Using the SAS solution in imaging
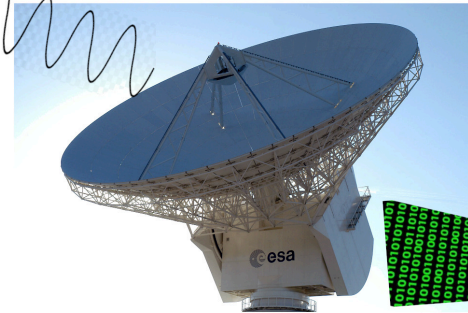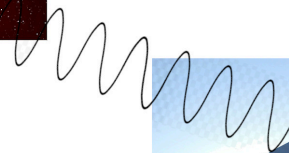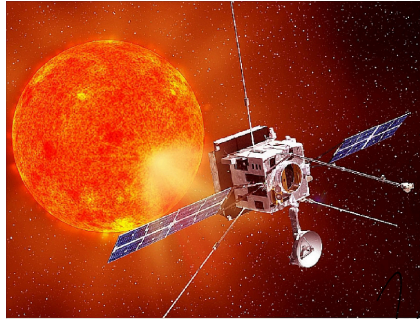
✦ The inner working of solving for aspect

- how is the SAS solution derived?

- how to access it?

- uncertainties and limitations

✦ User perspective

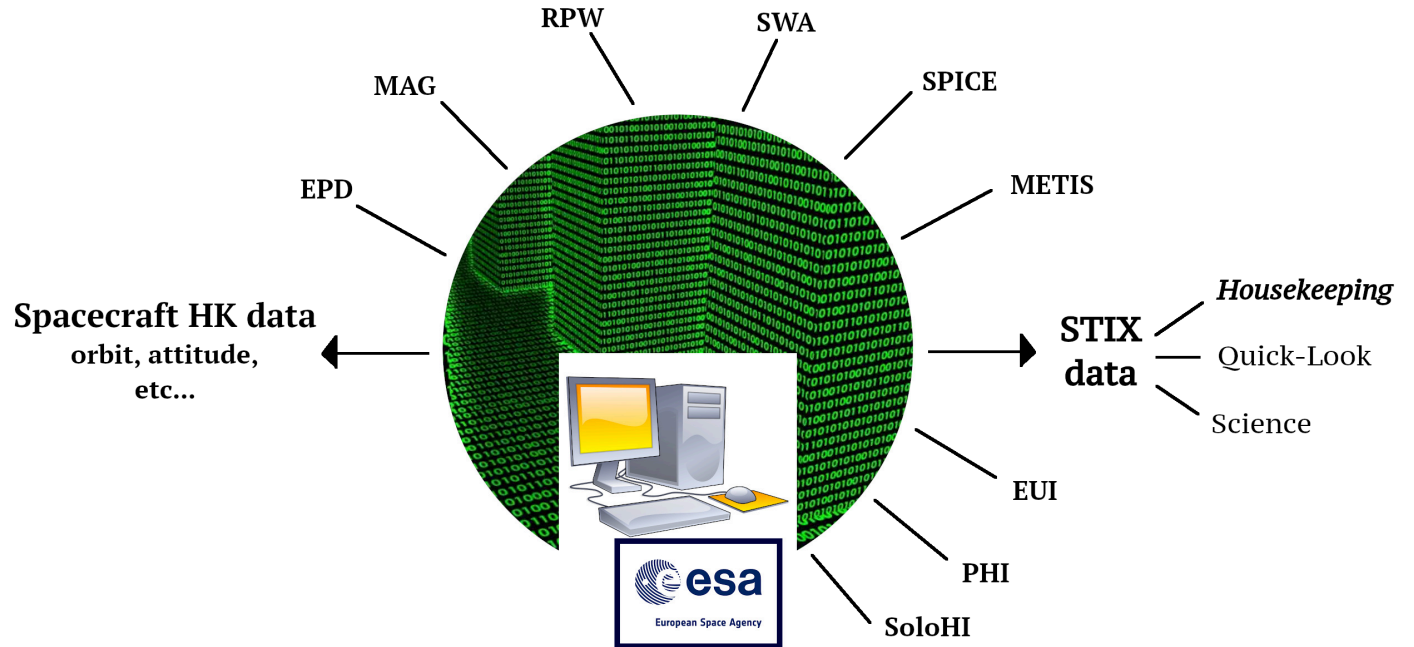- how to deal with it in the imaging pipeline?

