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JPL



Stability of the DORIS-derived terrestrial scale

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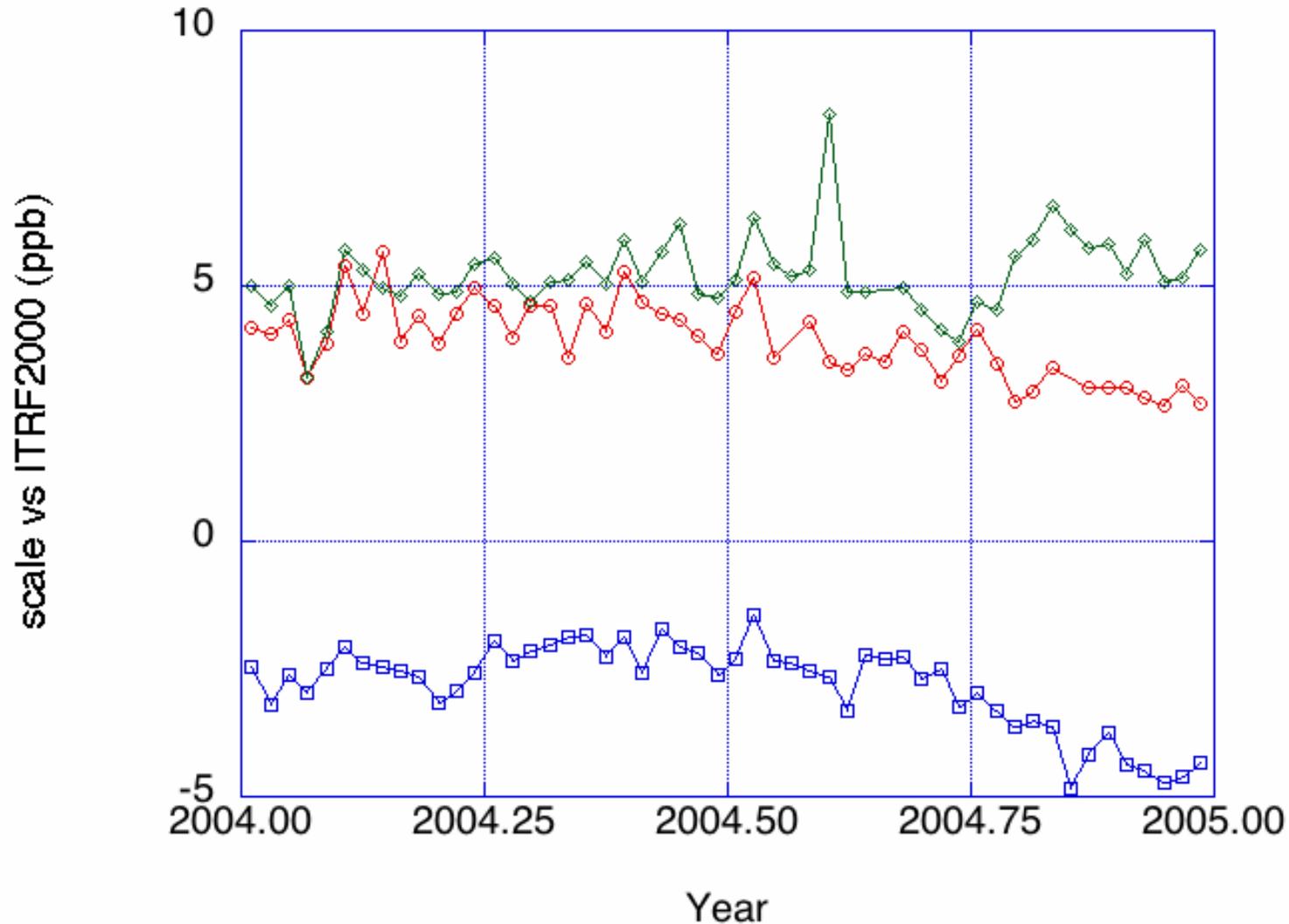
Multi-satellite weekly solutions

Allan variance:

GSFC = 0.665

IGN = 0.168

LCA = 0.427



What could create Terrestrial Reference Frame (TRF) scale biases?

- Technique-related issues
 - Preprocessing (common at CNES)
 - Atmospheric correction (2nd order ionosphere)
- Software and analysis-related issues
 - Gravity field
 - Phase center offsets
 - ...

