A new pipeline for MIRCx

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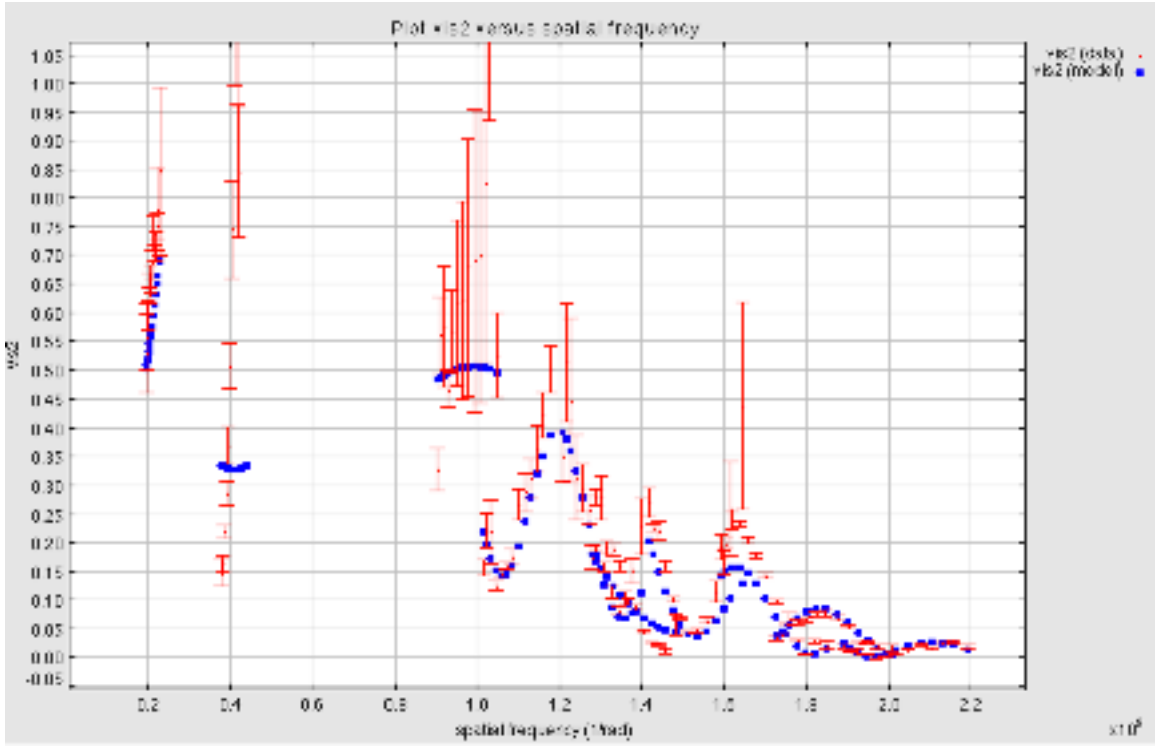
Rational for an alternate pipeline

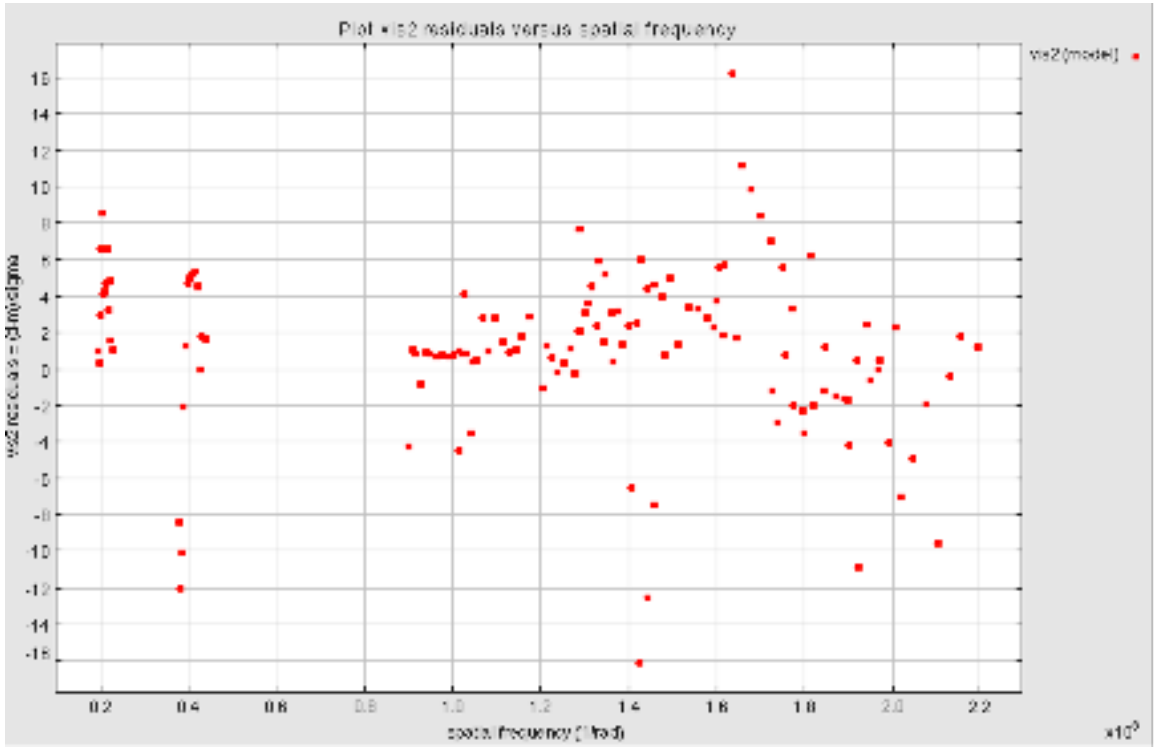
- Transition idl → python to increase the user and contributor community
- Work on large dataset in batch mode
- Clean-up ‘tuned’ algorithms that accumulated over time and upgrades
- Compute Quality Control parameters
- Experience the data myself

Teaser : does it works ??? Not quite yet.

