Update on STIX and Solar Orbiter pointing

- STIX absolute pointing calibration
- Pointing variations seen with other instruments

STIX Pointing calibration

STIX absolute pointing calibration

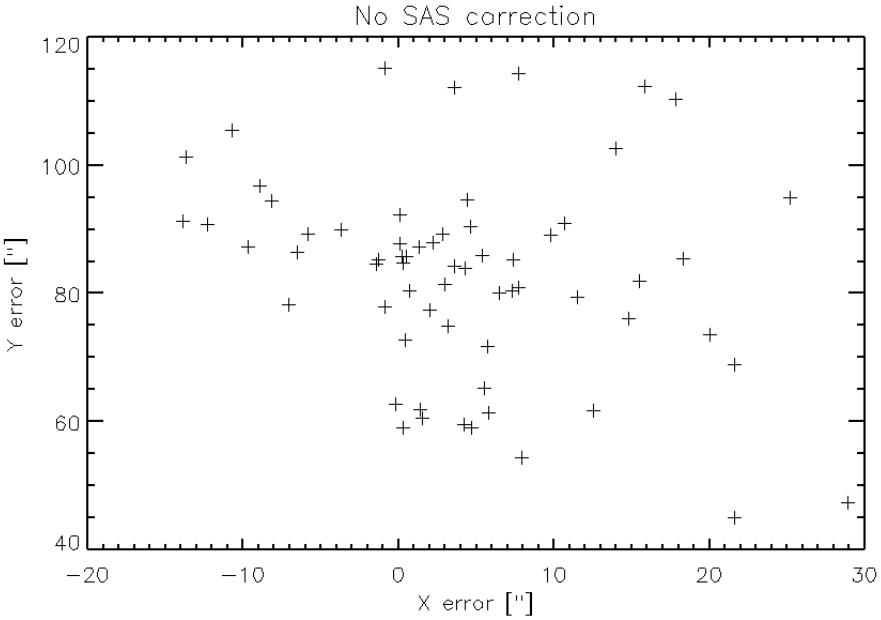
- The method :
  - sample of flares seen with STIX **and** from Earth
  - select time range + energy range of non-thermal emission
  - build STIX maps (with and without aspect correction)
  - identify corresponding features in AIA 1600 or 1700 Å map
  - bring both maps to same reference viewpoint
  - measure difference in locations
    - in HPC (solar) frame
    - rotate to STIX frame (s/c roll angle)

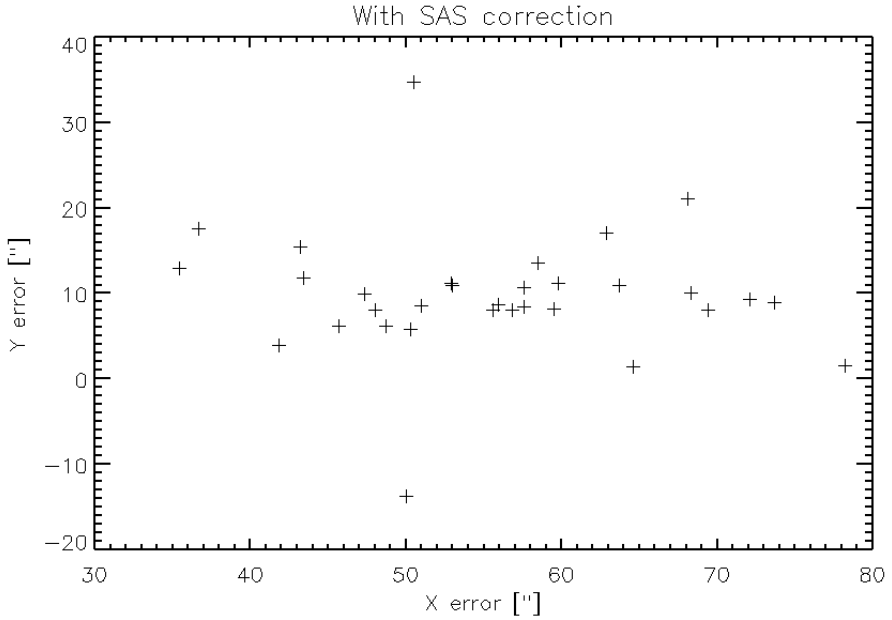
STIX absolute pointing calibration

- Current sample :
  - 87 flares, mostly C- and M-class
    - 64 with positions measured
  - distance 0.32 to 0.95 AU
    - 35 below 0.75 AU (aspect solution available)
  - 14 in 2021
    - incl. 13 with SolO roll angle ≈ ±20°

