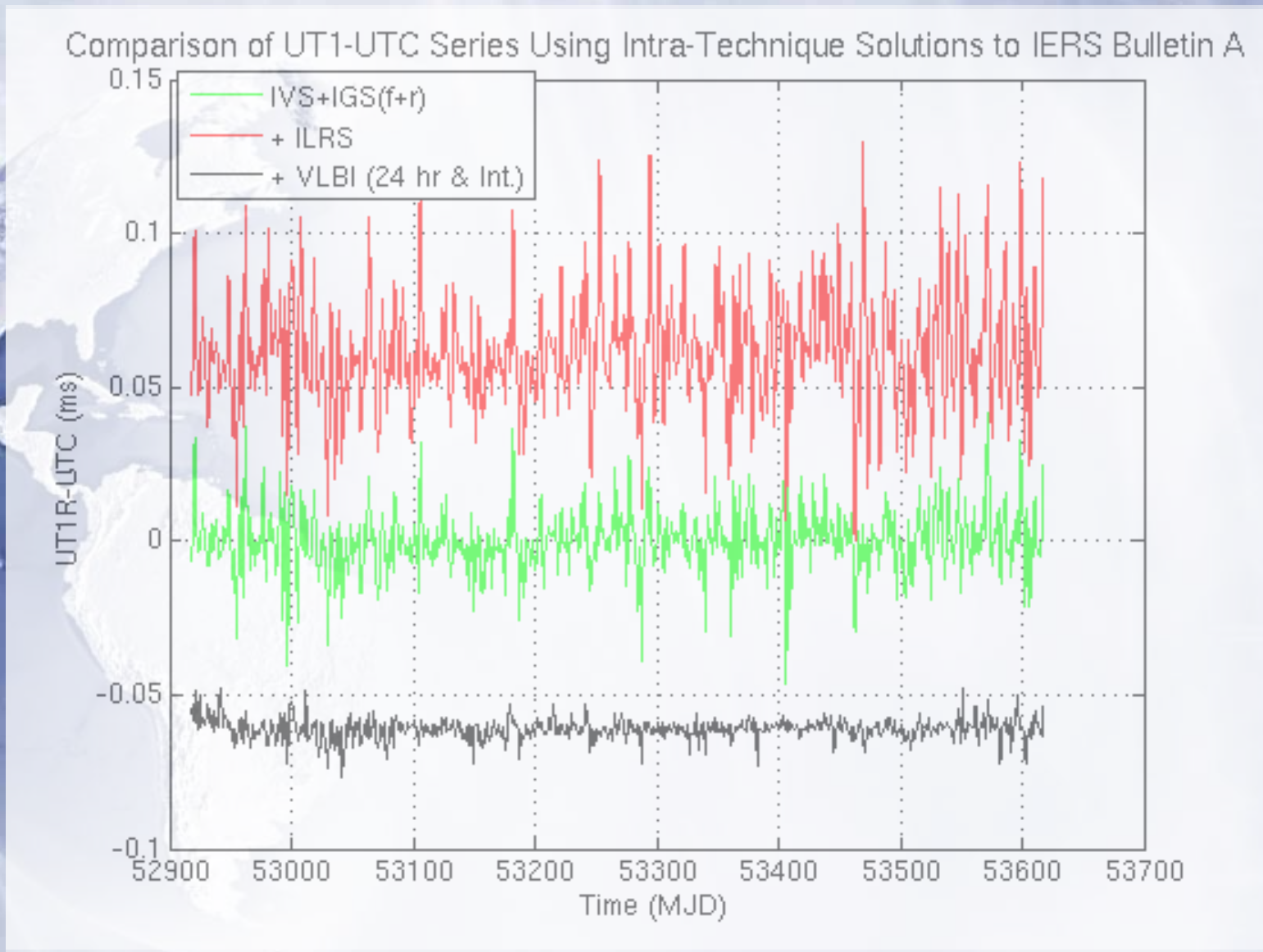
Initial Combinations and how they compare to Bulletin A

	PM-X	PM-Y
	(mas)	(mas)
IGS(finals)	0.0517	0.0408
IVS	0.1070	0.1033
ILRS	0.2674	0.3313
IDS	1.3536	0.7242


Comparison of PM-Y Series Using Intra-Technique Solutions to IERS Bulletin A
PM-Y (mas)
Time (MJD)
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
52900
53000
53100
53200
53300
53400
53500
53600
53700
Operational
IVS + IGS(f&r)
+ ILRS
+ IDS


Technique – Rapid Service in x
IVS VLBI
IAA VLBI
GSFC VLBI
USNO VLBI
ILRS SLR
DORIS
IAA SLR
MCC SLR
IGS
Bulletin B
C 04
Residual (msec. of arc)
0
5
10
15
7500
7550
7600
7650
MJD−46000