- vis2 fit to iotaPeg (reference binary)



- Residuals (reduced chi2= 6)



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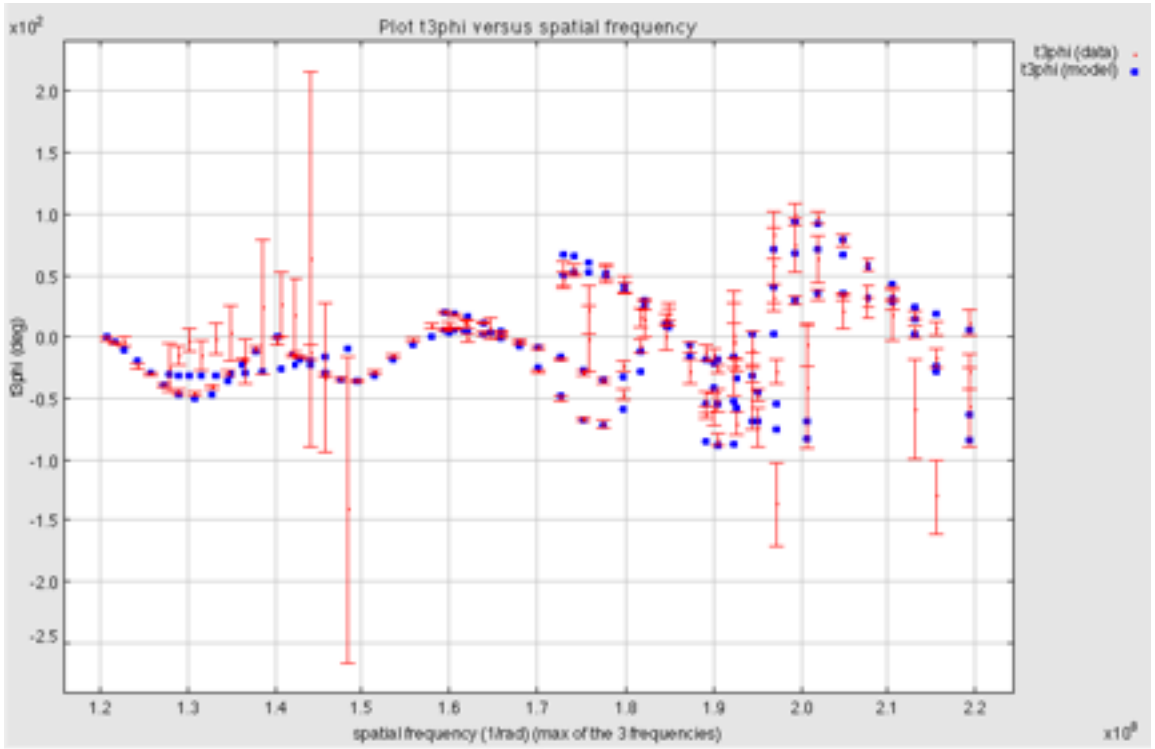
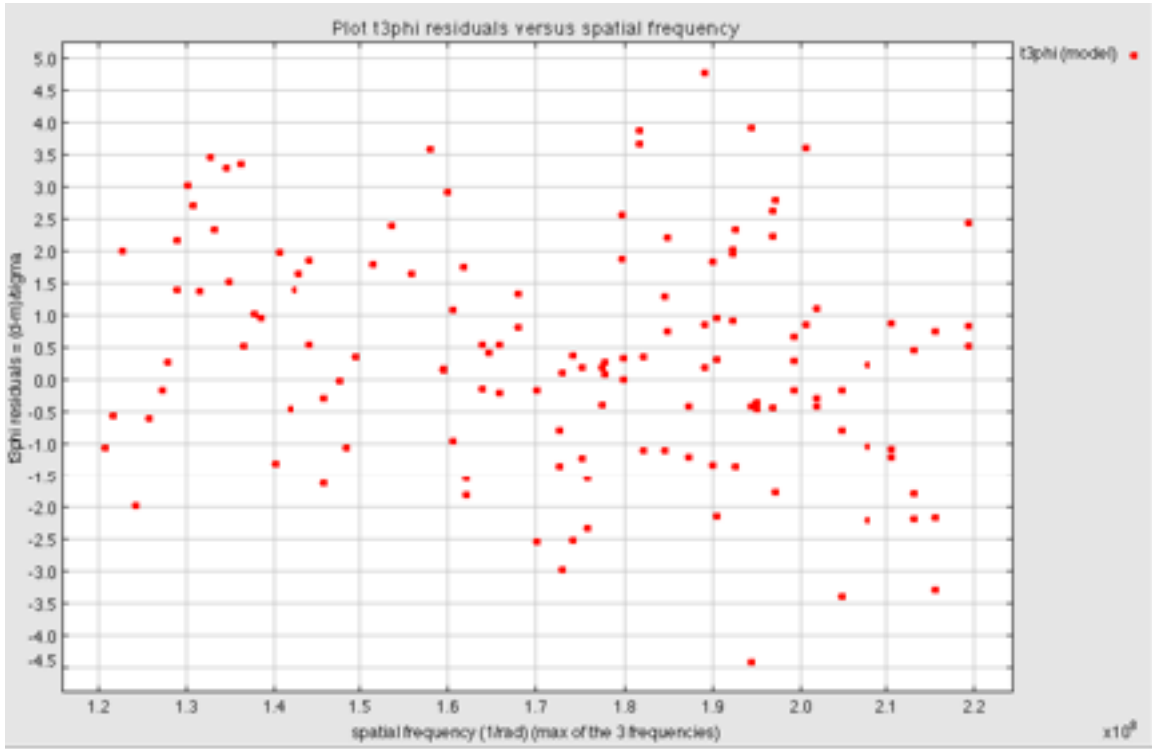
- t3phi fit to iotaPeg (reference binary)

