

**Combination of reprocessed
orbit, clock and ERP products**

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Status of IGS Final Products before Reprocessing

- Orbits (with 15-minute clocks) & ERP products since 1994
- SINEX (since 1996; ERP since June 1999)
- Combined Clocks
 - with 5-minute sampling since Oct 2000 (week 1085)
 - with 30-second sampling since Dec 2006 (week 1406)
- ACs:

	# in Combi	COD	ESA	EMR	GFZ	JPL	MIT	NGS	SIO
SINEX	8	y	y	y	y	y	y	y	y
ERP	8	y	y	y	y	y	y	y	y
Orbits	8	y	y	y	y	y	y	y	y
Clocks	6	y	y	y	y	y	y	-	-
Clk 30s	3	y	-	y	-	-	y	-	-

: Reprocessing contribution

- **Goal**

- **Generation of RF with consistent ERP (contribution to ITRF)**
- **Consistent orbits referred to given RF**
- **Consistent clocks for PPP in given RF (now possible after Oct 2000 only)**

- **Test period**

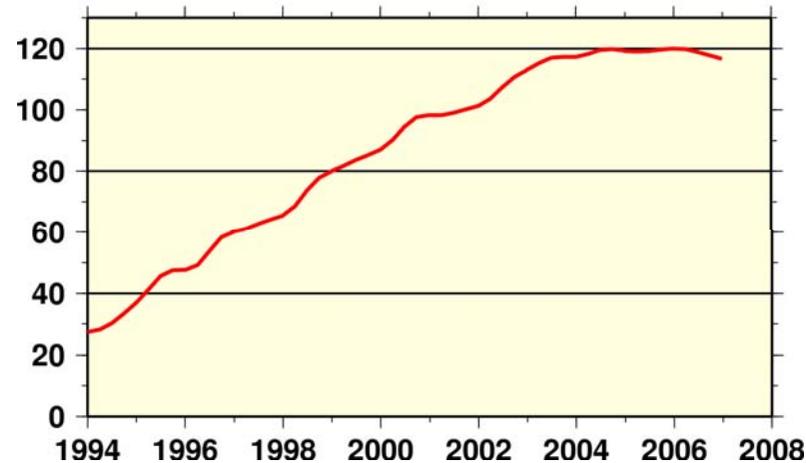
- **Jan to Apr 2000, 14 GPS weeks (1042 to 1056)**
- **Jun to Dec 2007, 30 GPS weeks (1430 to 1459) (Check with latest official products) [NGS last 10 weeks → used as interval for all statistics]**

	ESA	GFZ*	MIT	NGS	PDR	SIO	# in Cmb	RouCmb
SINEX	y	y	y	y	y	(y)	6	8
ERP	y	y	y	y	y	y	6	8
Orbits	y	y	y	y	y	y	6	8
Clocks	y	y	y	-	-	-	3	6
Clk 30s	-	-	y	-	-	-	--	3

*not 2000

~COD

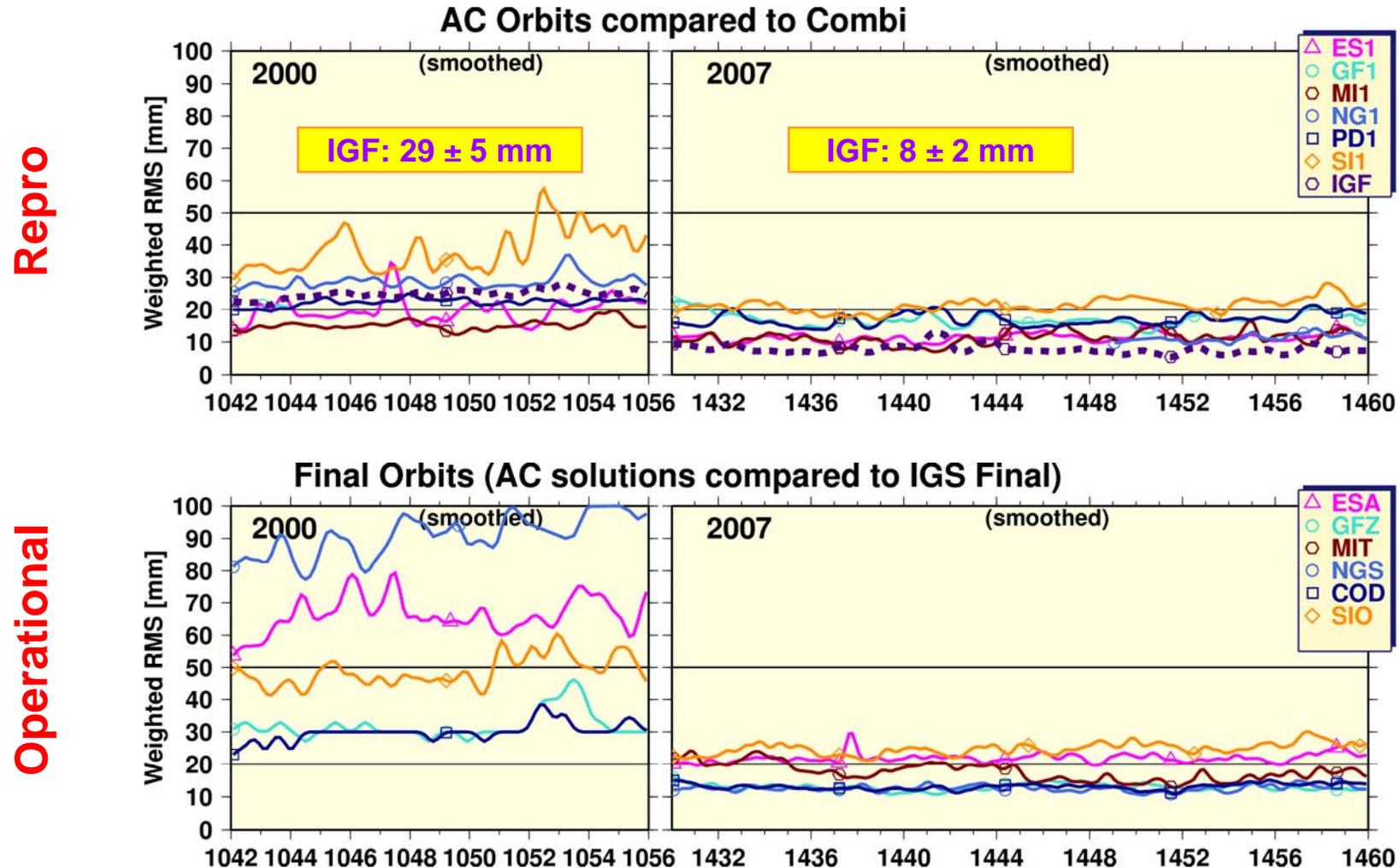
- Number of stations defining the IGS05



- Note: AC's frame rotation from SINEX combination will be used to align the orbits.
- ➔ Consistency between orbits and SINEX solution is important, and is degrading in the early years because of the reduced number of RF stations

Orbits – Differences to combination

- All orbits (including operational IGS Finals) are compared to combined repro orbits.