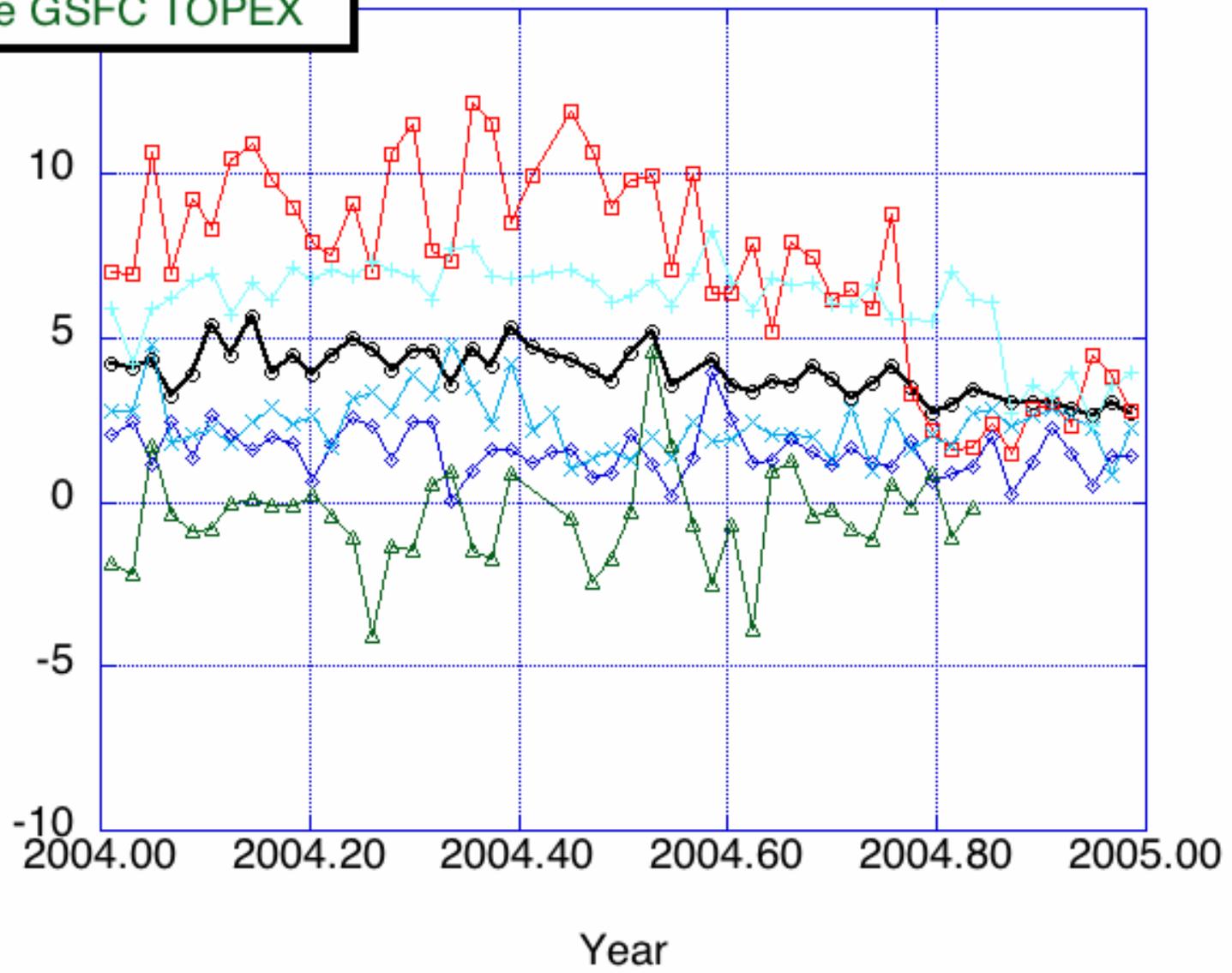
NB: It is then important to test solutions from different Analysis Groups (with different software packages)

Description of Analysis strategies	GSFC GEODYN (version 0407)	IGN Gipsy/Oasis II (version 4.03)	LCA GINS/Dynamo
Force & Measurement models Static Gravity Time variable gravity Atmospheric gravity Ocean tides Ocean loading Earth tides Atmospheric drag Albedo/IR Center of Mass offset	GGM02C (120*120) C20-dot, C21-dot, S21-dot Via NCEP GOT00 GOT00 IERS2000 MSIS86 Knocke & Ries (1988) Computed	GGM01C (120*120) none DTM94 From CNES data files	GRIM5-C1 (120*120) Truncated at 90 for ENVISAT and SPOTs and 75 for TOPEX ECMWF FES2002 IERS2000 DTM-94 Grids from ECMWF Computed for SPOTs and TOPEX before 9/2004 (otherwise from CNES data files) From CNES data files for ENVISAT
Estimation strategy Elevation cut-off Arc length Drag resets Data weight	5 deg 7-days 6-hr (ENVISAT, SPOT5) 8-hr (TOPEX, SPOT2, SPOT4) 0.5 mm/s	From CNES data files 1-day 6-hr for (ENVISAT and SPOTs) None for TOPEX 0.4 mm/s for SPOT5 0.5 mm/s for all others	12 deg 3.5 days 6-hr for ENVISAT and SPOTs 12-hr for TOPEX 0.4 mm/s

GSFC results

- scale GSFC allsats
- scale GSFC ENVISAT
- scale GSFC SPOT2
- scale GSFC SPOT4
- scale GSFC SPOT5
- scale GSFC TOPEX