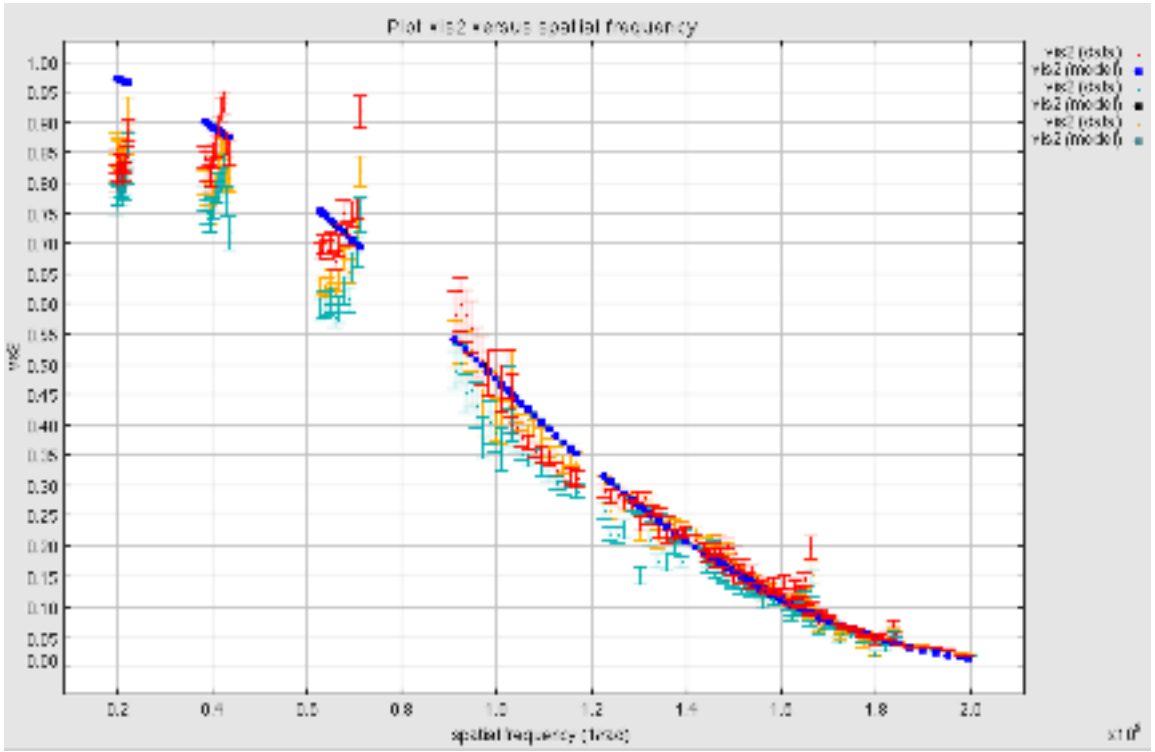


- Residuals (reduced chi2 = 2)