STIX absolute pointing calibration

- Current sample : 64 flares





- No SAS correction (N = 64)
- <ΔX> = 4.2 +/- 9.2” <ΔY> = 82.6 +/- 15.6”

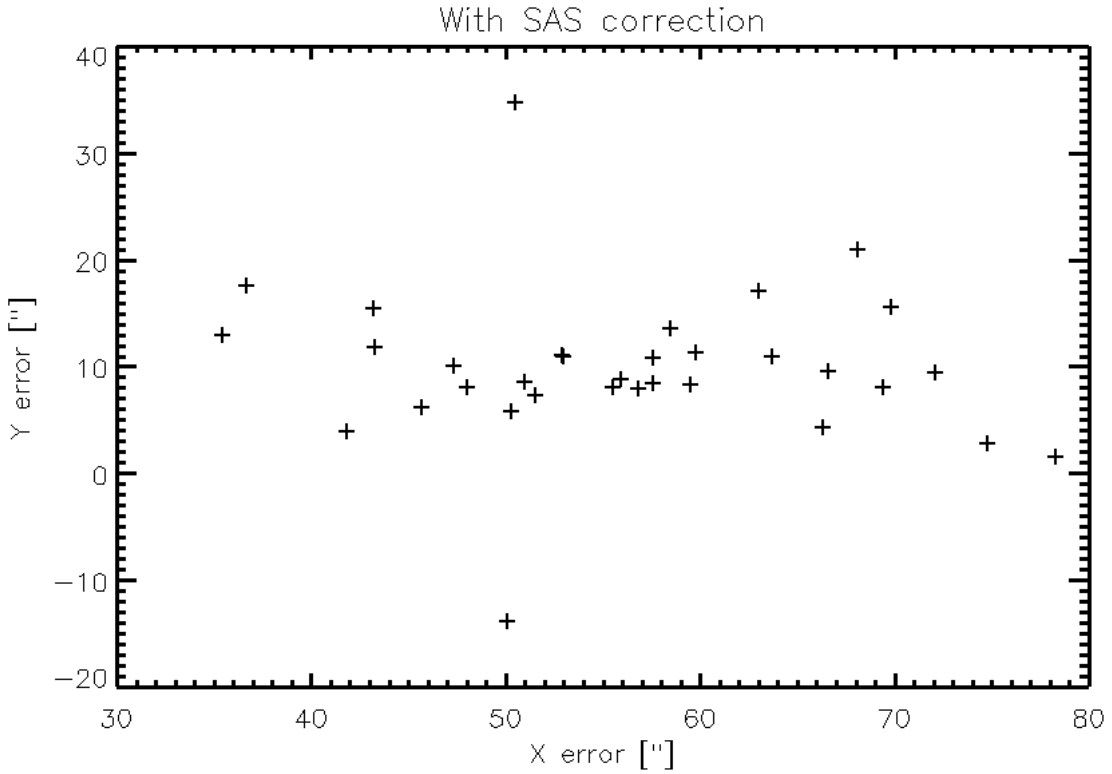
- SAS corrected (N = 32)
- <ΔX> = 55.6 +/- 10.5” <ΔY> = 9.8 +/- 7.3”