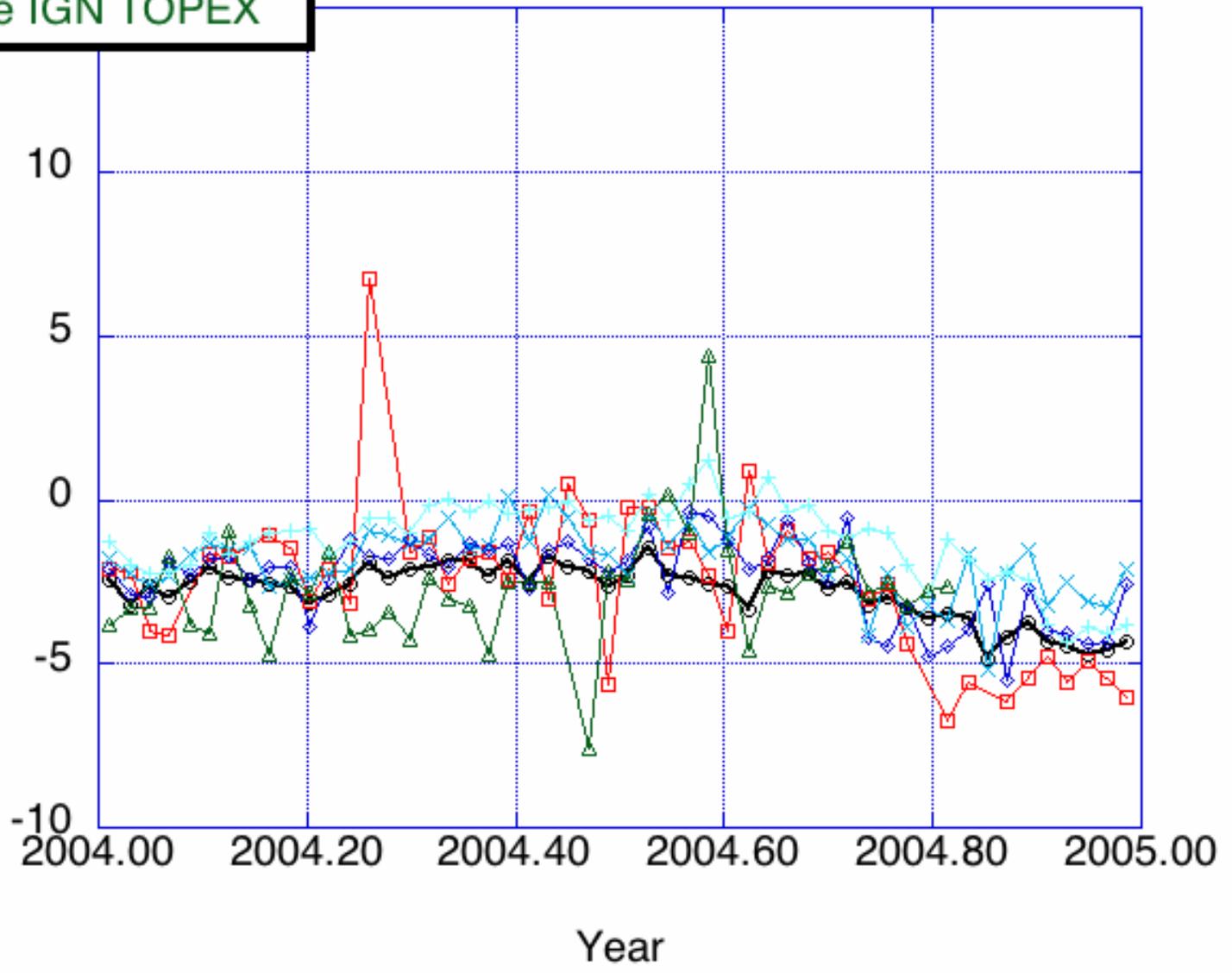
scale vs ITRF2000 (ppb)