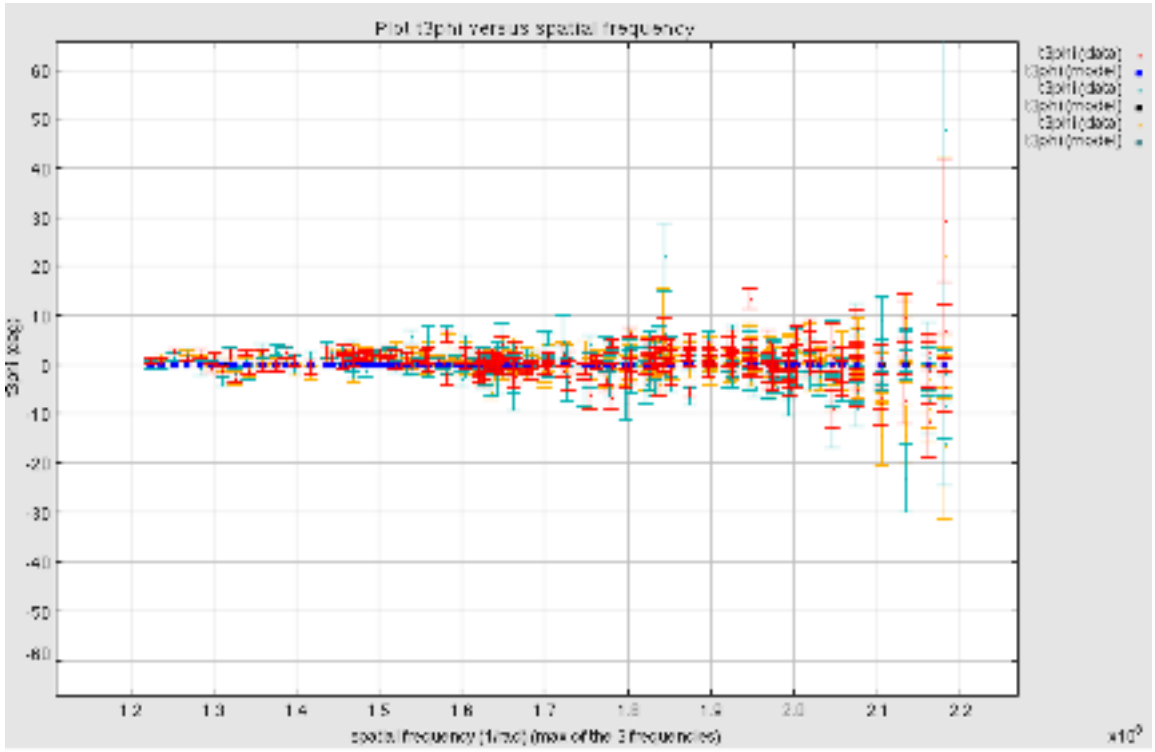


Teaser : does it works ??? Not quite yet.