Comparison Of PM-Y Series Using Intra-Technique Solutions to IGS Finals
Operational
IVS + IGS(f&r)
+ ILRS
+ IDS
PM-Y (mas)
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
52900
53000
53100
53200
53300
53400
53500
53600
Time (MJD)

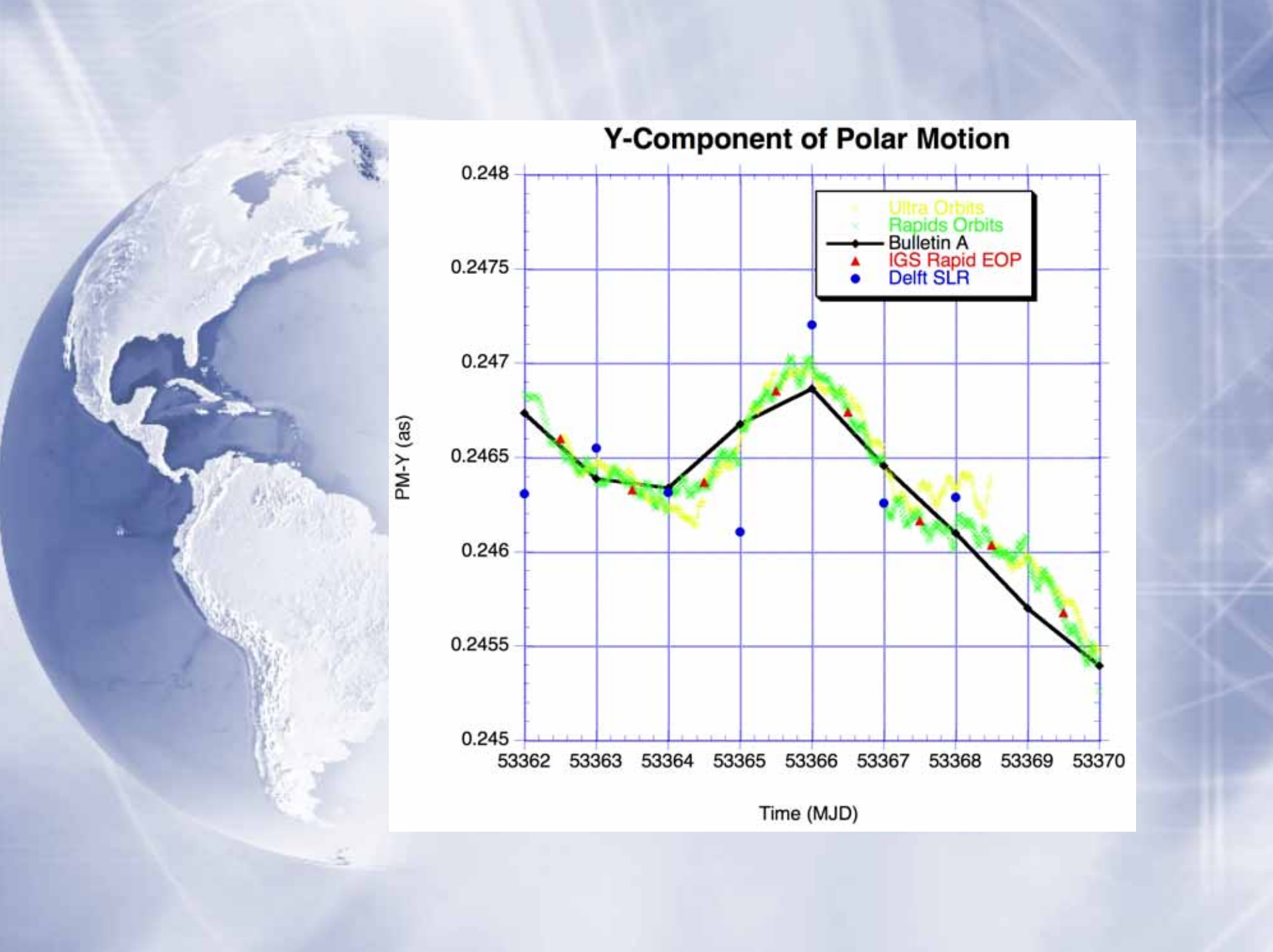

Comparison of UT1-UTC Series Using Intra-Technique Solutions to IERS Bulletin A
IVS+IGS(f+r)
+ ILRS
+ VLBI (24 hr & Int.)
UT1R-UTC (ms)
0.15
0.1
0.05
0
-0.05
-0.1
52900
53000
53100
53200
53300
53400
53500
53600
53700
Time (MJD)