STIX absolute pointing calibration

- Current sample : 33 events with SAS solution

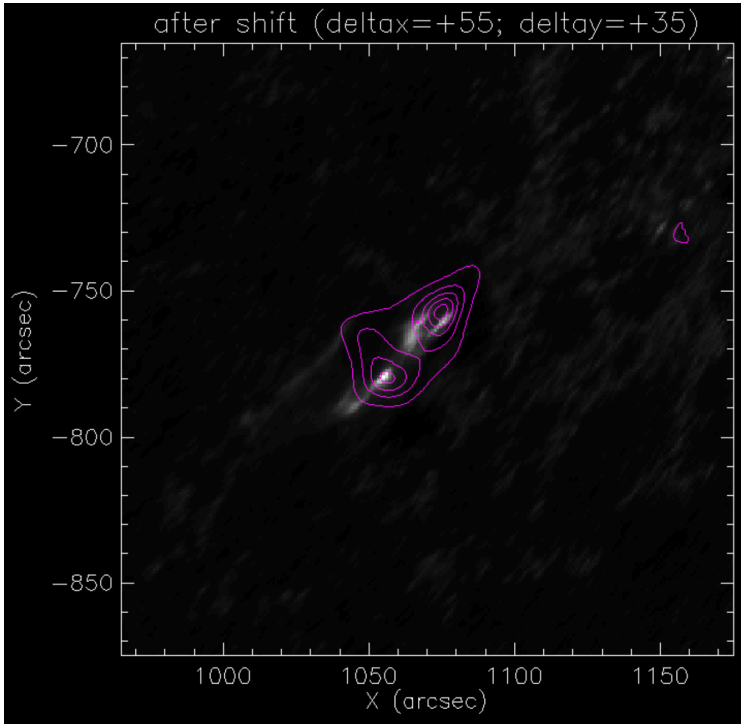
<ΔX> = 56.2 +/- 10.6”

<ΔY> = 9.9 +/- 7.3”

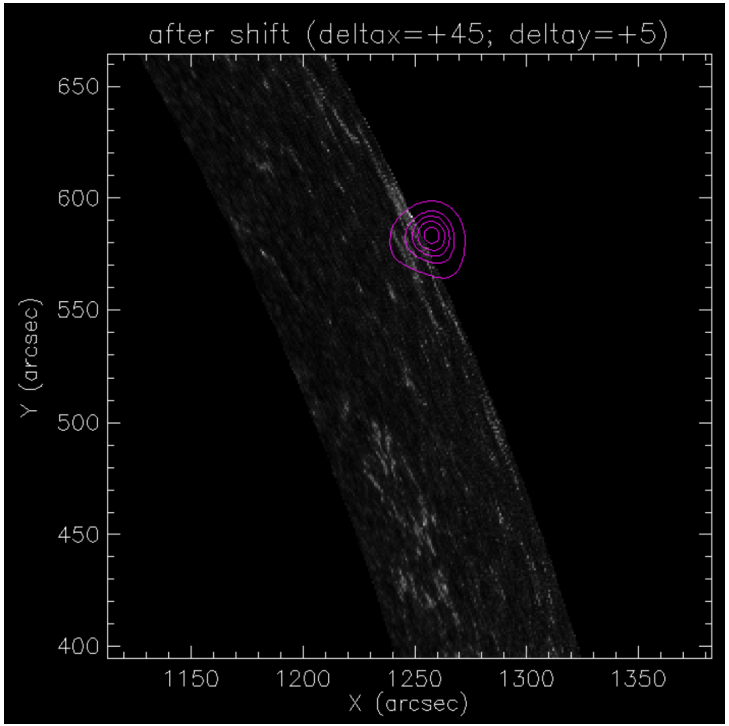


STIX absolute pointing calibration

Good



Bad !