- Visibilities

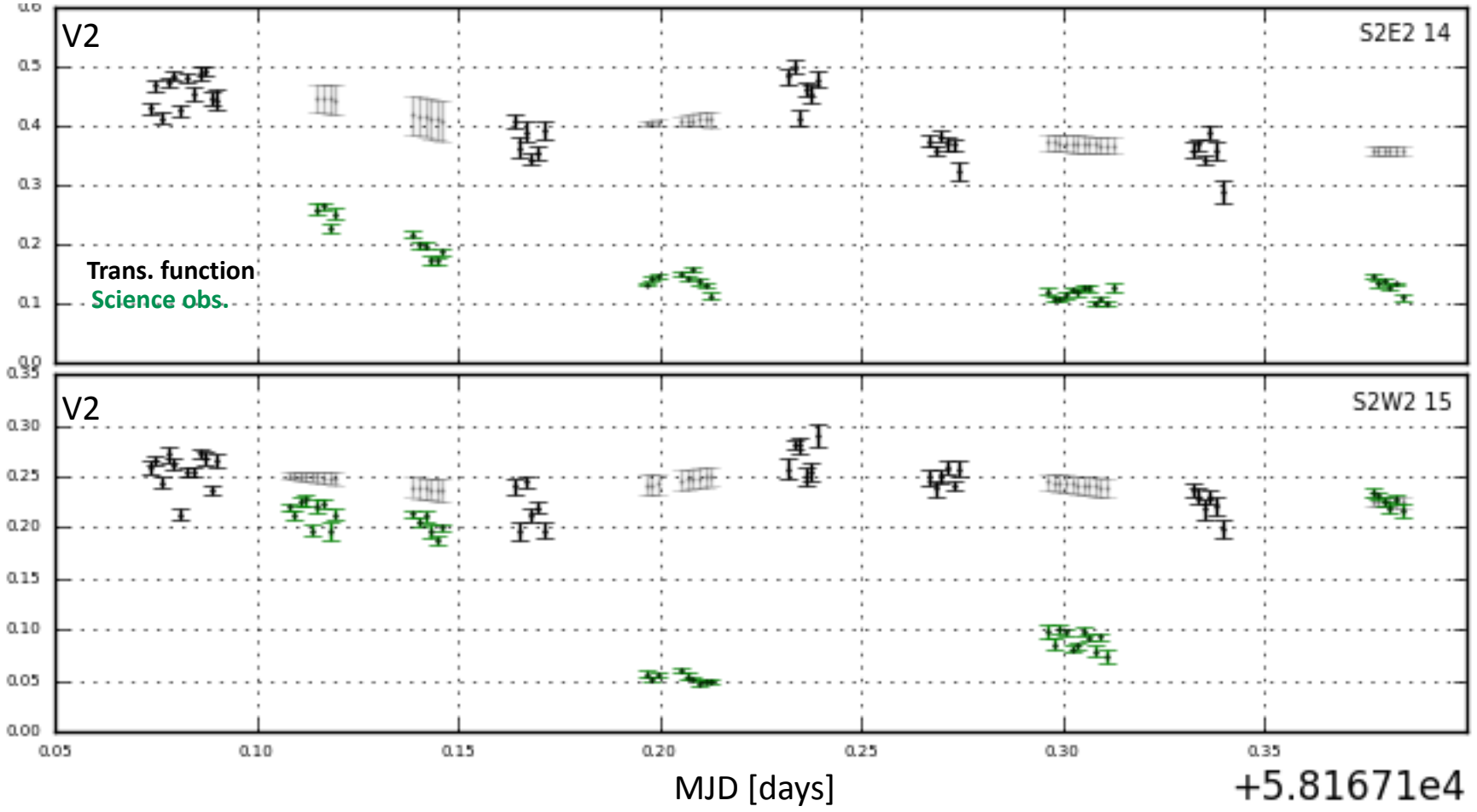


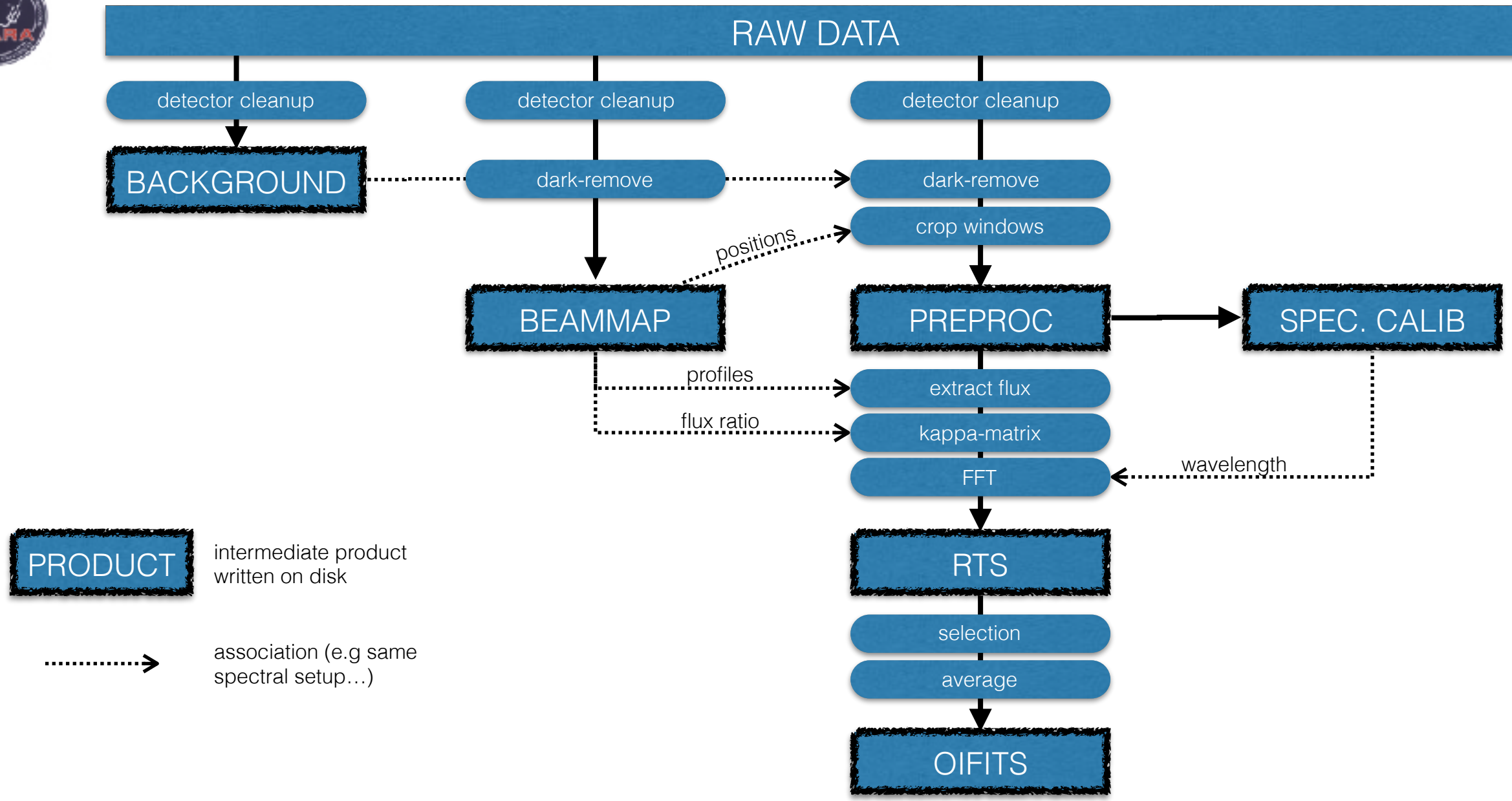
- Closure phase

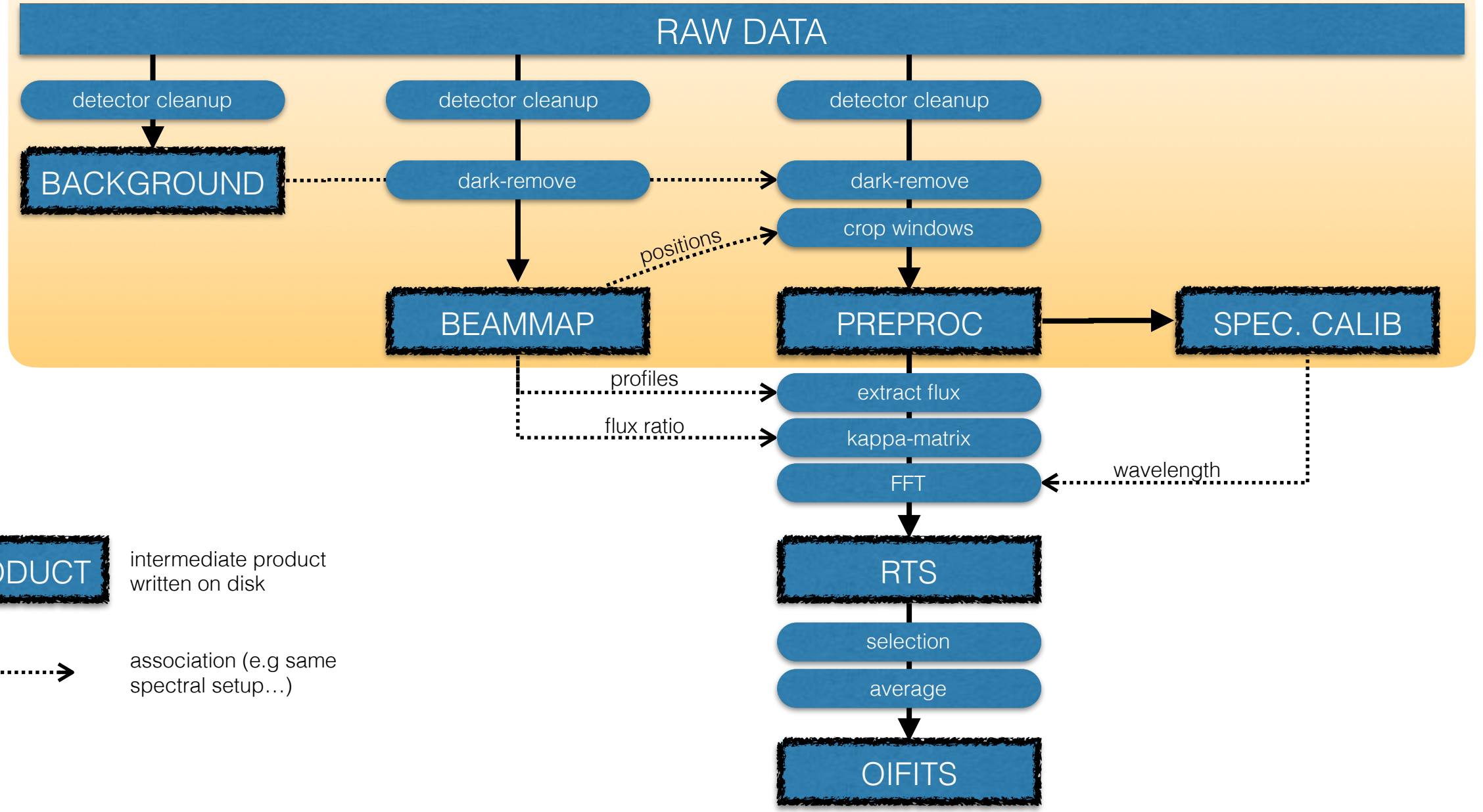


Example of night sequence

- Consecutive points have well-behaved statistic.
- Target to target fluctuations, still to be understood.