IGN/JPL results

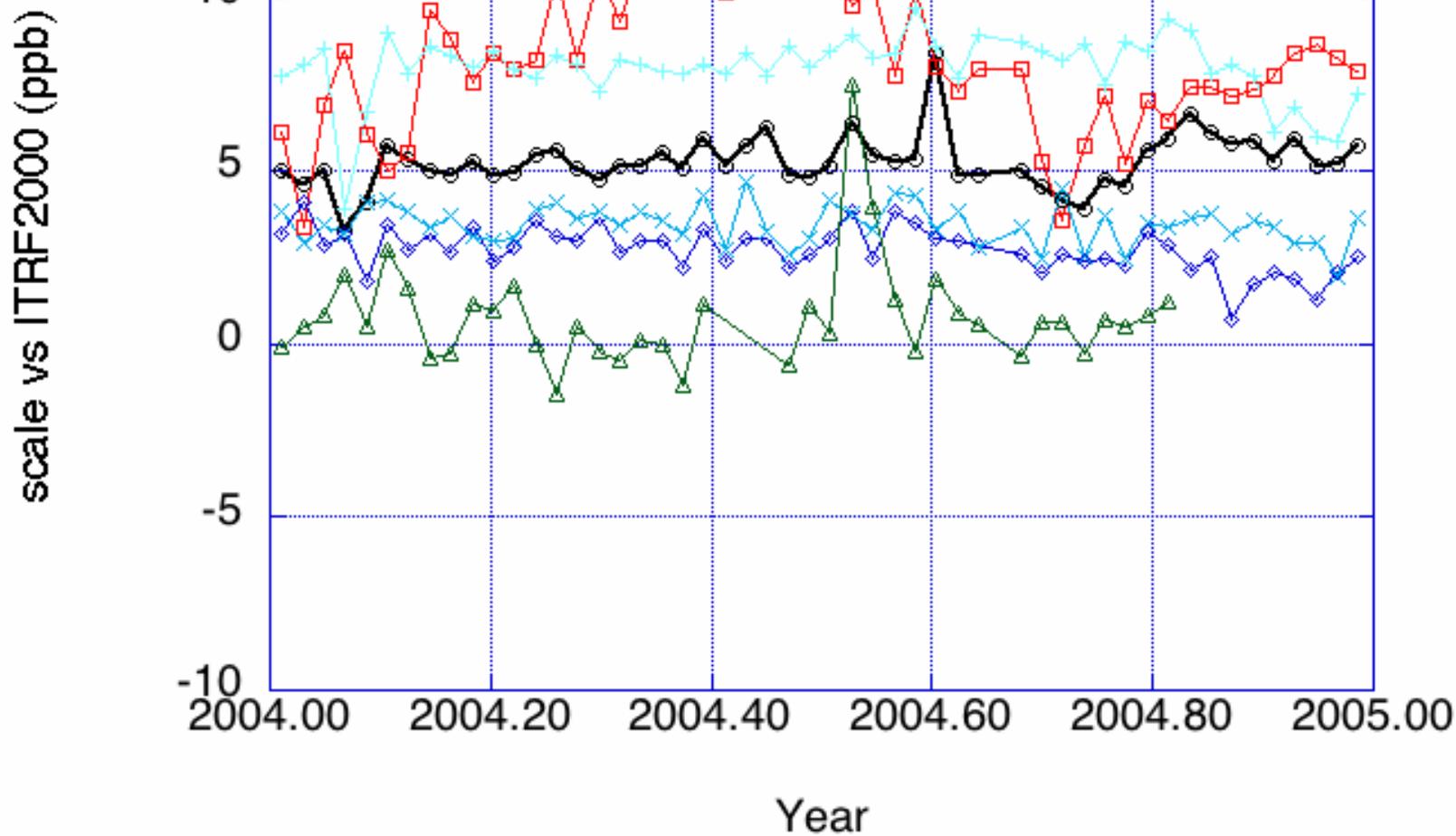
- scale IGN allsats
- scale IGN ENVISAT
- ◇— scale IGN SPOT2
- ×— scale IGN SPOT4
- +— scale IGN SPOT5
- △— scale IGN TOPEX

scale vs ITRF2000 (ppb)