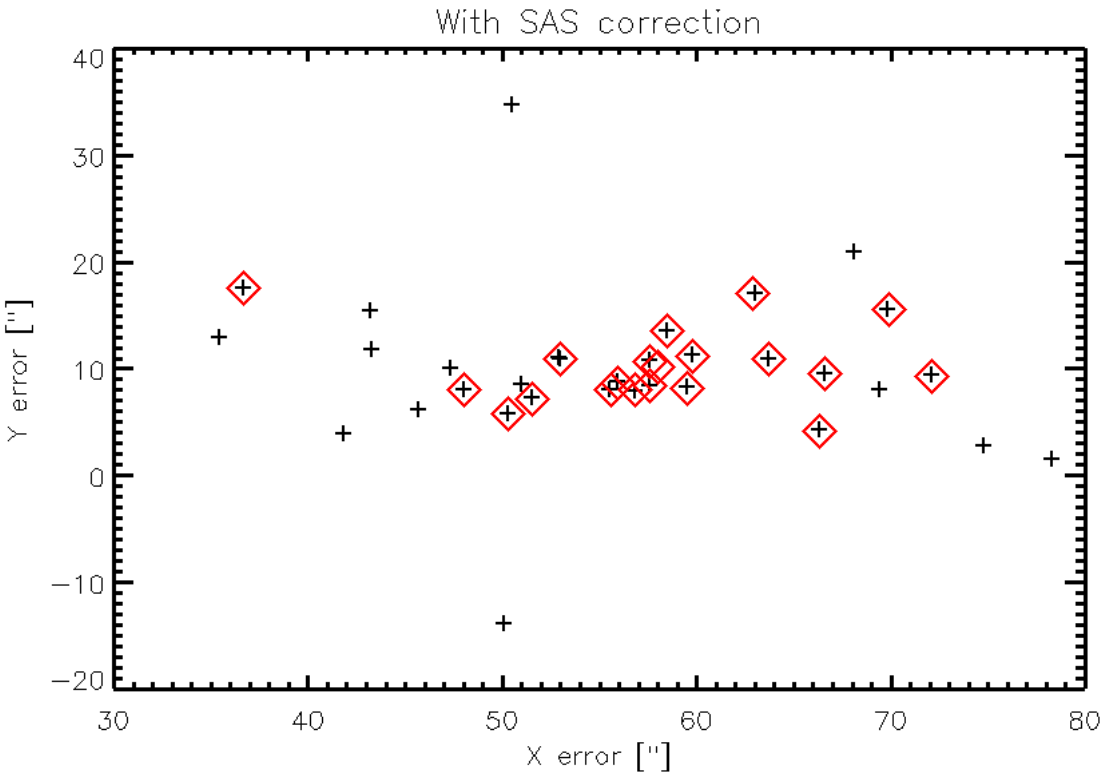


STIX absolute pointing calibration

- Current sample : best 21 cases (far from limb, clear identification in AIA, …)

<ΔX> = 55.6 +/- 13.1”

<ΔY> = 9.9 +/- 3.6”