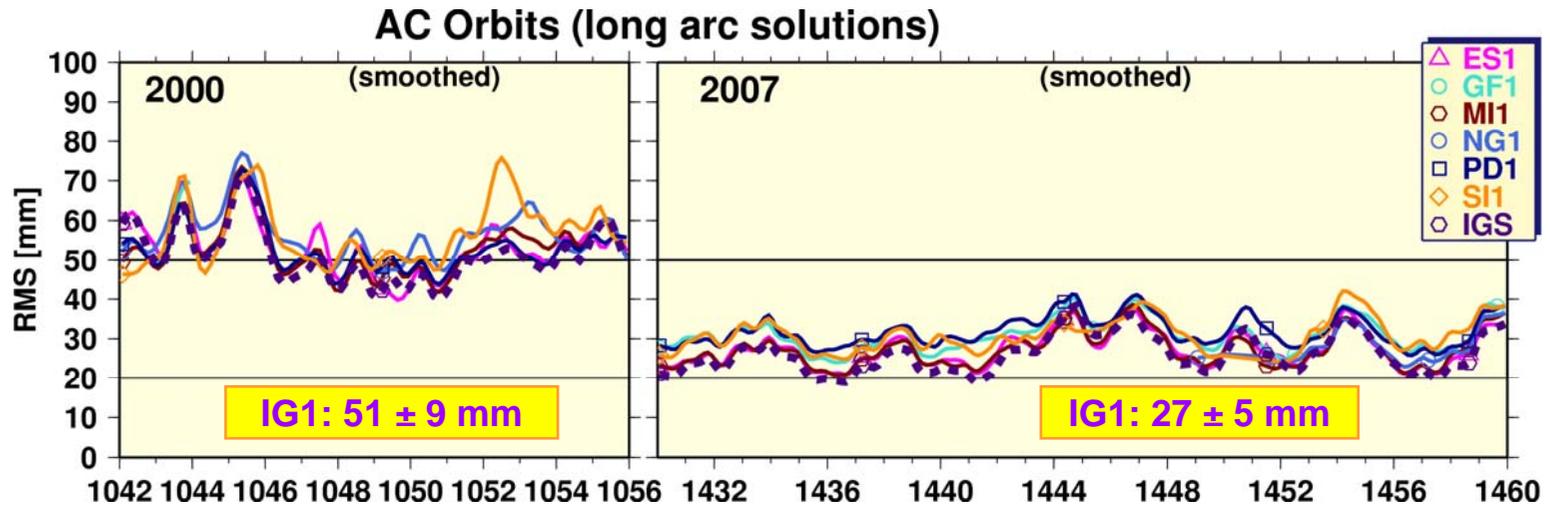
- Improvements for 2000

- Repro quality comparable with operational product in 2007

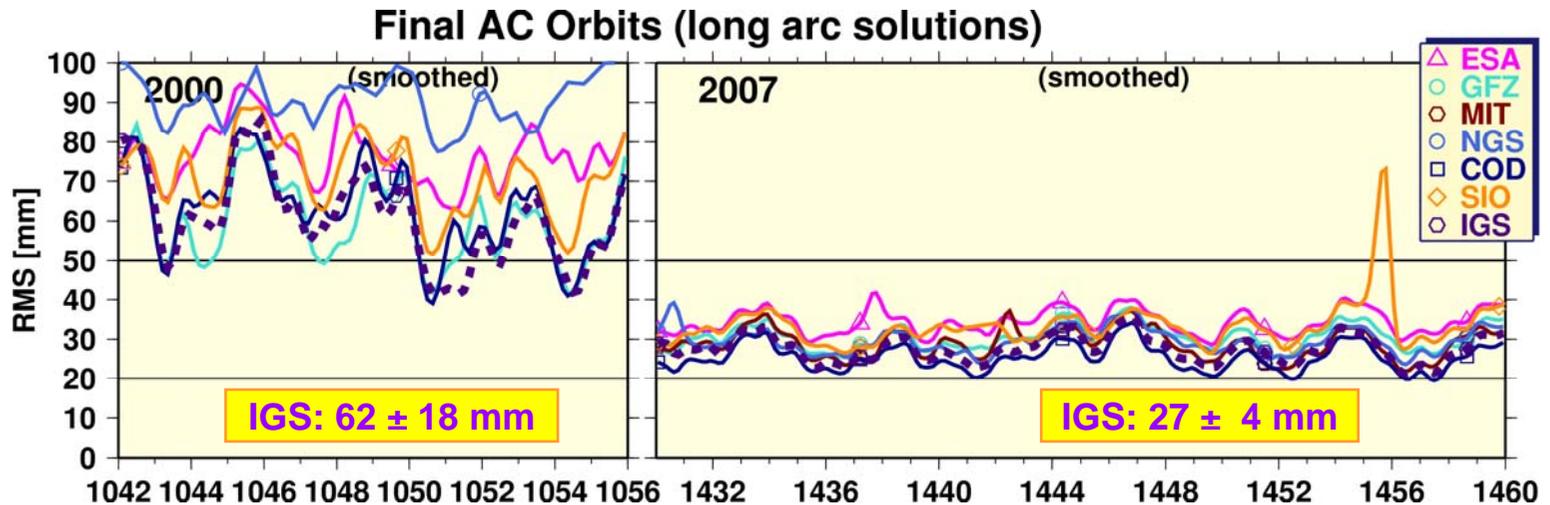
Orbits – Long Arc Fit

- 7-day long arc fit through all orbits, including the combined ones

Repro

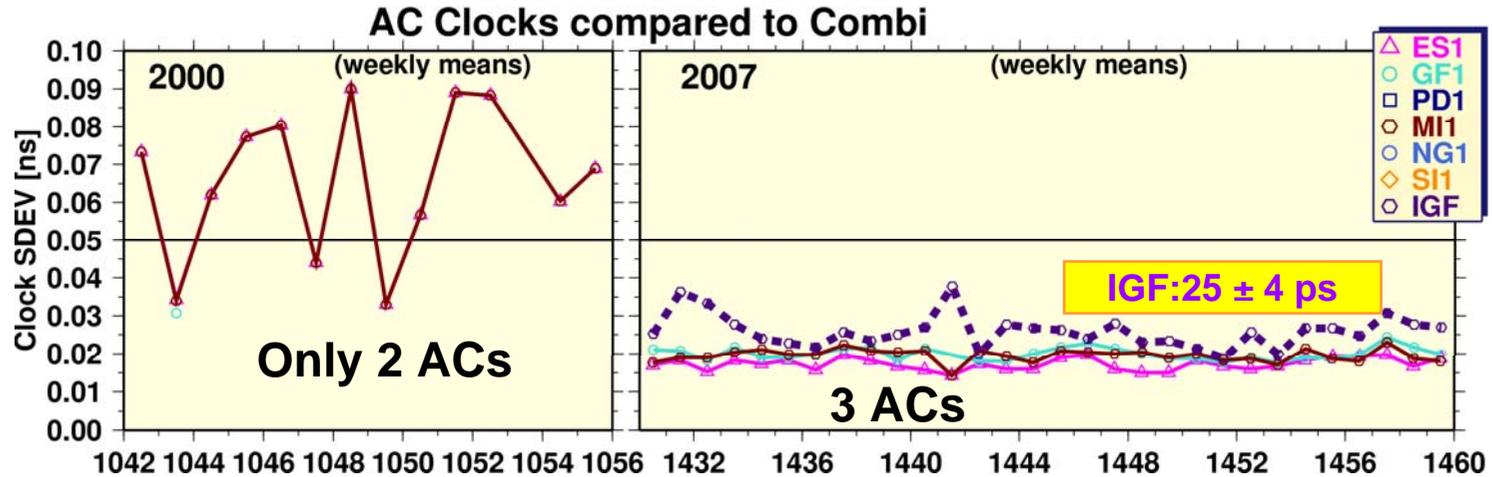


Operational

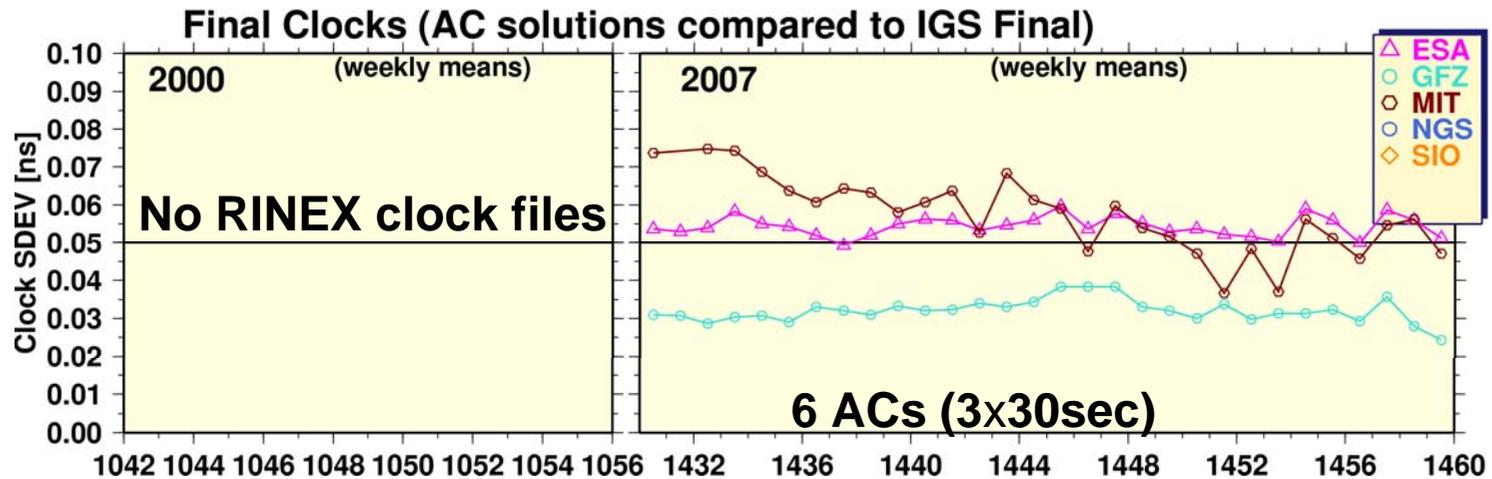


Clocks – Differences to combination

Repro



Operational

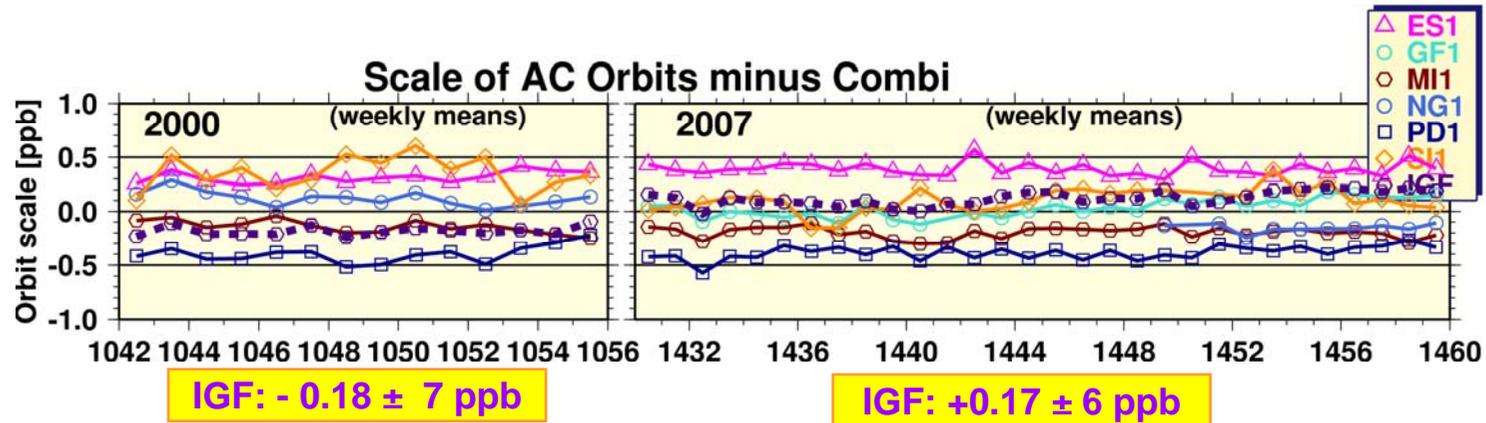


● No final answer for 2000

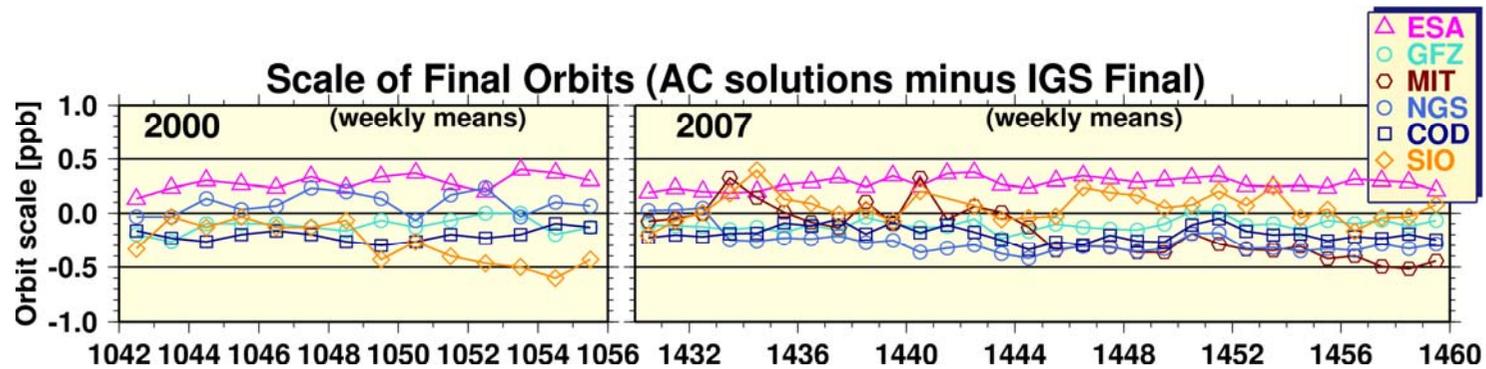
● Good repro clock quality
(official: more ACs, including 30s)