CLS/LEGOS results

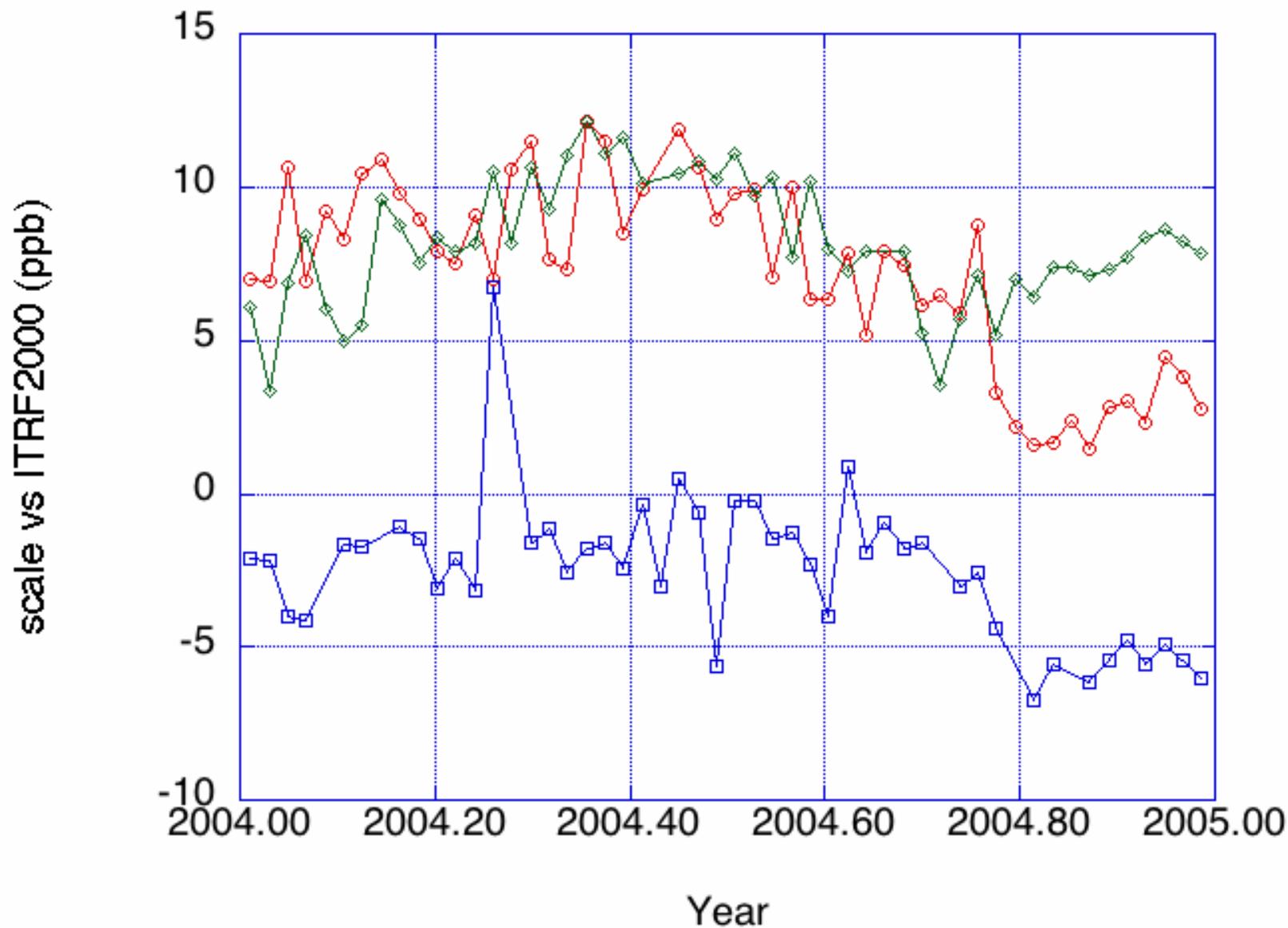
- scale LCA allsats
- scale LCA ENVISAT
- ◇— scale LCA SPOT2
- ×— scale LCA SPOT4
- +— scale LCA SPOT5
- △— scale LCA TOPEX