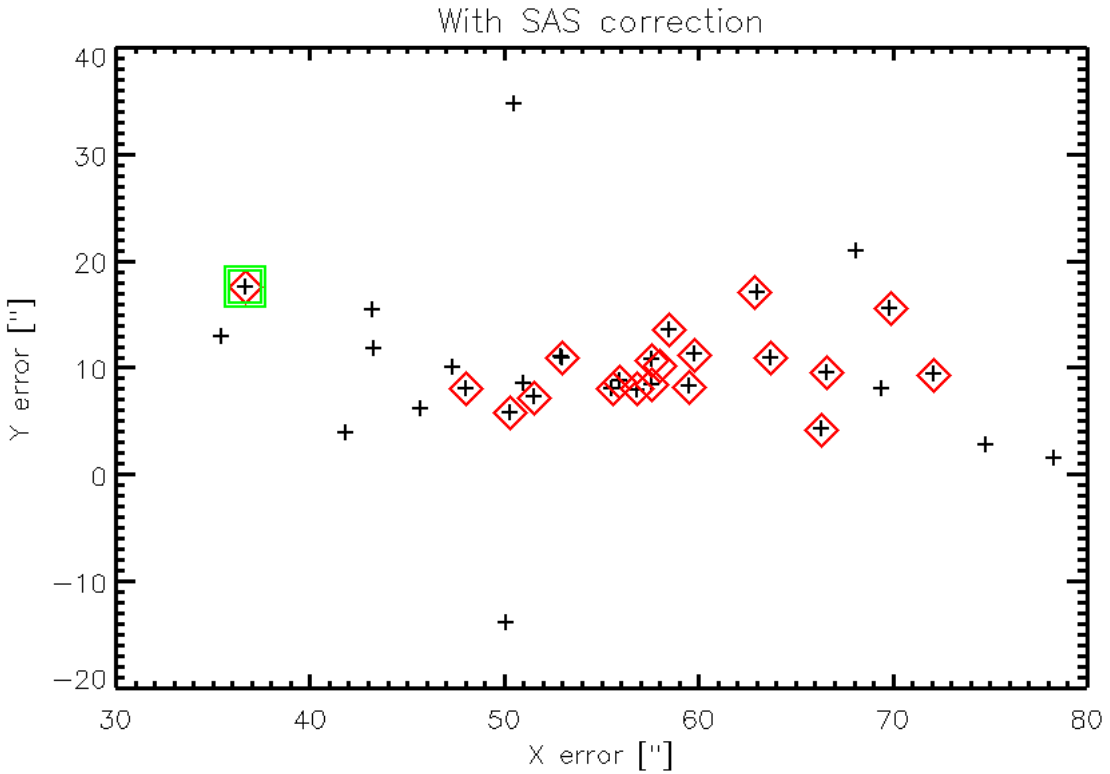
STIX absolute pointing calibration

- Current sample : best case

“very good, in principle we should only use such cases” [Säm Krucker]

ΔX = 36.7”

ΔY = 17.6”



STIX absolute pointing calibration

- Current sample : best 21 cases (far from limb, clear identification in AIA, …)

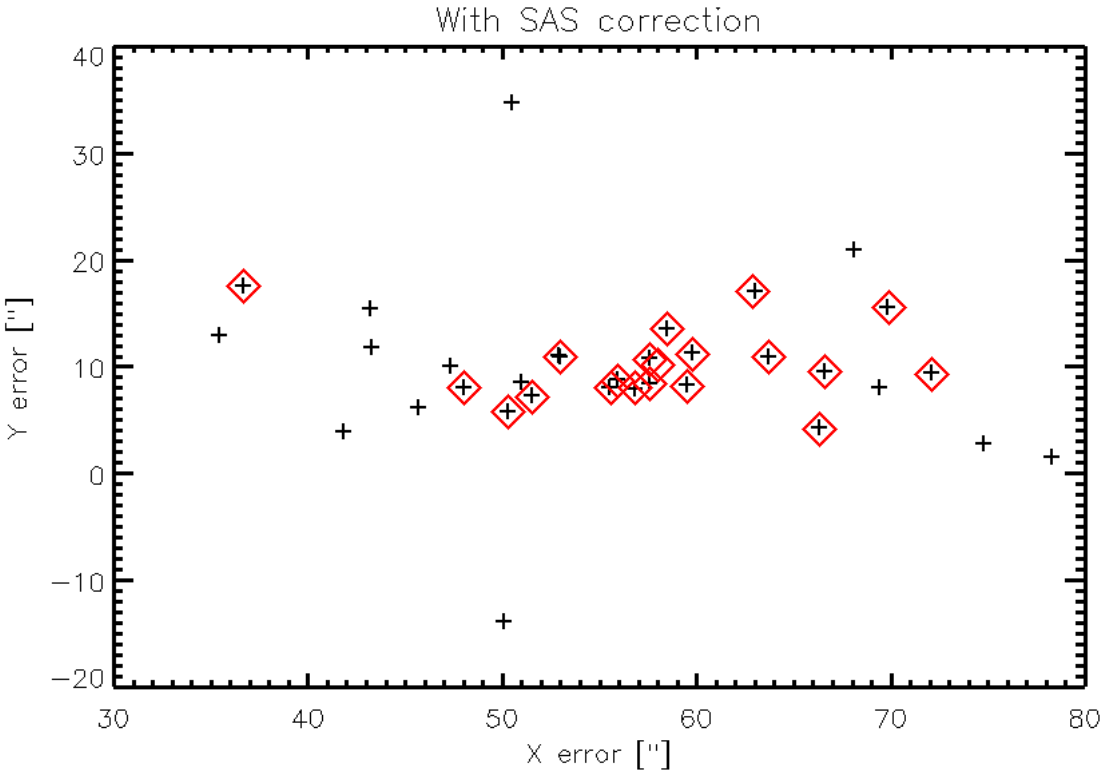
<ΔX> = 55.6 +/- 13.1”

<ΔY> = 9.9 +/- 3.6”

Current values in SSW:

ΔX = 60.0”