RAW DATA
detector cleanup
detector cleanup
detector cleanup
BACKGROUND
dark-remove
dark-remove
crop windows
positions
BEAMMAP
PREPROC
SPEC. CALIB
profiles
extract flux
flux ratio
kappa-matrix
wavelength
FFT
RTS
selection
average
OIFITS
PRODUCT
intermediate product written on disk
association (e.g same spectral setup…)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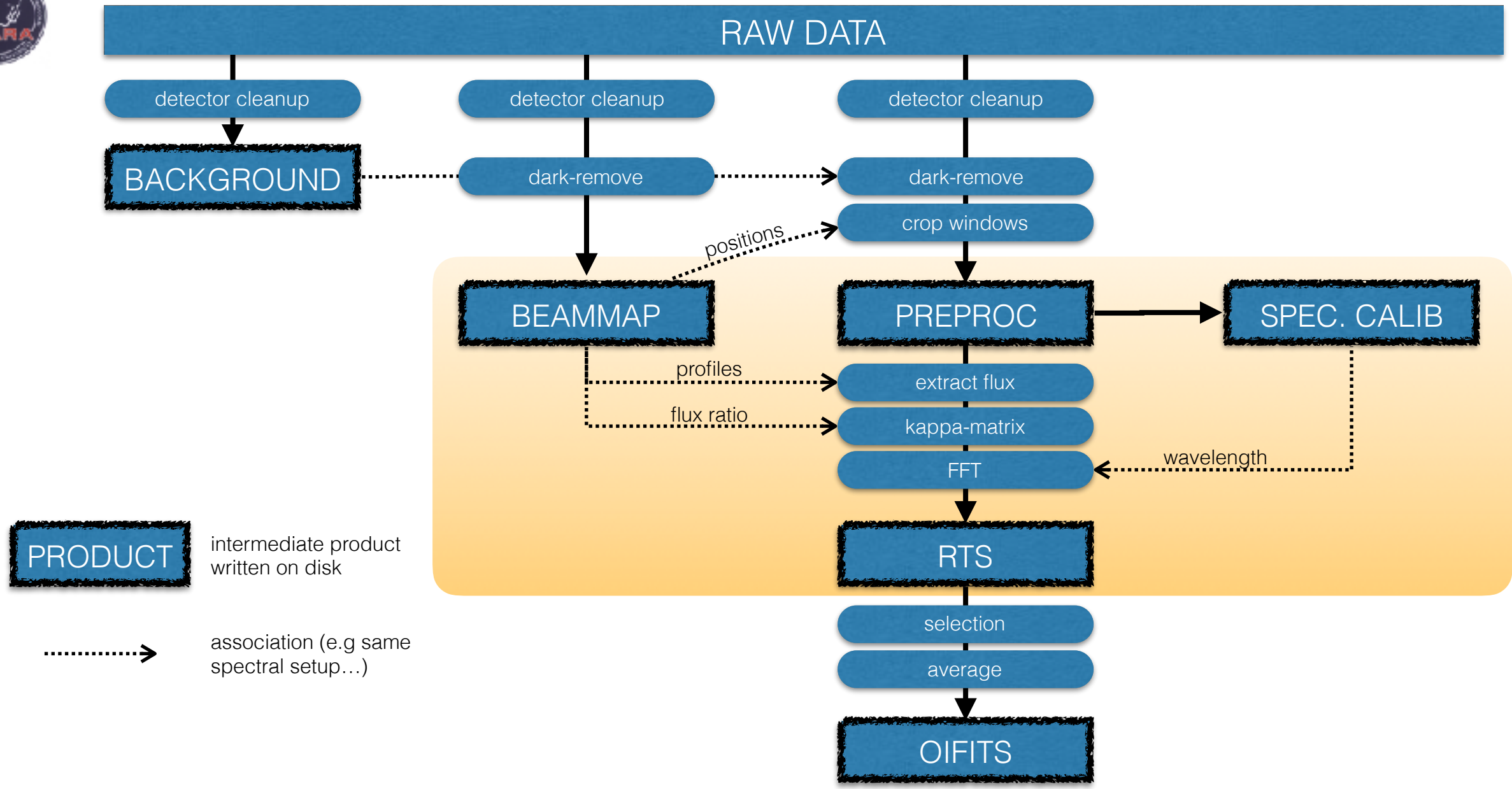
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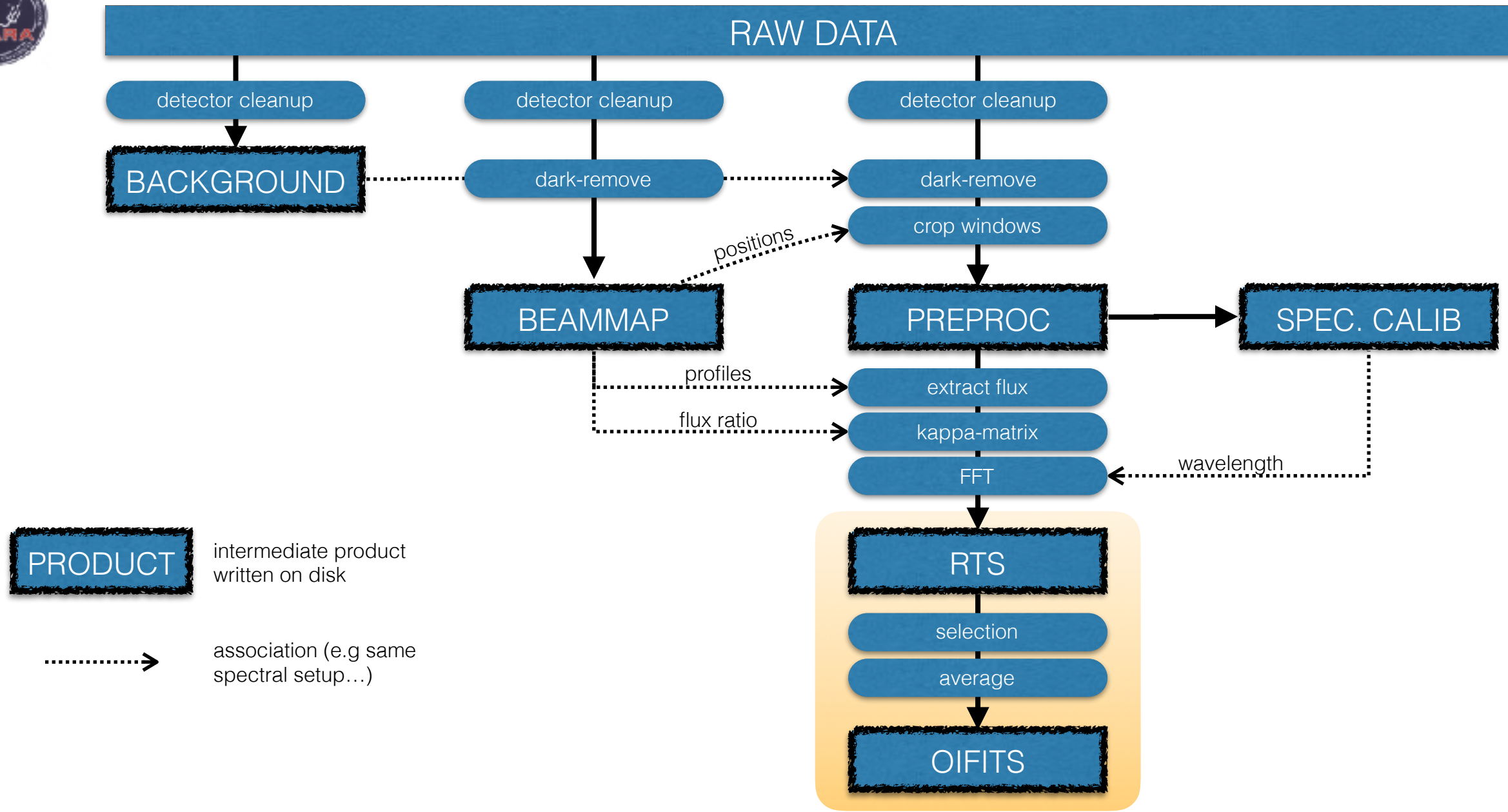
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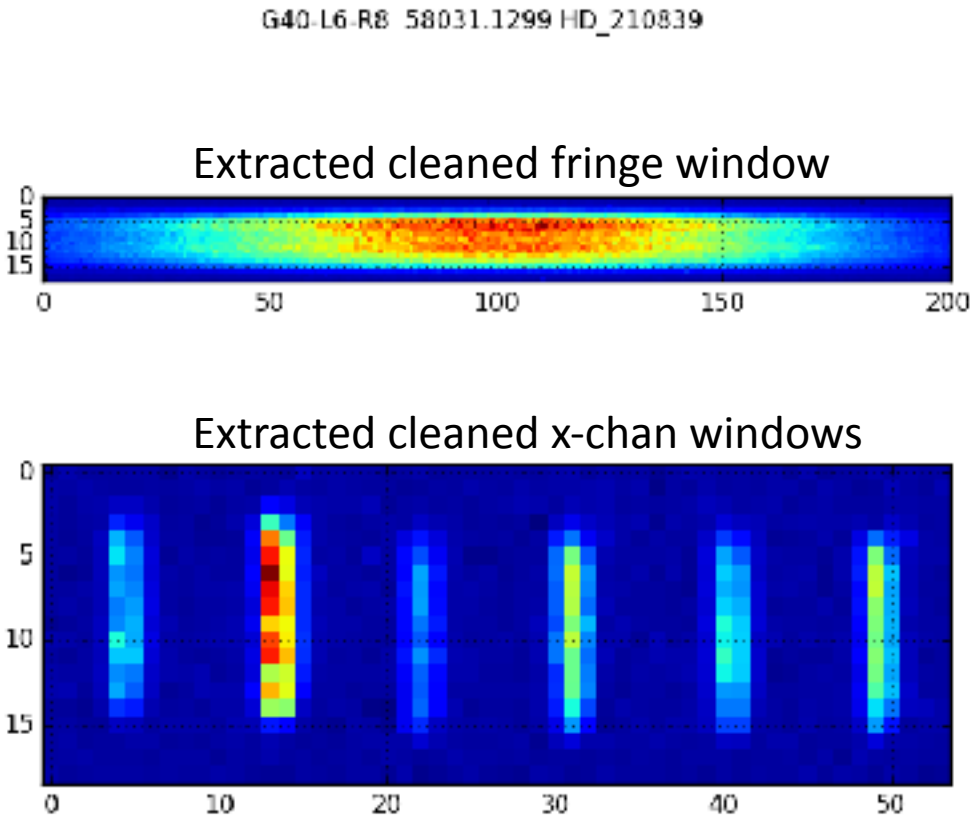
From RAW to PREPROC