Orbit – Scale

Repro



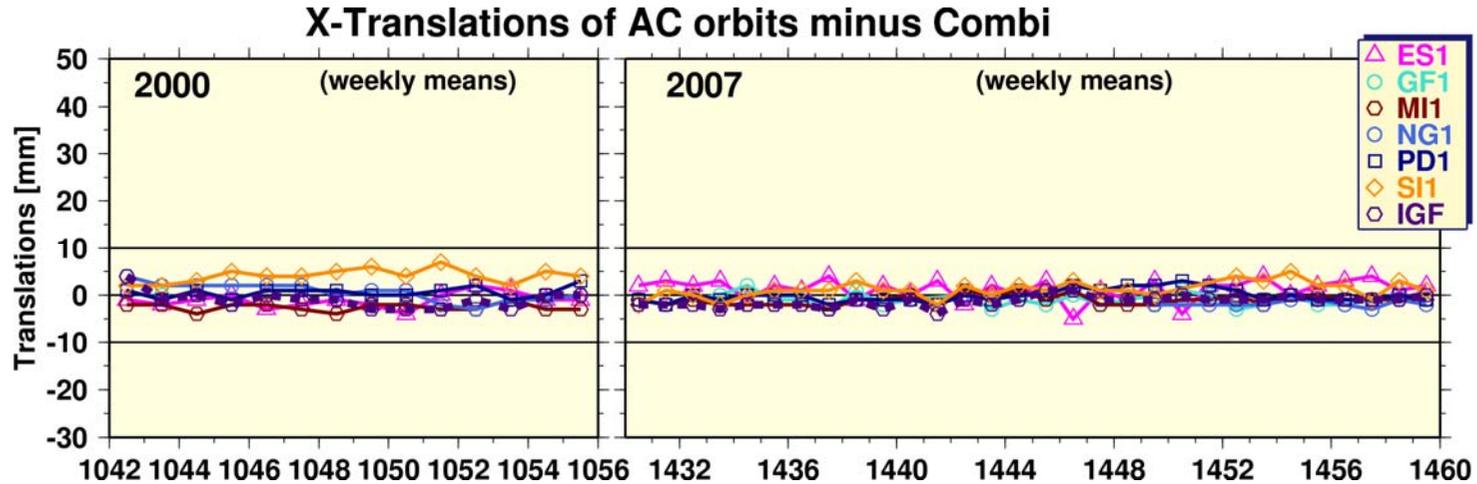
Operational



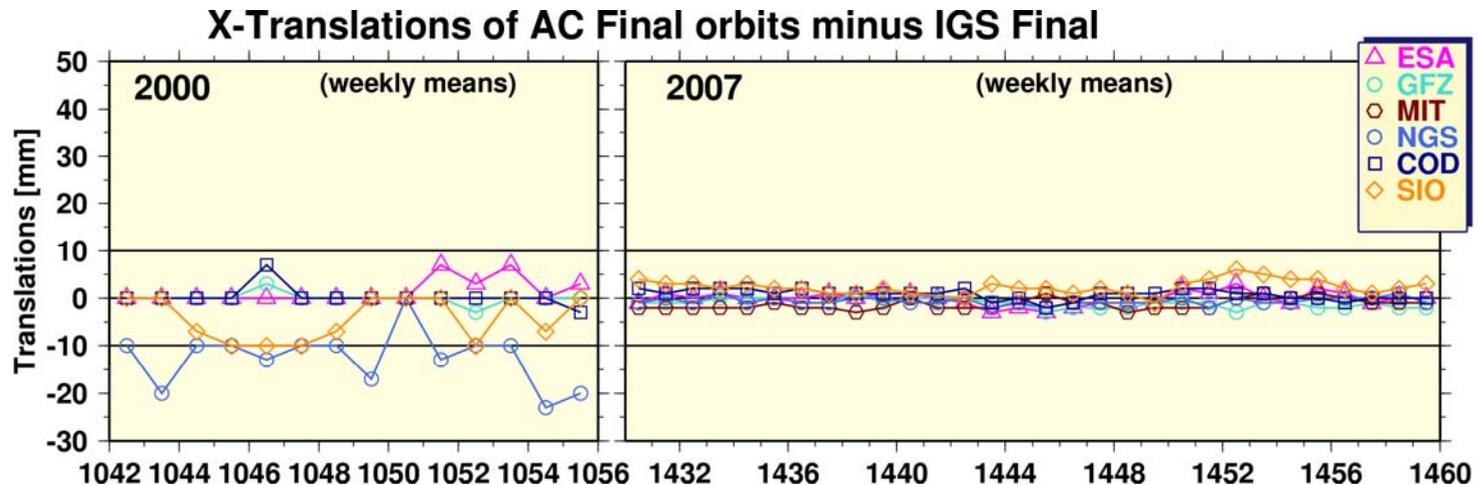
- ACs have different scale.
- Causing a diff of 0.35 ppb btw 2000 and 2007 in operational time series
- Stability per AC and biases are similar to operational solution

Orbit – X-Transformation

Repro



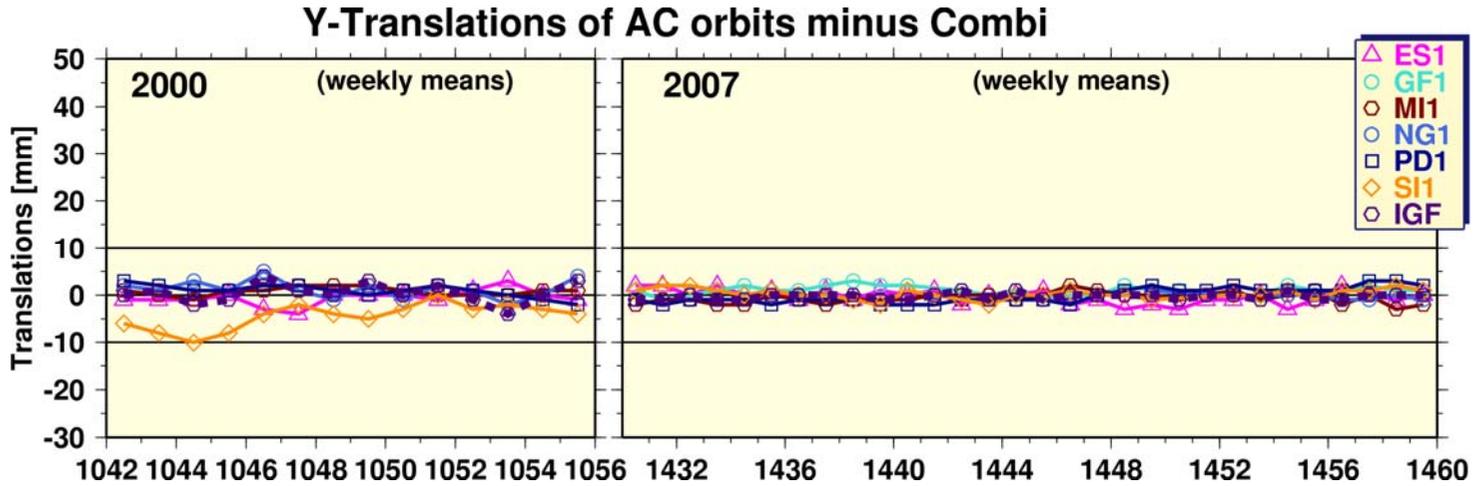
Operational



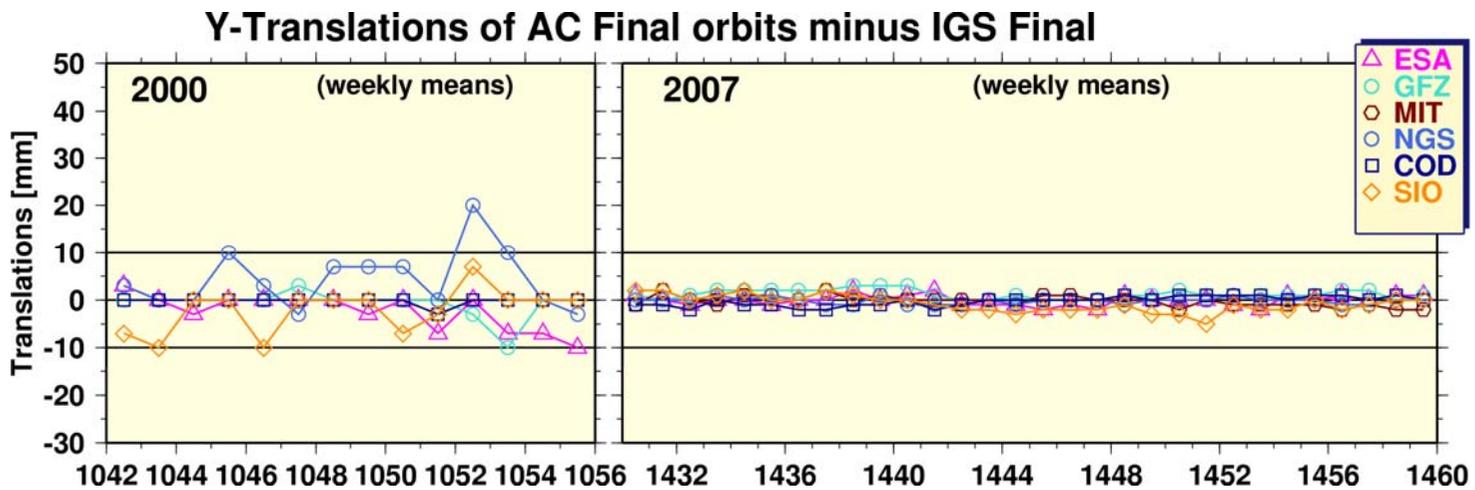
● Consistency among ACs in 2000 is now comparable to 2007