- what to do in case of doubts?

How is the SAS solution derived?

✦ From raw data…

How is the SAS solution derived?
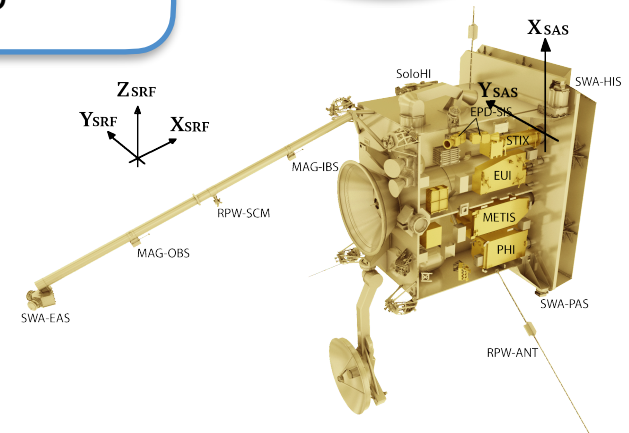
✦ Raw data :
From ESA
to instrument
teams

How is the SAS solution derived?
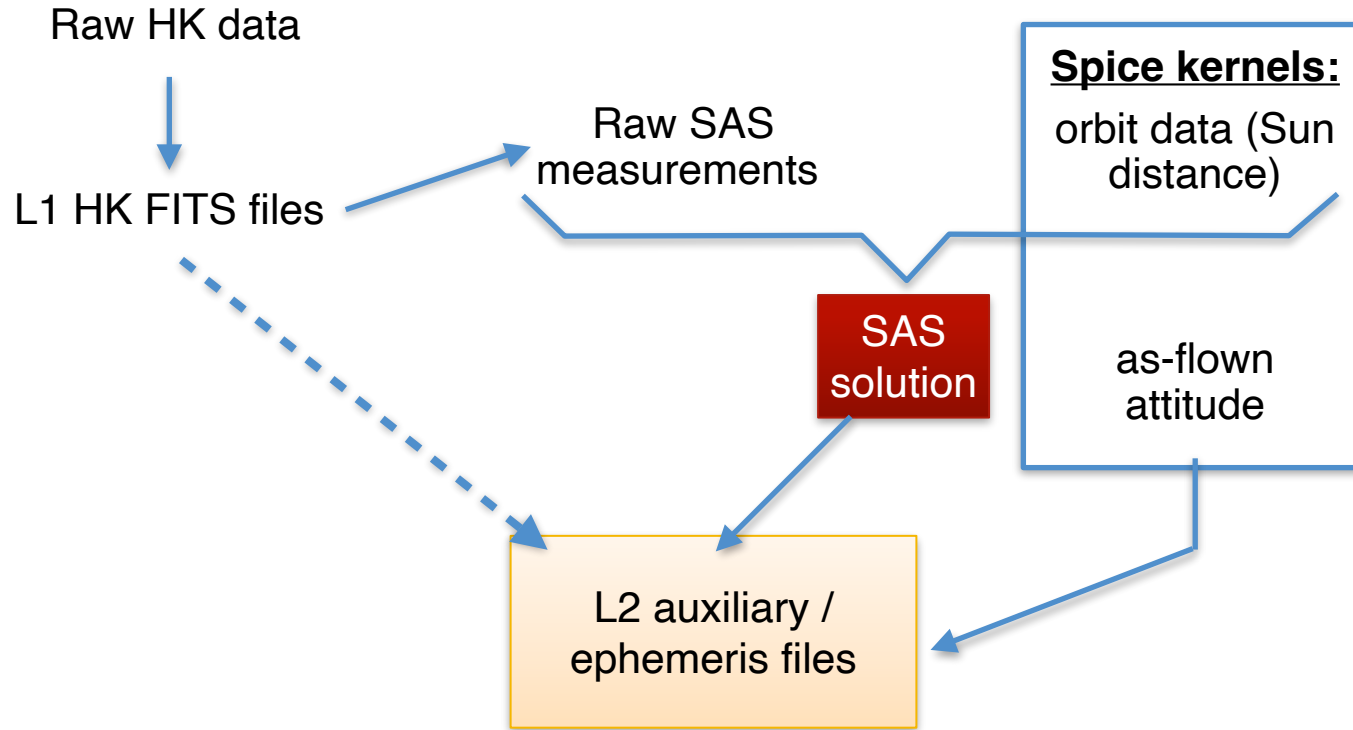
✦ From SAS raw data to an aspect solution:

- STIX Housekeeping data:
  - SAS measurements every 64s
  - …
- Spacecraft orbit
  - ⇒ solar disk apparent size
- Simulated SAS data as fn. of (X,Y)

⇒ closest (X_{SAS}, Y_{SAS})

solution for each time stamp

→ $Y_{SRF} = Y_{SAS}$

$Z_{SRF} = X_{SAS}$

SAS solution: how to access it?

Raw HK data

L1 HK FITS files

Raw SAS measurements

Spice kernels:
orbit data (Sun distance)

SAS solution

as-flown attitude

L2 auxiliary / ephemeris files

SAS solution: how to access it?

L2 auxiliary / ephemeris files

SAS solution: how to access it?

Coming soon…

L2 auxiliary / ephemeris files

fv: Binary Table of solo_L2_stix-aux-ephemeris_2022

control_index	spice_disc_size	y_srf	z_srf	sas_ok	sas_erro
K	E	E	E	L	11A
	arcsec	arcsec	arcsec		
Modify	Modify	Modify	Modify	Modify	Modify
1248	1.234291E+03	-2.933629E+01	-7.170448E+01	T	NULL
1249	1.234280E+03	-2.903310E+01	-7.216138E+01	T	NULL
1250	1.234270E+03	-2.989700E+01	-7.129560E+01	T	NULL
1251	1.234259E+03	-2.857974E+01	-7.261097E+01	T	NULL
1252	1.234249E+03	-2.833743E+01	-7.238422E+01	T	NULL
1253	1.234238E+03	-2.832867E+01	-7.239102E+01	T	NULL
1254	1.234228E+03	-2.780482E+01	-7.275713E+01	T	NULL
1255	1.234217E+03	-2.720251E+01	-7.304580E+01	T	NULL
1256	1.234207E+03	0.000000E+00	0.000000E+00	F	SUN_TOO_FAR
1257	1.234196E+03	0.000000E+00	0.000000E+00	F	SUN_TOO_FAR
1258	1.234186E+03	0.000000E+00	0.000000E+00	F	SUN_TOO_FAR
1259	1.234175E+03	0.000000E+00	0.000000E+00	F	SUN_TOO_FAR
1260	1.234165E+03	0.000000E+00	0.000000E+00	F	SUN_TOO_FAR

SAS data processing: uncertainties and limitations

✦ <u>Known limitations</u> :

- SUN_TOO_FAR: d_Sun > 0.75 AU
  - ⇒ no signal in at least 2 SAS arms ⇒ no solution

- SUN_TOO_CLOSE: solar image radius exceeds range covered by simulated data (**should not happen!**)

- OFFPOINT_TOO_LARGE: if solution found well beyond solar limb

- NO_SOLUTION: in case the computation failed, for whatever reason

- Large off-pointing
  - ⇒ larger uncertainty (calibration issue? ghost images? …)

SAS data processing: uncertainties and limitations

✦ <u>Uncertainties</u> :

- Pointing at Sun centre:
  - statistical error ~10"

    more on that topic on Tuesday

- Large off-pointing:
  - larger uncertainty (up to several arcmin)

Using the SAS solution: user's perspective

✦ How to deal with SAS correction in the imaging pipeline?

Somewhere in your imaging script / function / procedure:

```
aux_data = stx_create_auxiliary_data(aux_fits_file, time_range)
```

This builds a structure that contains (among others):

```
STX_POINTING
 = (Y_SRF, Z_SRF) + mean systematic offsets
```

Until now:

```
compare with spacecraft pointing (corrected for average shift between STIX and s/c)
if difference > 2' then use s/c (+ correction) pointing
```

New:

```
use only SAS data where SAS_OK = 1
```

Using the SAS solution: user's perspective

✦ How to deal with SAS correction in the imaging pipeline?

```
aux_data = stx_create_auxiliary_data(aux_fits_file, time_range)
```

This structure is passed to functions *stx_estimate_flare_location* and all imaging algorithms

⇒ you don't need to care!

✦ In case of doubts: <u>contact me</u>!

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