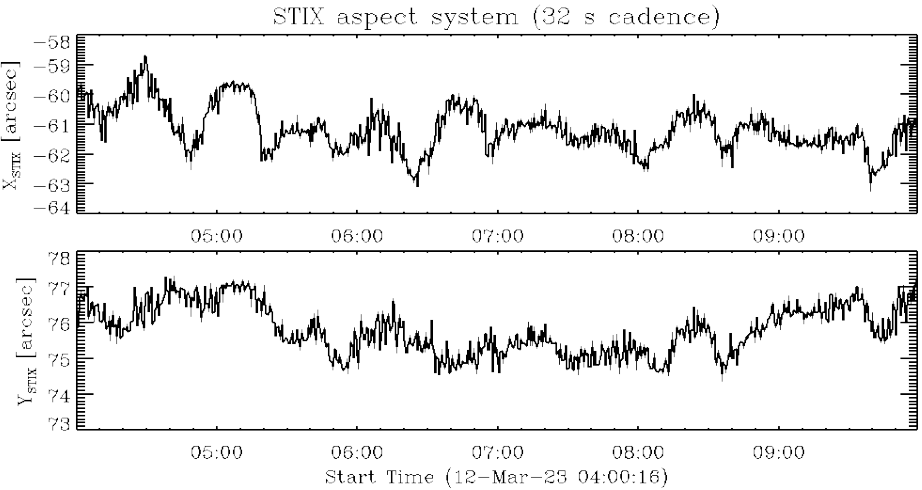
ΔY = 8.0”

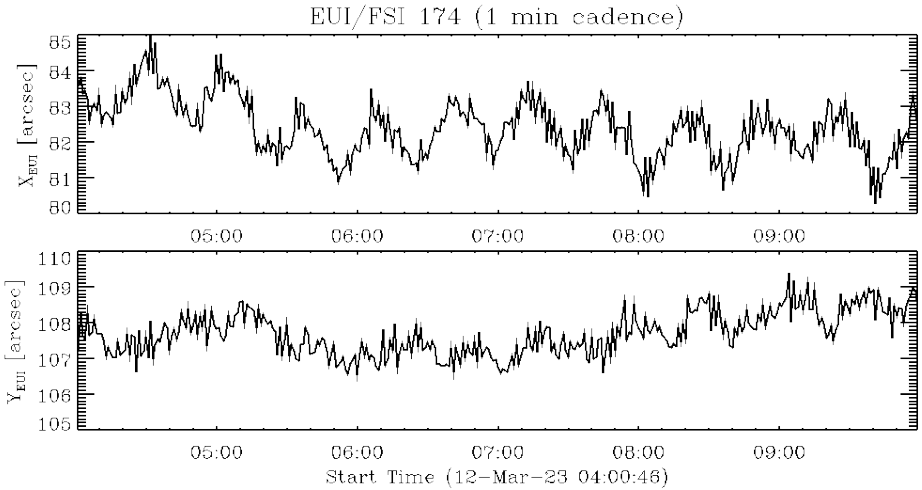


Comparison with other instruments on Solar Orbiter

STIX and EUI/FSI

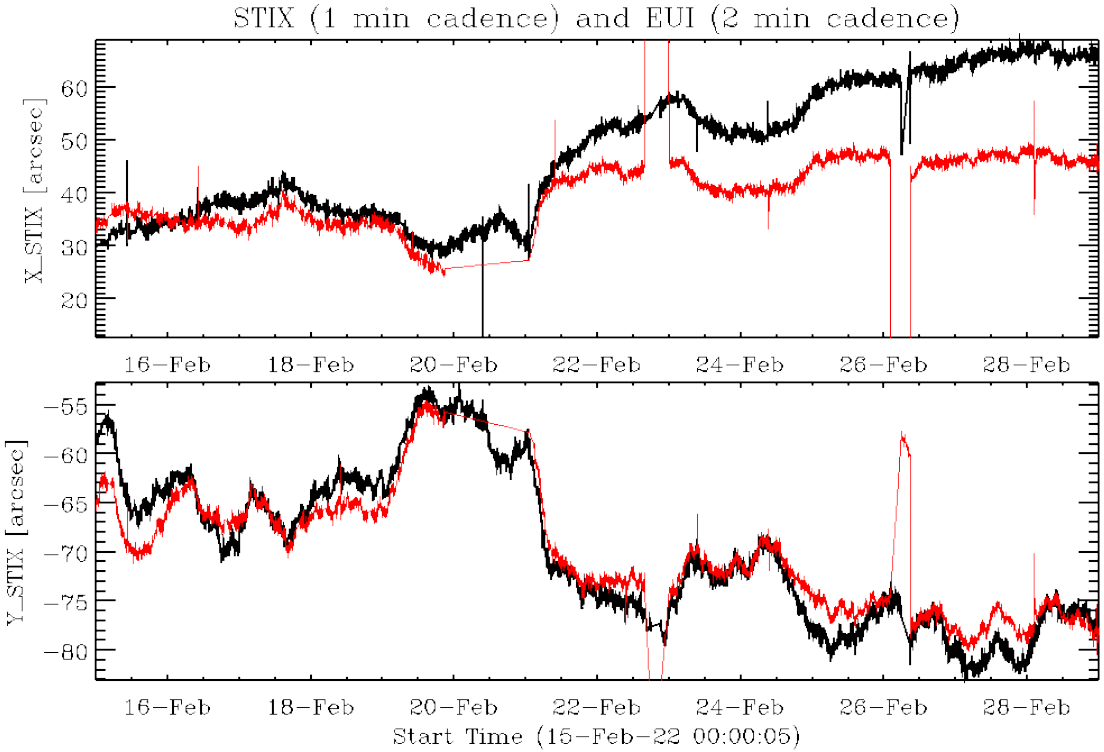
- Same oscillations with ~30 minutes period