Orbit – Y-Transformation

Repro

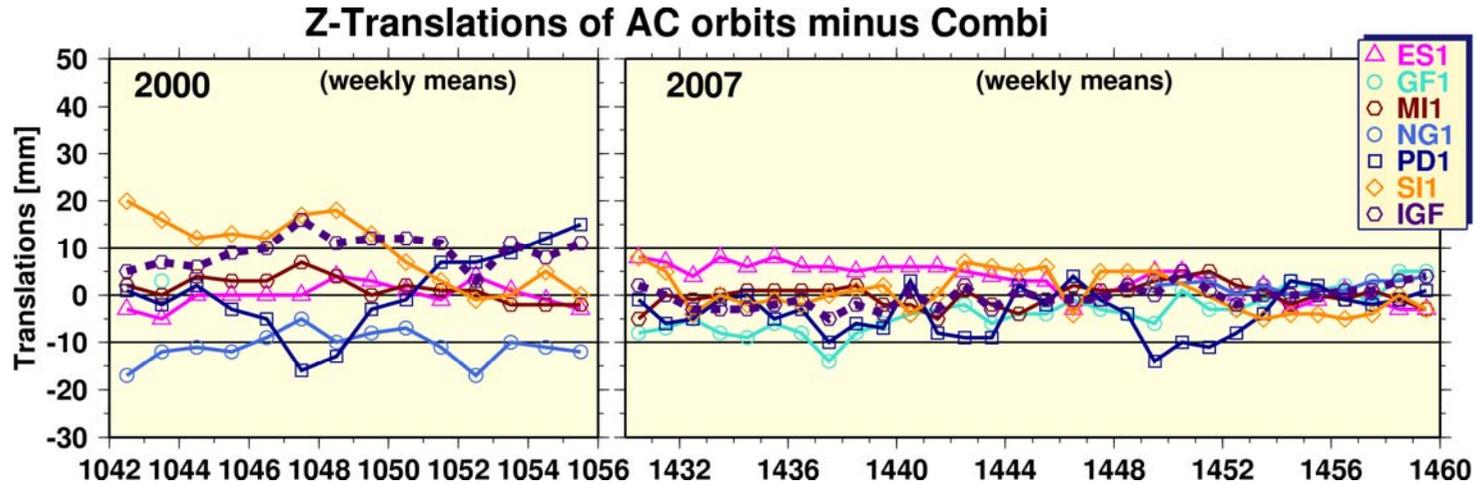


Operational

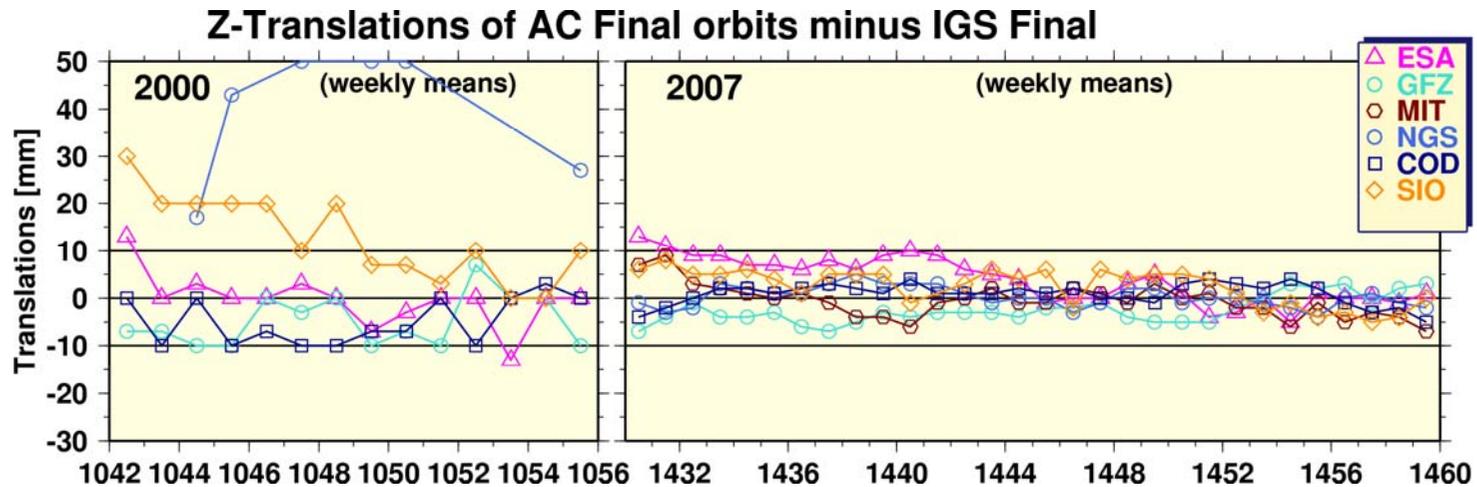


Orbit – Z-Transformation

Repro



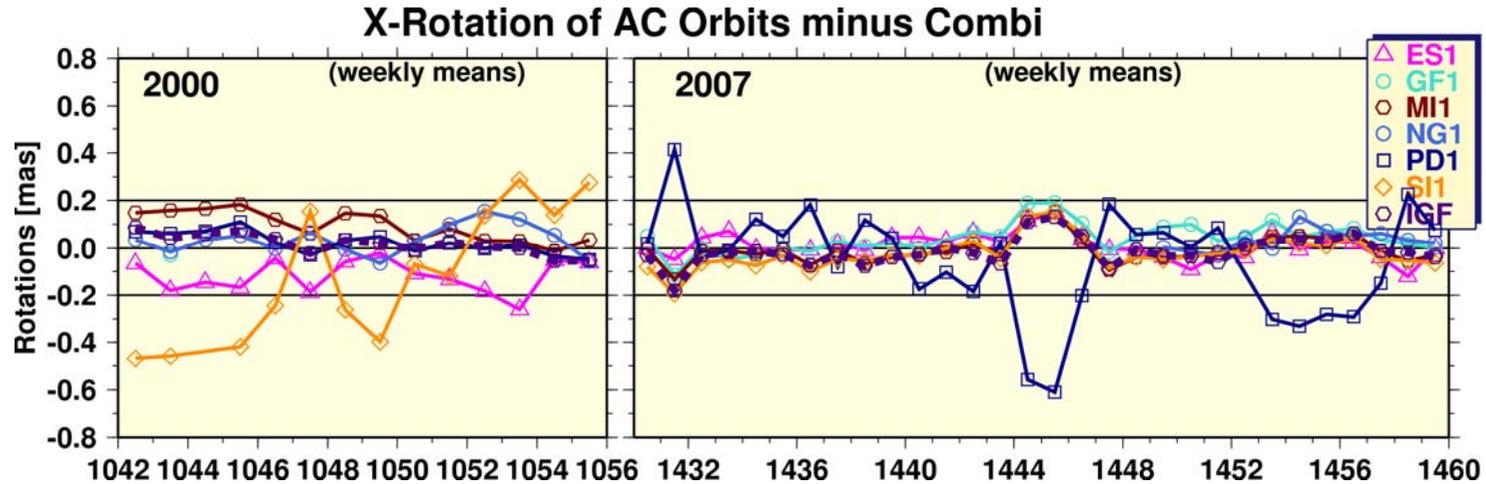
Operational



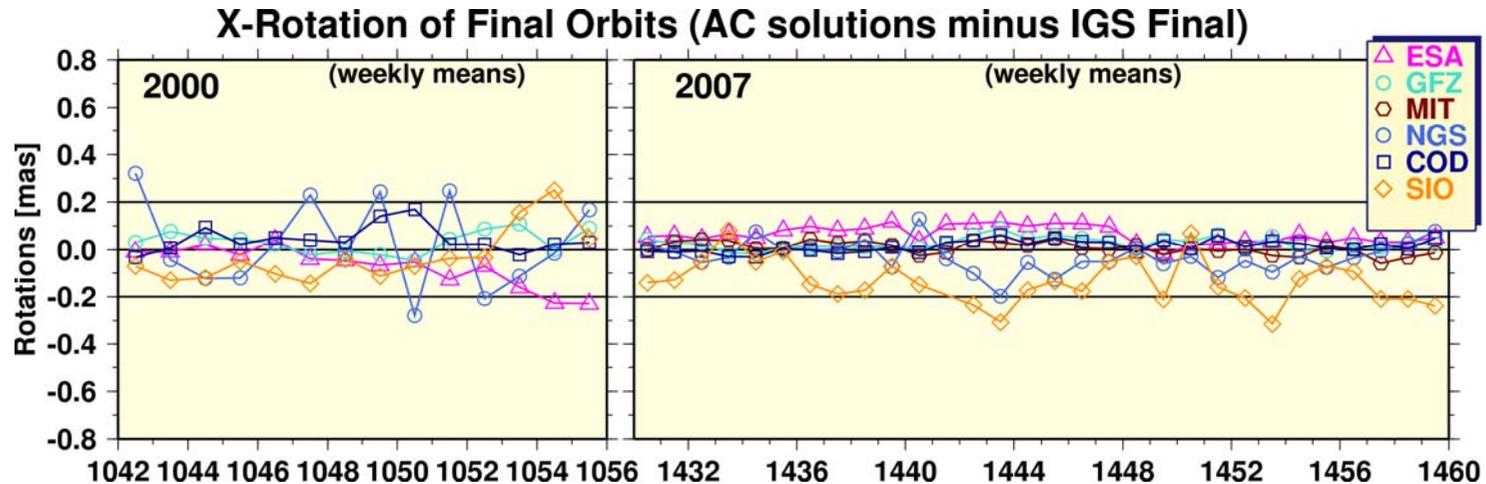
● 2000: ACs have smaller scatter, but biases are still there

Orbit – X-Rotation

Repro



Operational

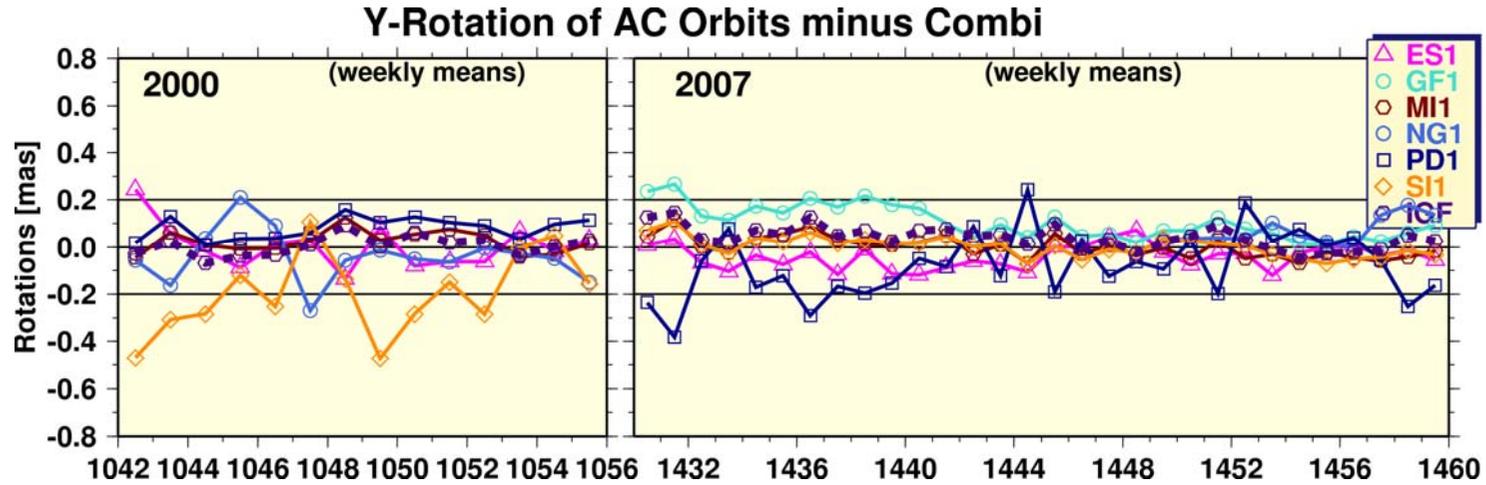


● ACs have smaller scatter, but still biases. Problem at SI1 (not in SNX combi).

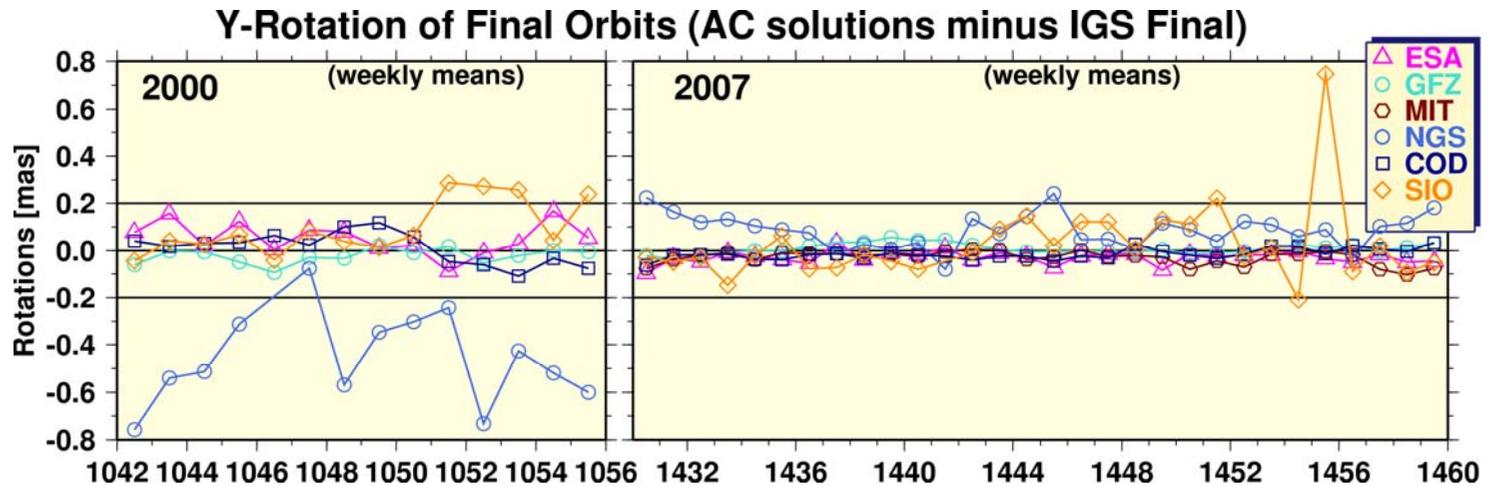
● Large biases at PD1 caused by present inconsistency to SNX