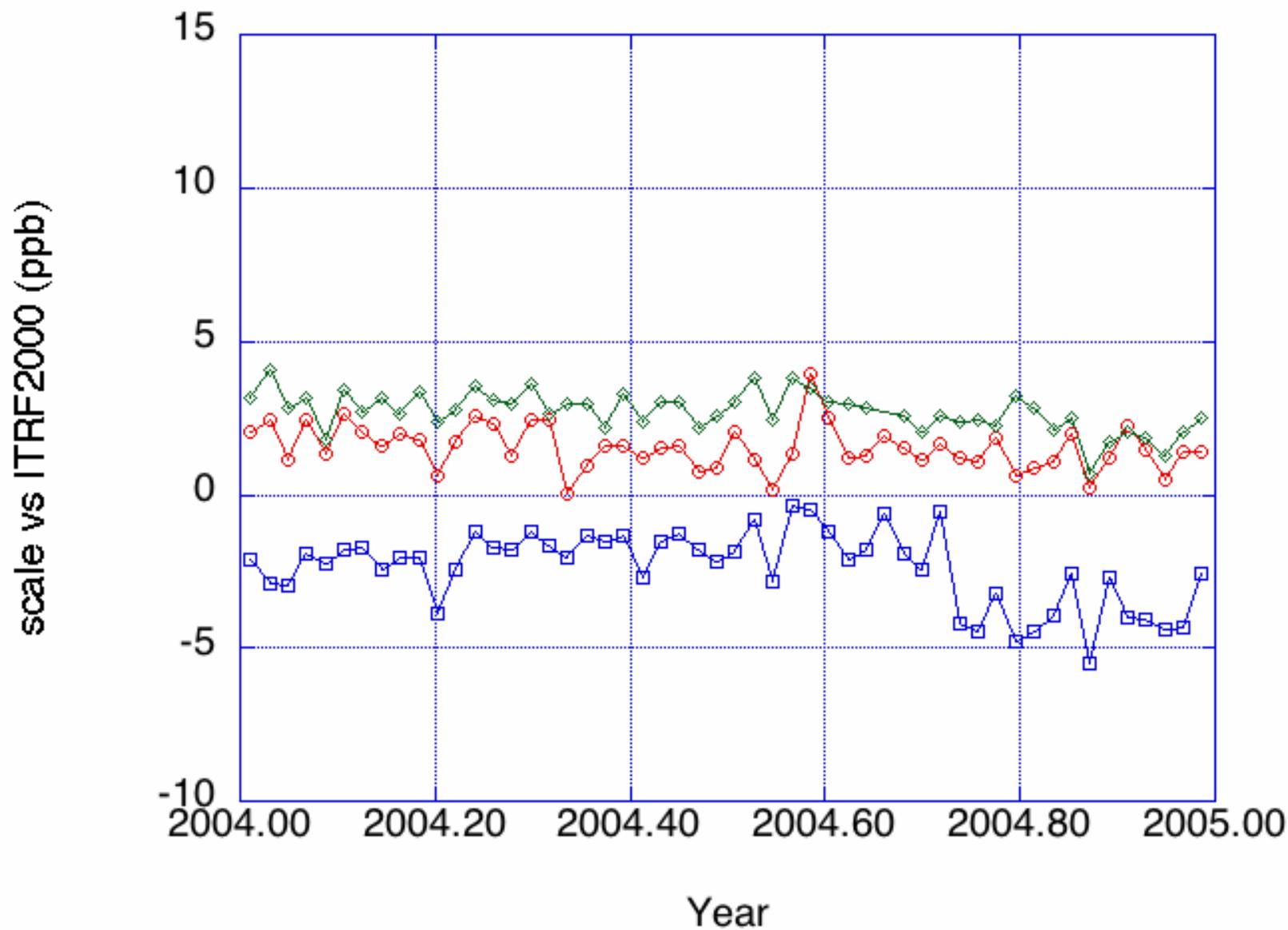
Comments

- The newer satellites (ENVISAT and SPOT5) show a larger derived scale (+6 ppb) than the other satellites in both the GSFC and the LCA solutions but not in the IGN solution. This could be to phase center corrections estimation
- IGN/JPL show a better internal consistency between satellites