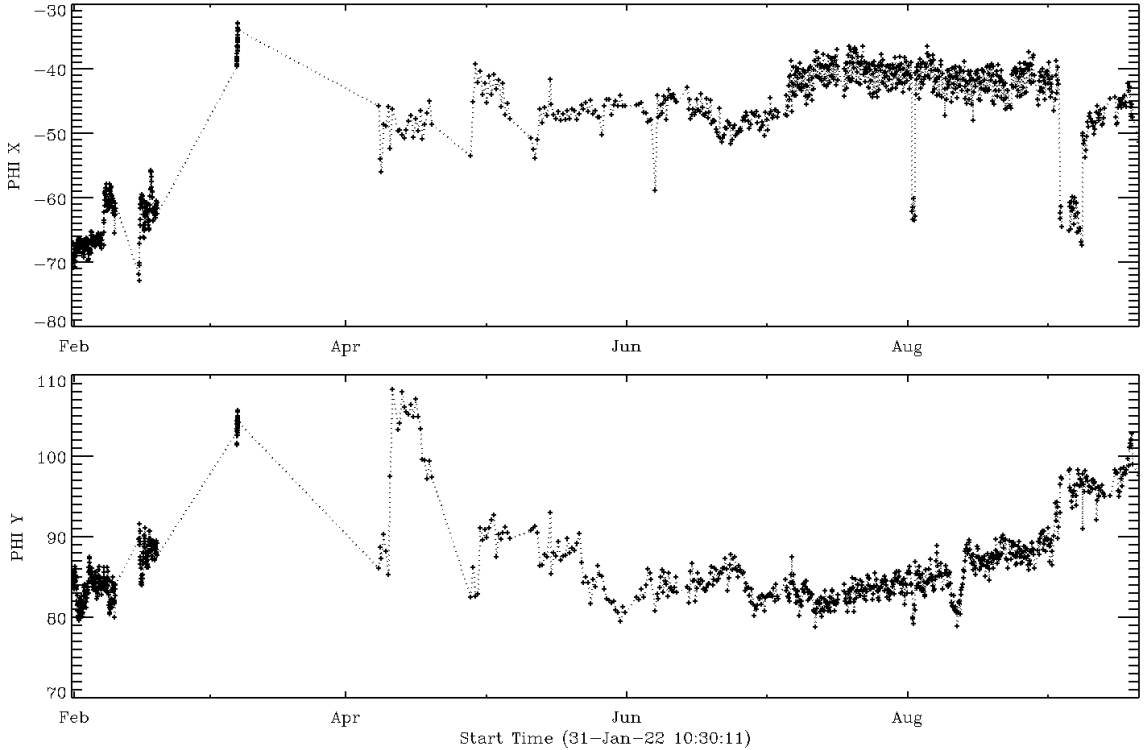
STIX and EUI/FSI

- Similar trend on scale of days (but small differences)