Orbit – Y-Rotation

Repro

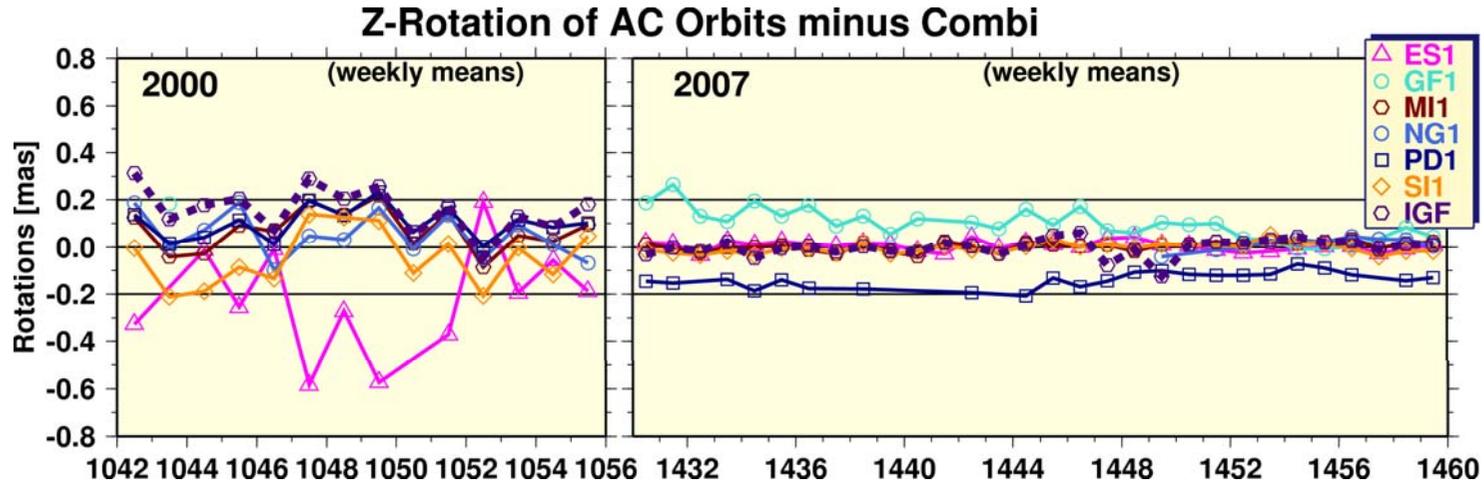


Operational

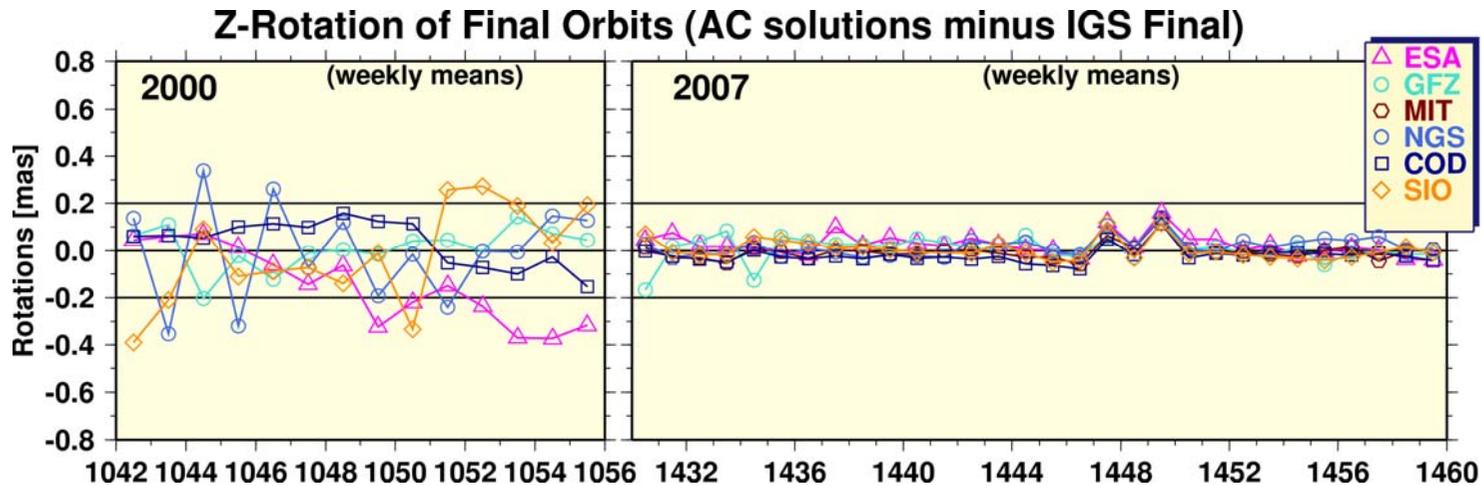


Orbit – Z-Rotation

Repro

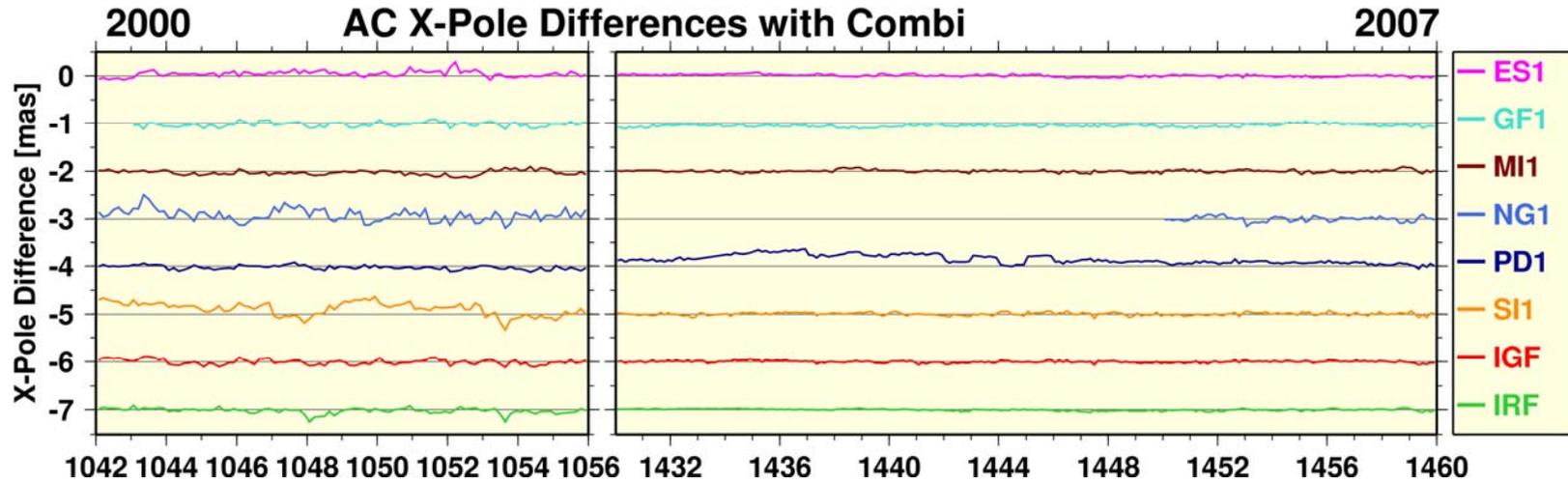


Operational

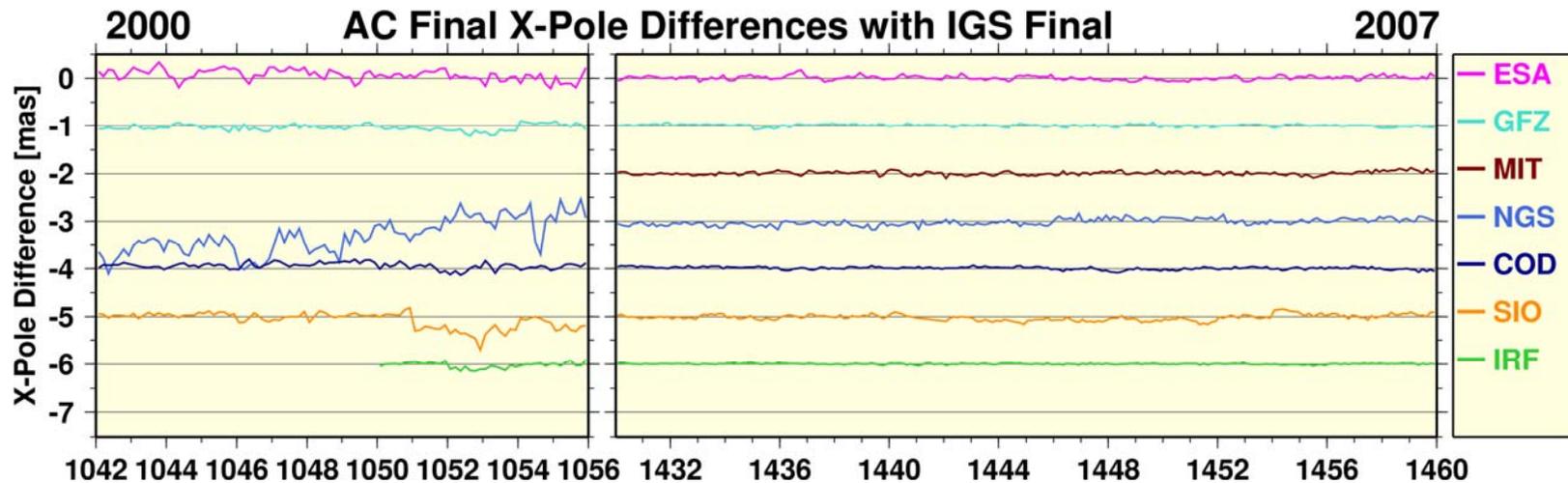


- 2000: ACs have smaller scatter, but still biases. Problem at ES1.