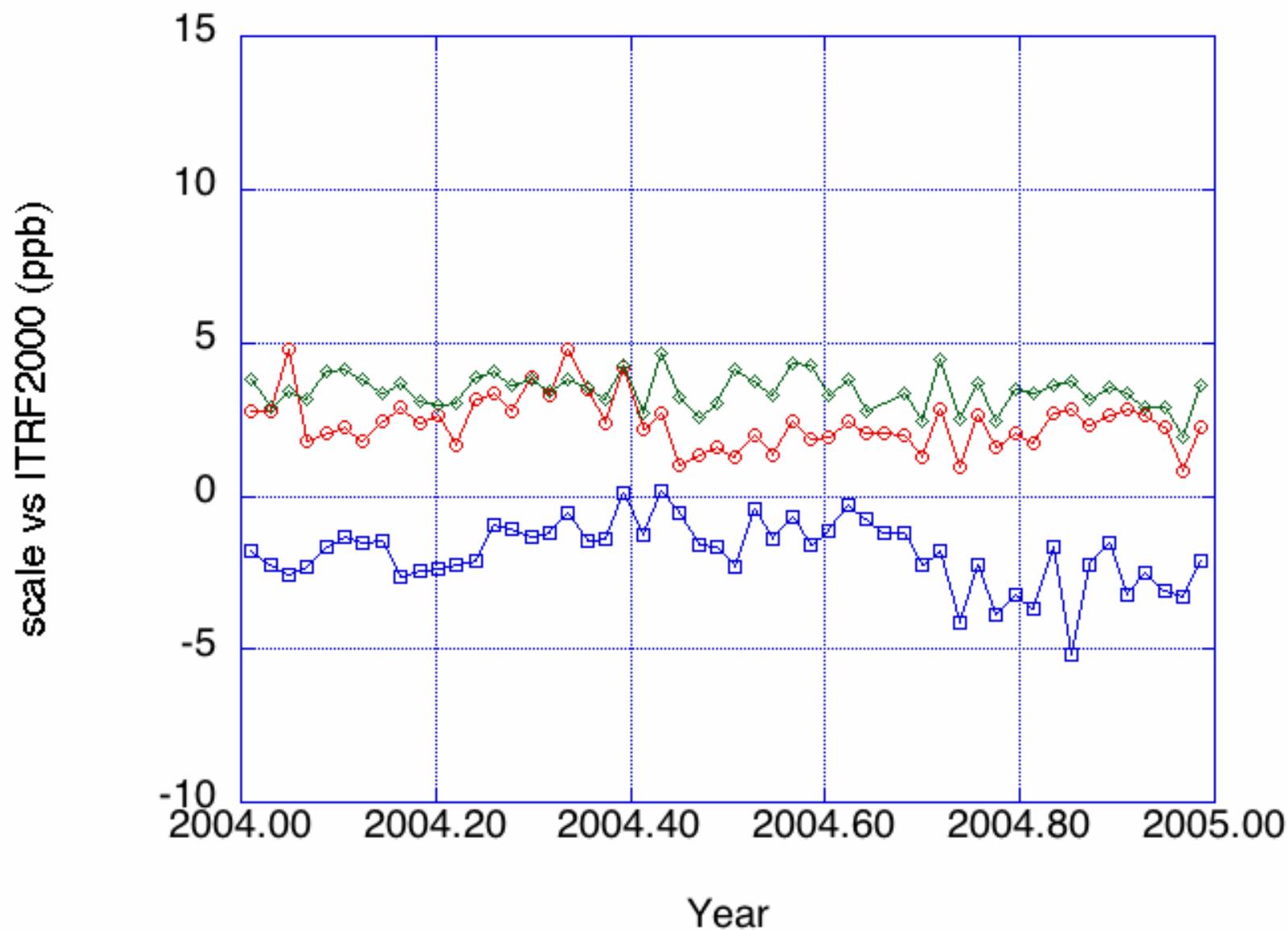
ENVISAT



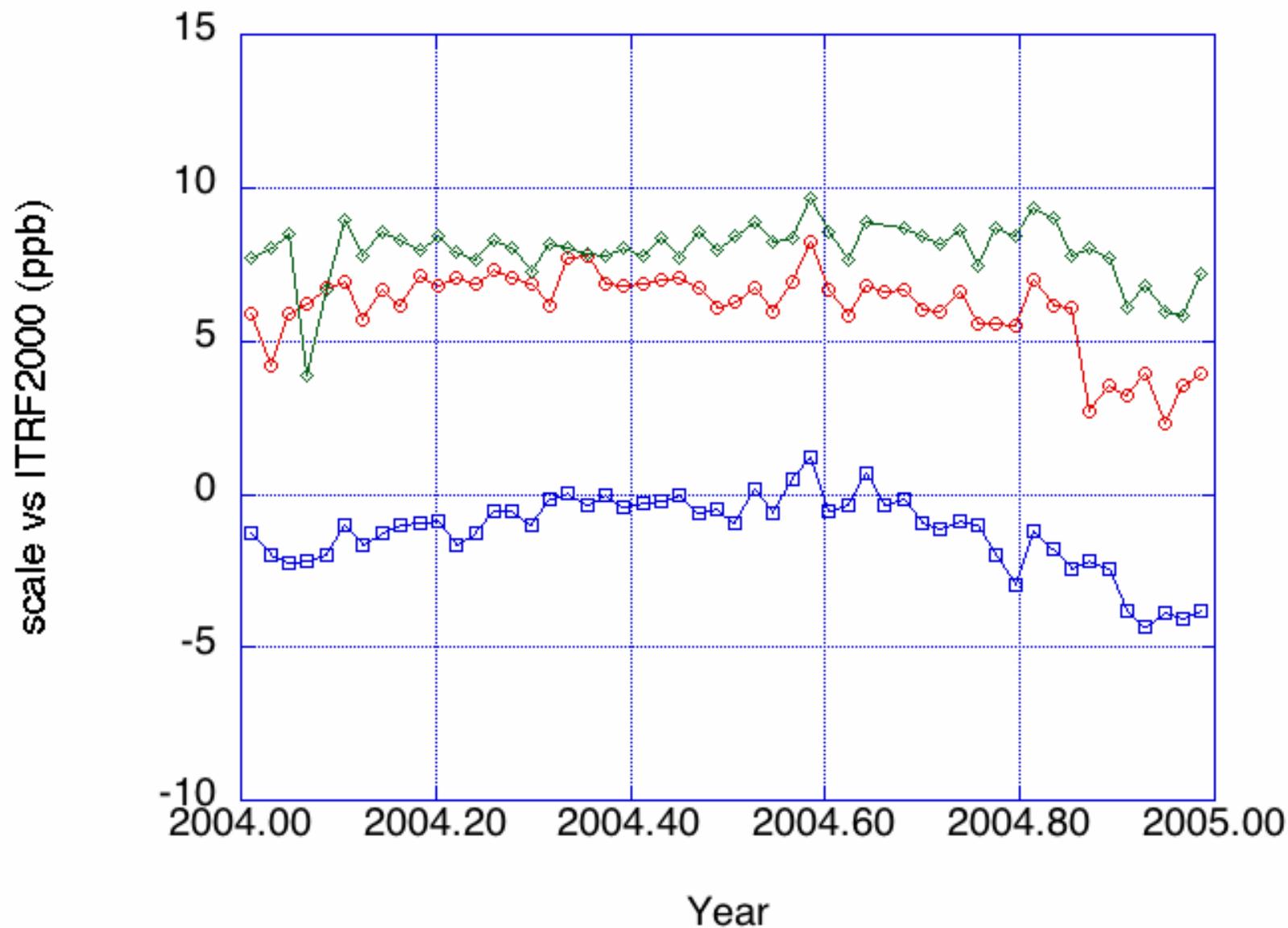
SPOT2



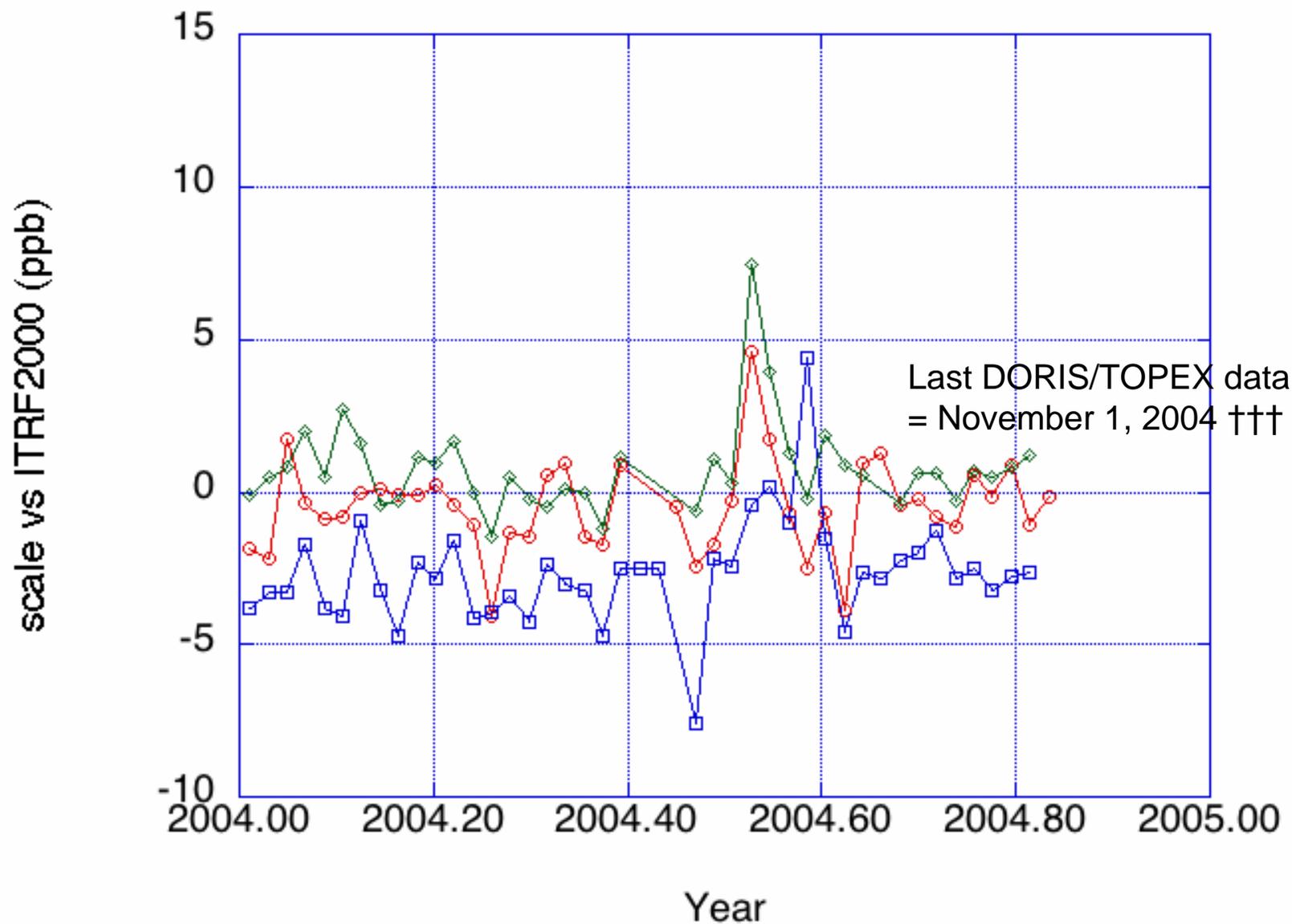
SPOT4



SPOT5



TOPEX



Description of the analysis

- We have analyzed weekly DORIS solutions (station coordinates using loose constraints in SINEX format) and compared the DORIS-derived scale with ITRF2000.
- Data were available from 3 different groups (**GSFC/NASA**, **IGN-JPL**, **LEGOS-CLS**) using **single satellite** solutions or **multi-satellites** solutions in 2004, using 3 different softwares.
- The goal is to investigate the possible use of DORIS to help define the scale in the future ITRF2004 realization and to separate scale errors between technique-related errors (DORIS) and software related errors.

Conclusions

- The 3 different DORIS solutions show clear **systematic errors** over time that seem to be mainly due to software-related issues than to the DORIS technique itself (typically 3-5 ppb)
- GSFC/NASA and LEGOS-LCA results are closer than IGN/JPL (which is closer to ITRF2000)
- IGN-JPL show a better internal agreement between individual satellites solutions as well as with external comparisons with ITRF2000
- In our opinion, DORIS could be used in ITRF2004 to define the datum scale with proper weighting