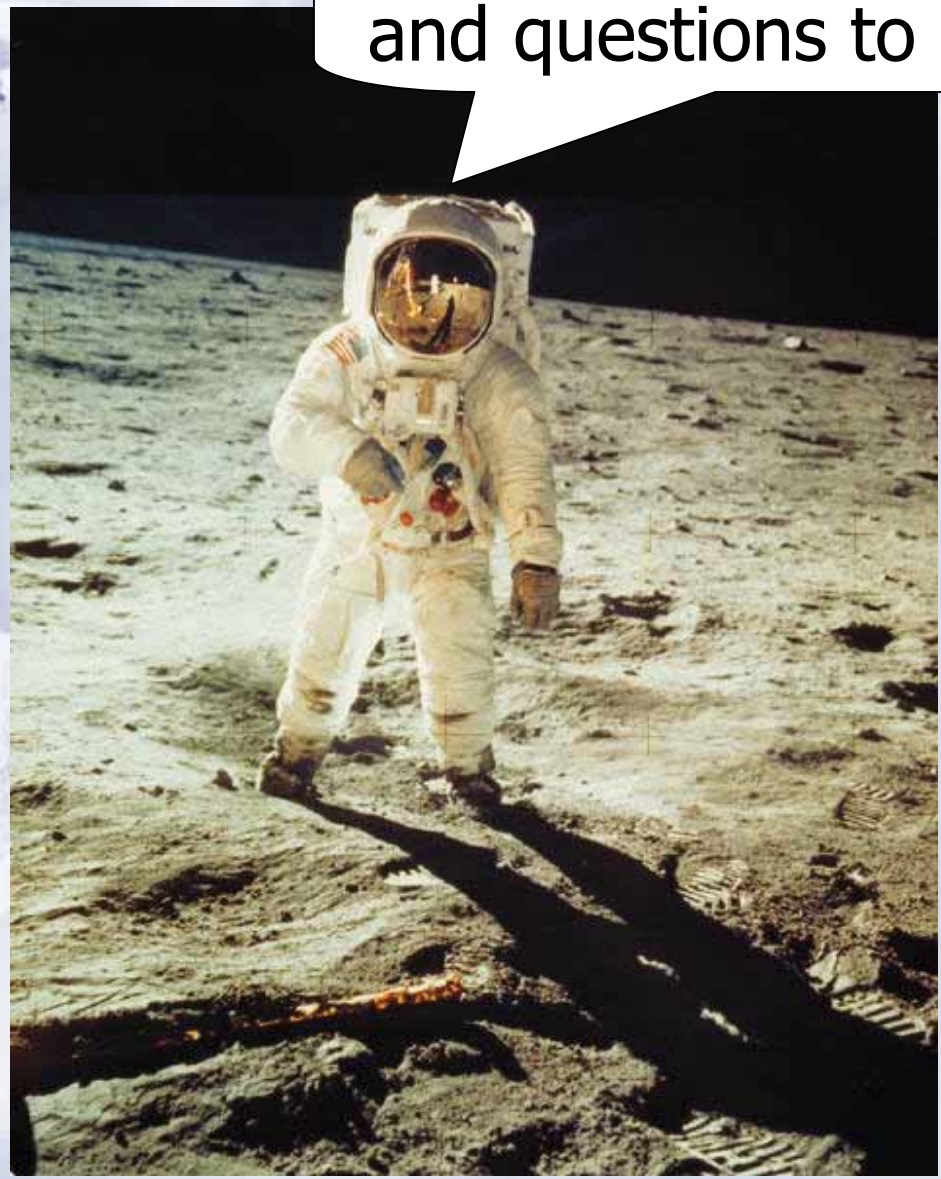
What's Next?

- Determine the combination that best works for the IERS RS/PC.
  - IVS and IGS combinations already used
  - Replace Analysis Centers (ACs) SLR series with ILRS Series
  - UT1-UTC will still require VLBI (24hr & Intensives) from ACs.

Items to Consider

- Will required the EOPs be available in a timely fashion and in useful form (i.e.,not unconstrained solutions).
- Will the solutions from the AC still be available for the near-real time users?
- Having all series be at uniform sample times a good thing?
  - Does it Compliment the series?
  - Promote higher sample rates?


Y-Component of Polar Motion
Ultra Orbits
Rapids Orbits
Bulletin A
IGS Rapid EOP
Delft SLR
PM-Y (as)
0.248
0.2475
0.247
0.2465
0.246
0.2455
0.245
53362
53363
53364
53365
53366
53367
53368
53369
53370
Time (MJD)


We still have work to do,
and questions to answer.