Repro

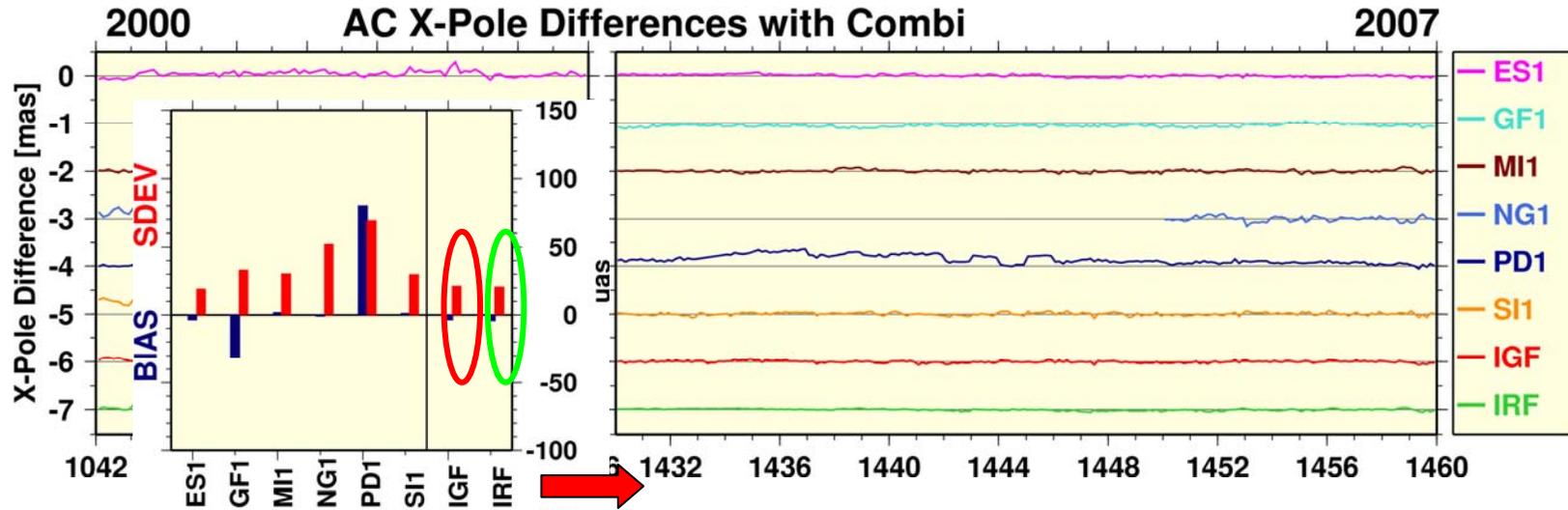


Operational

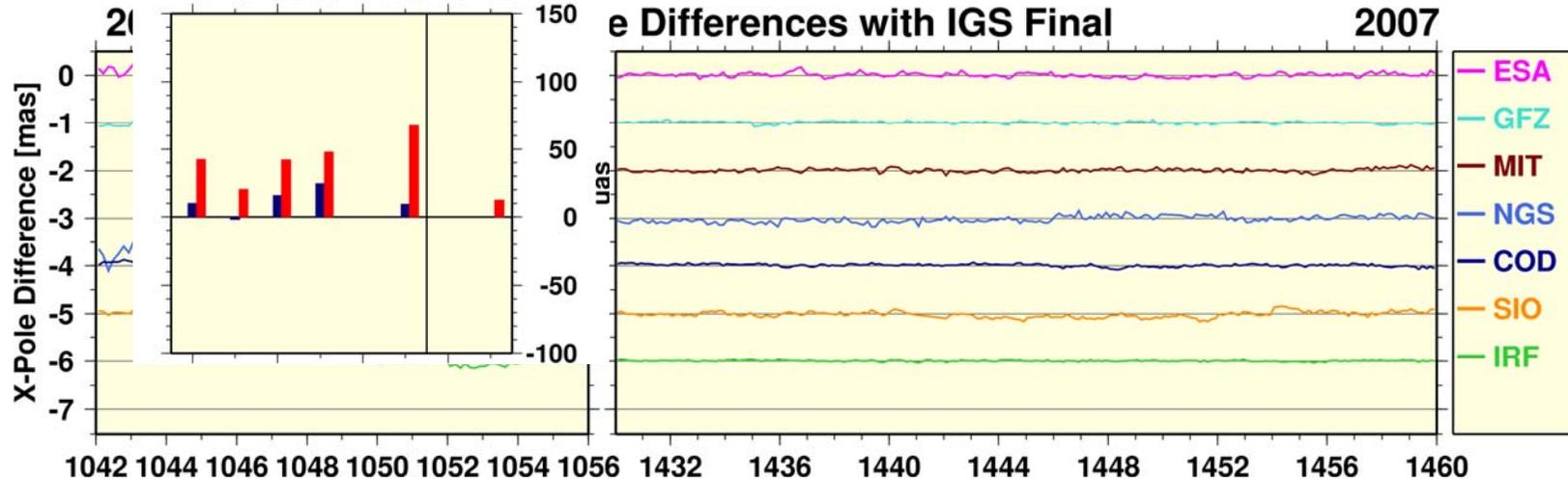


- ACs have better quality.
- But not as good as in 2007 (RF!)
- Good repeatability at ACs (PD1!)
- IGF & IRF small scatter, no bias

Repro

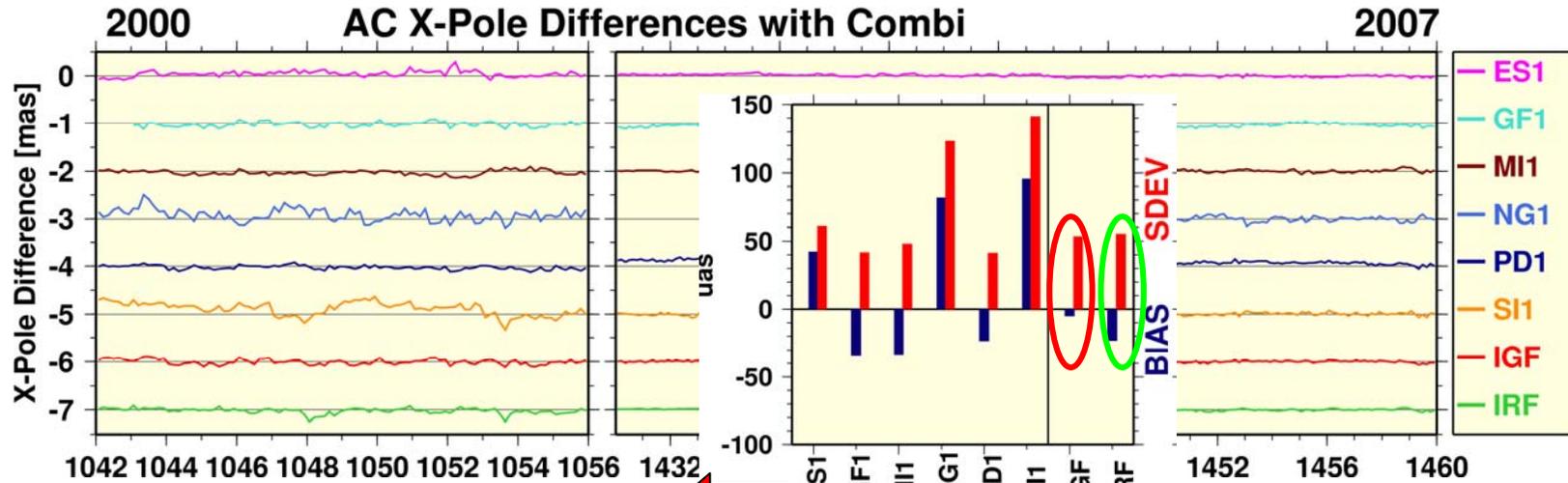


Operational

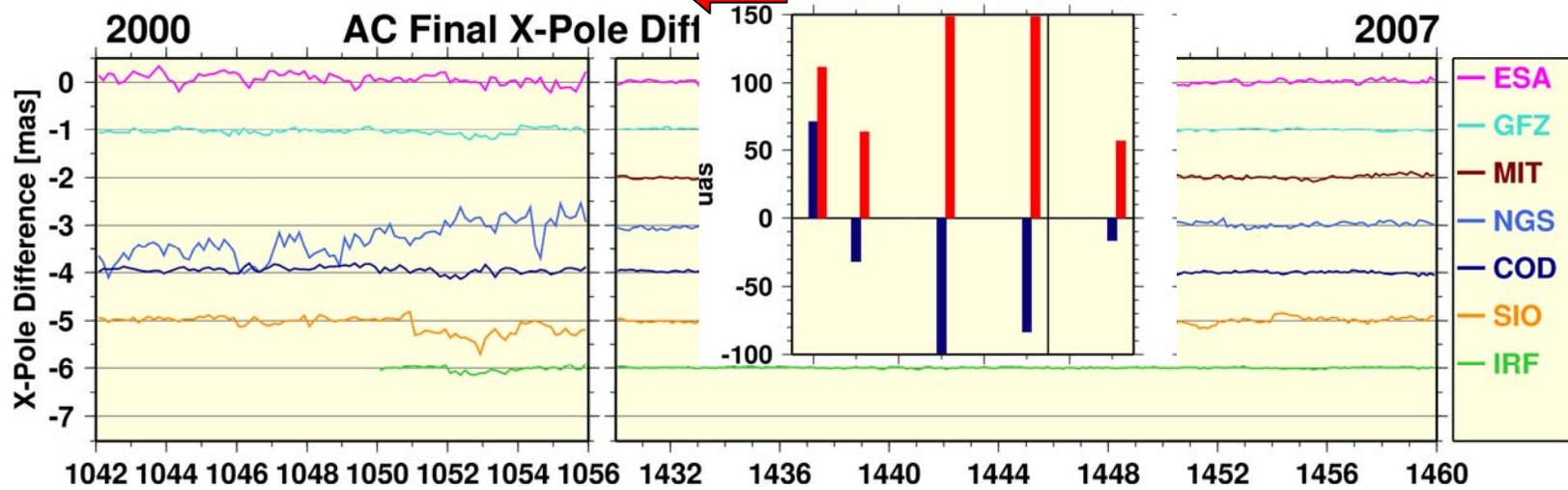


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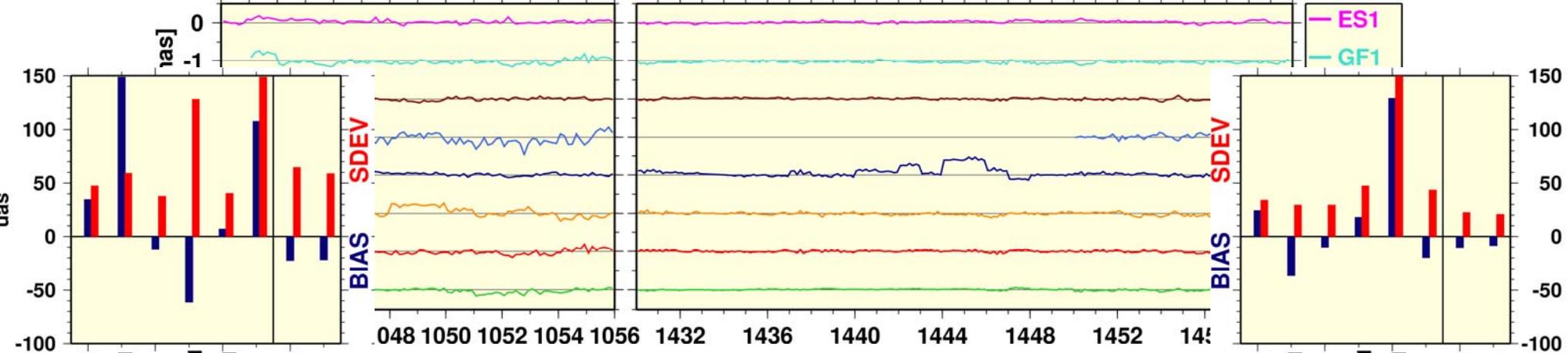