PHI/FDT pointing over ~8 months

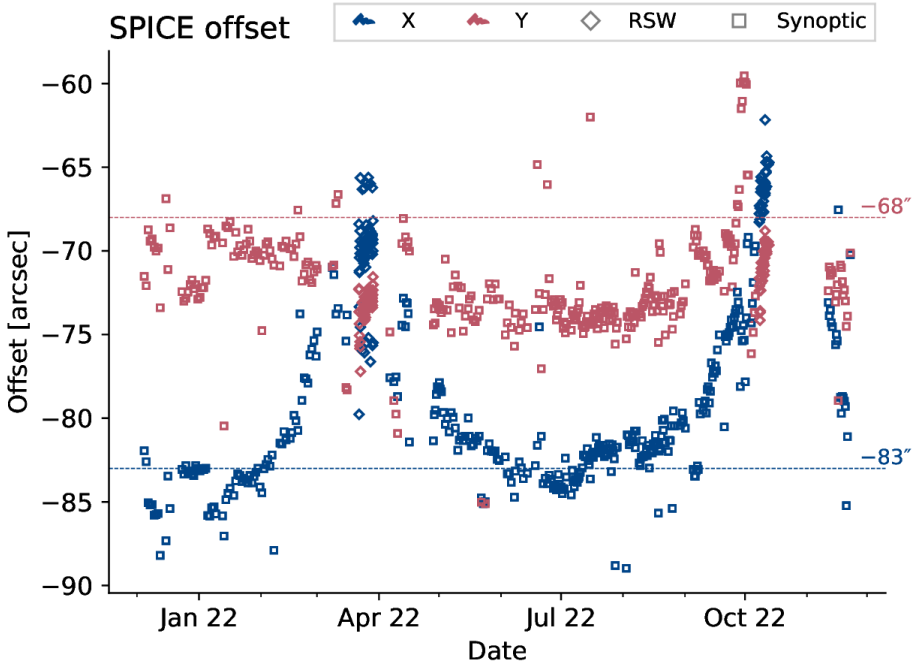
- slow large drifts also seen, up to 30” amplitude

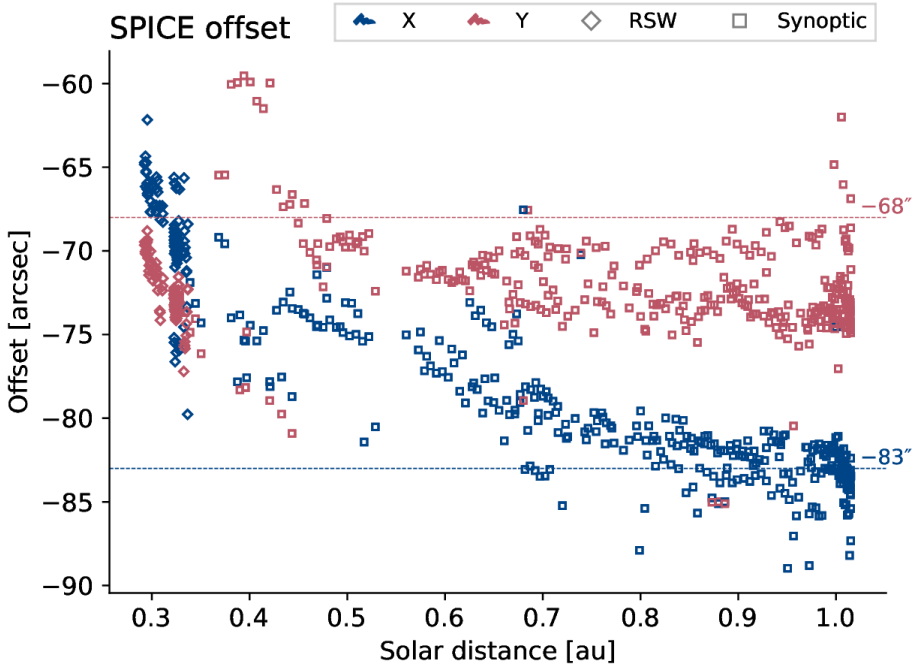


SPICE pointing over a year

- drifts well correlated with solar distance (= temperature)

[plot by G. Pelouze]





Conclusions

- Thermoelastic effects seen by all instruments
- Small differences under investigation

- STIX pointing absolute calibration uncertainty ~10”

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