Operational

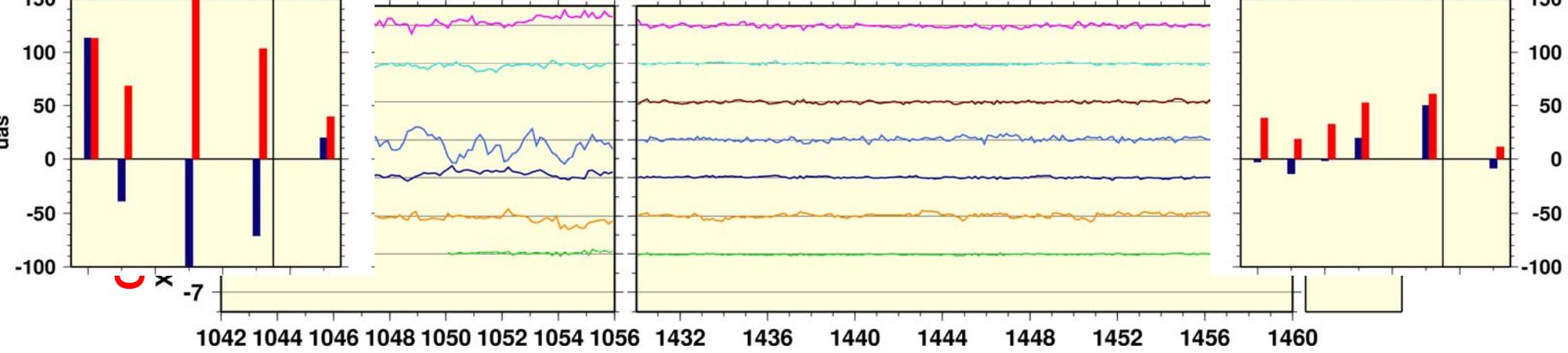


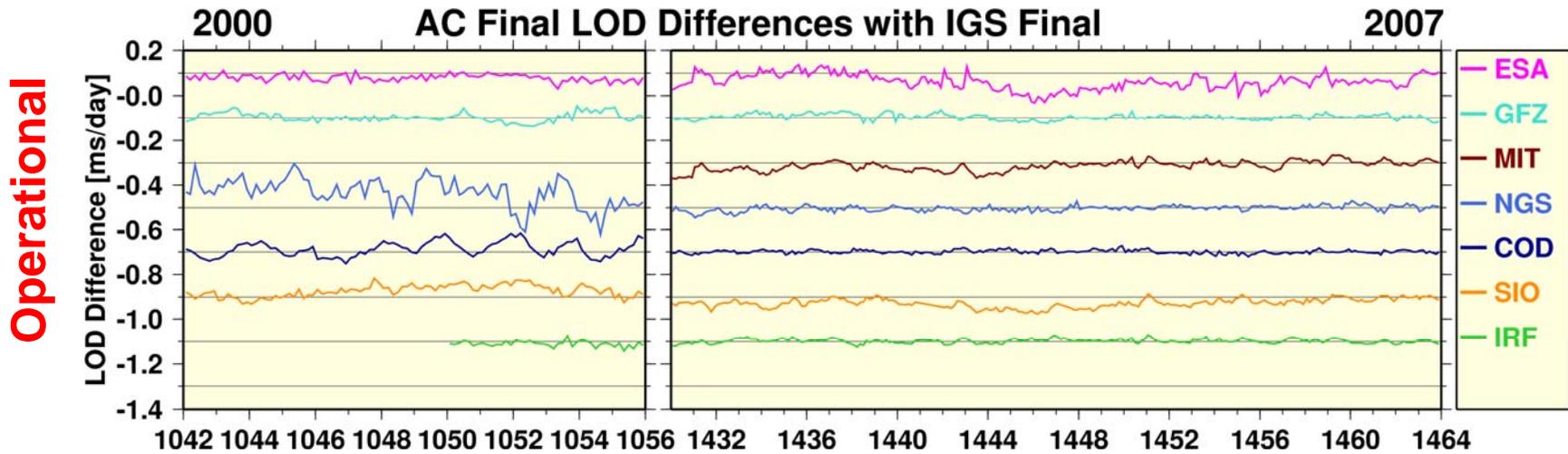
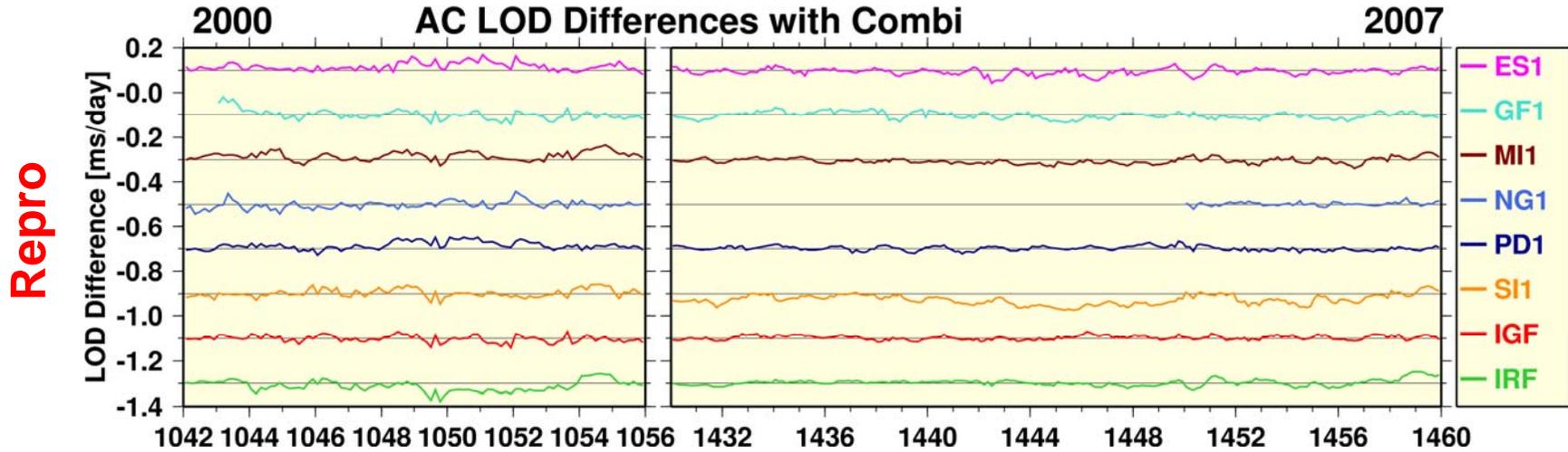
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2000 AC Y-Pole Differences with Combi 2007



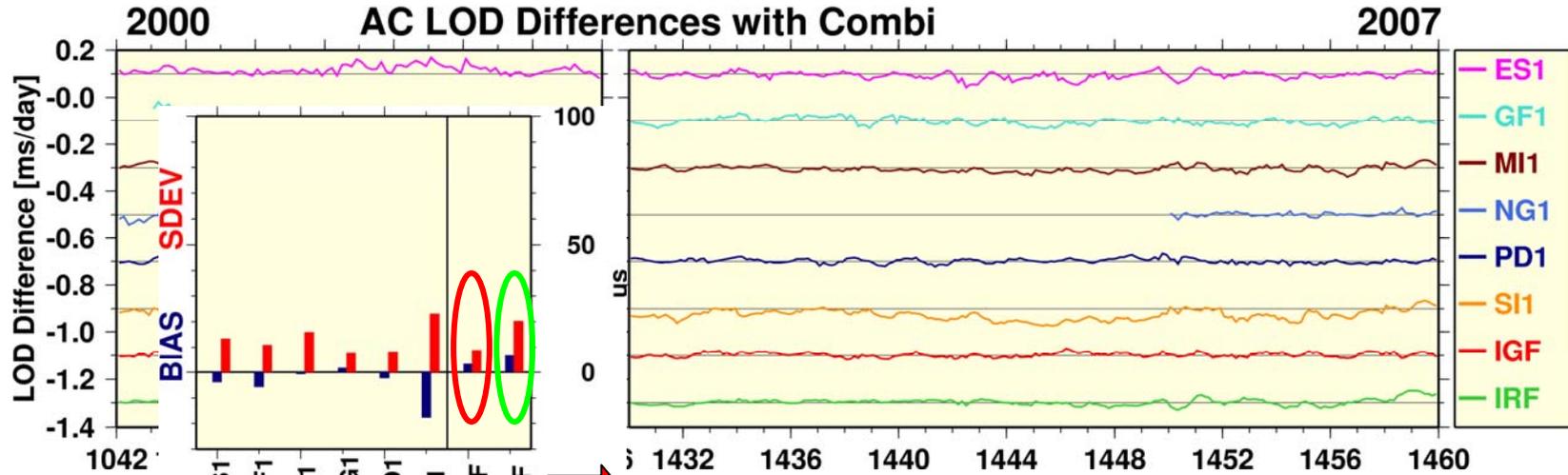
AC Final Y-Pole Differences with IGS Final



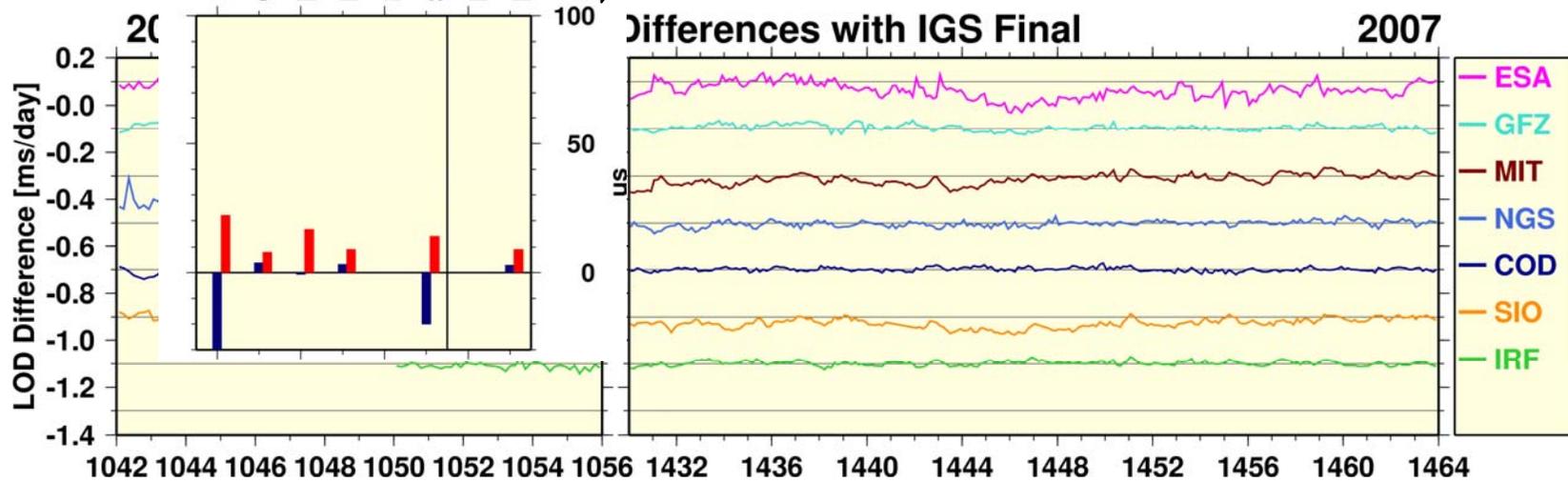


- ACs have better quality.
 - But not as good as in 2007 (RF!)
- Good repeatability at ACs (better ES1)
 - IGF & IRF small scatter, no bias

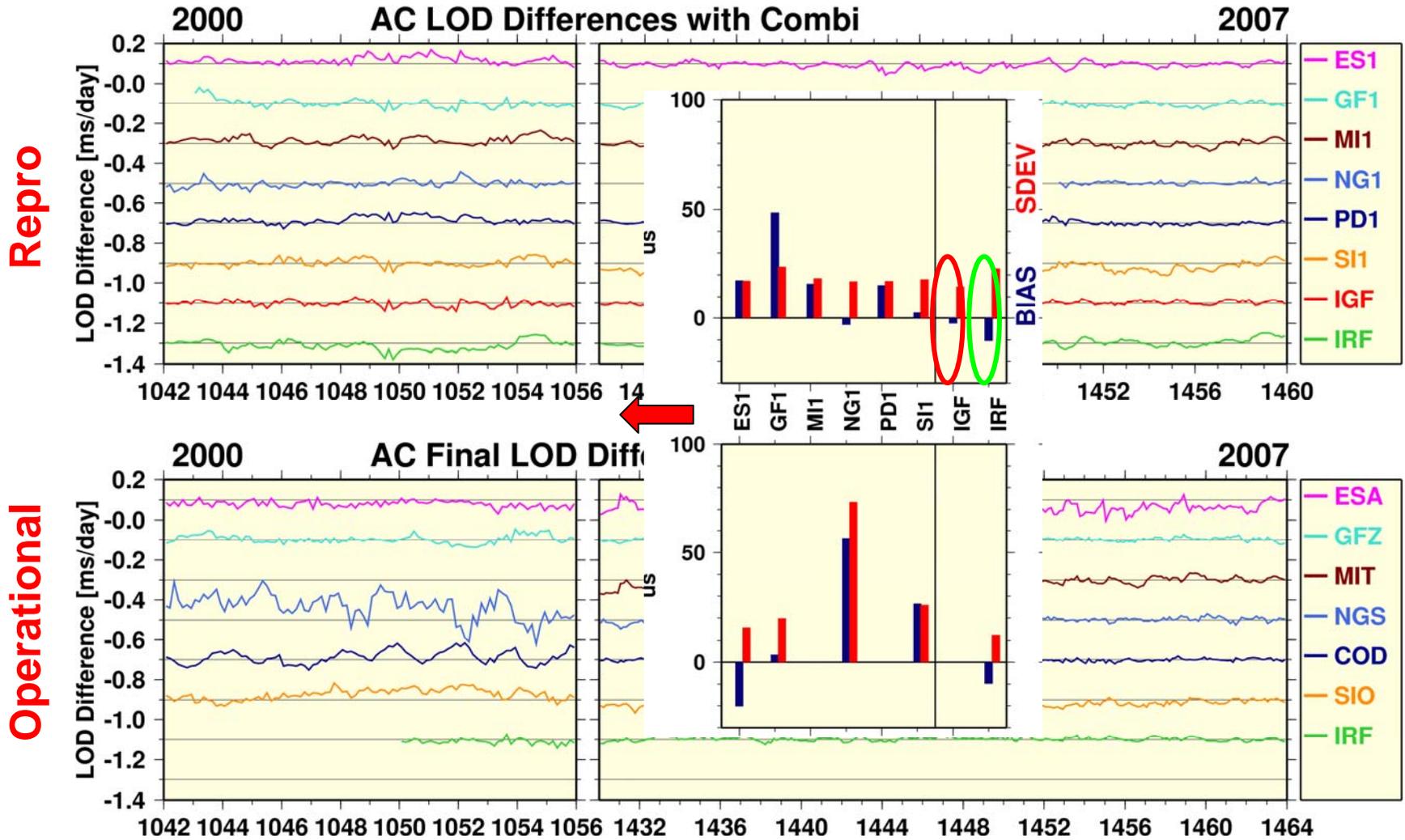
Repro



Operational

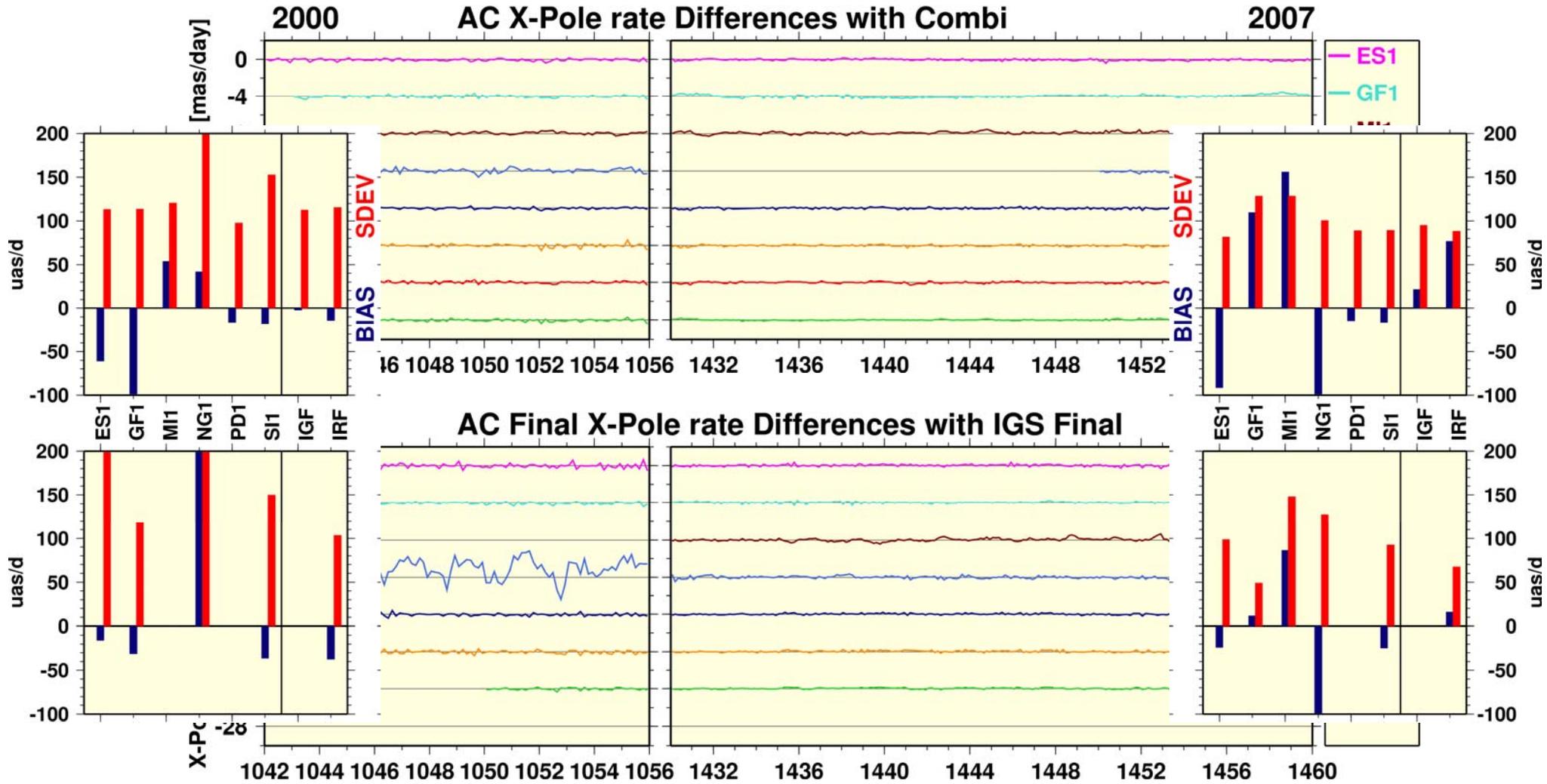


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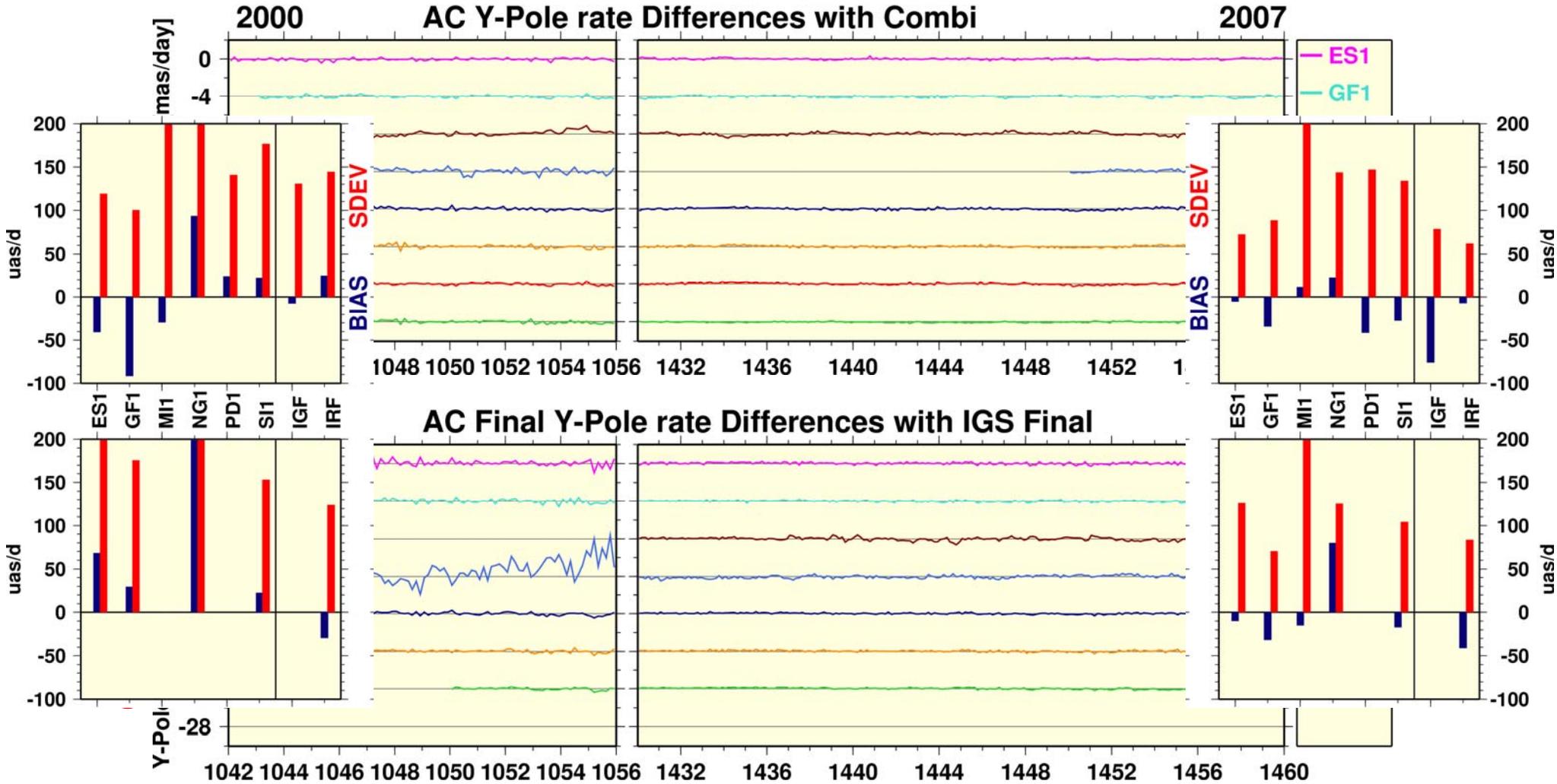


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X-Pole rate



Y-Pole rate



- **Reprocessing evaluation**
 - **2007: Repro has same quality as latest operational products**
 - **2000: Repro quality is better than for the old operational products (better, consist. S/W & models result in more consistent submissions)**
 - **Problem for clocks (still not enough submissions; especially for 30s)**
- **More ACs shall join the reprocessing; esp. for clocks**
- **For the clock solutions the unique 4-character ID (RINEX file name) shall be used.**
- **All reprocessing ACs have to follow the rules for generating IGS Final products, i.e. all products have to be consistent (esp. to SNX)**