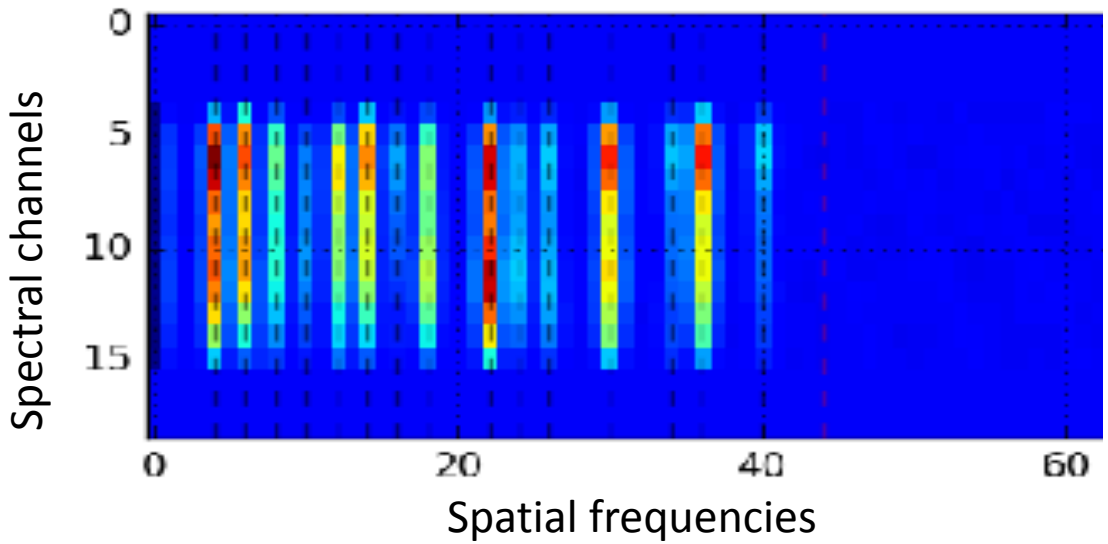
- Clean raw data from detector behaviour
  - Compute CDS from non-destructive
  - Remove electronic interference
  - Remove background
  - Flag saturation
  - *Non-linearity*

- Output PREPROC
  - Clean, cropped images of fringes
  - Clean, cropped images of x-chan



From PREPROC to Real Time Signals

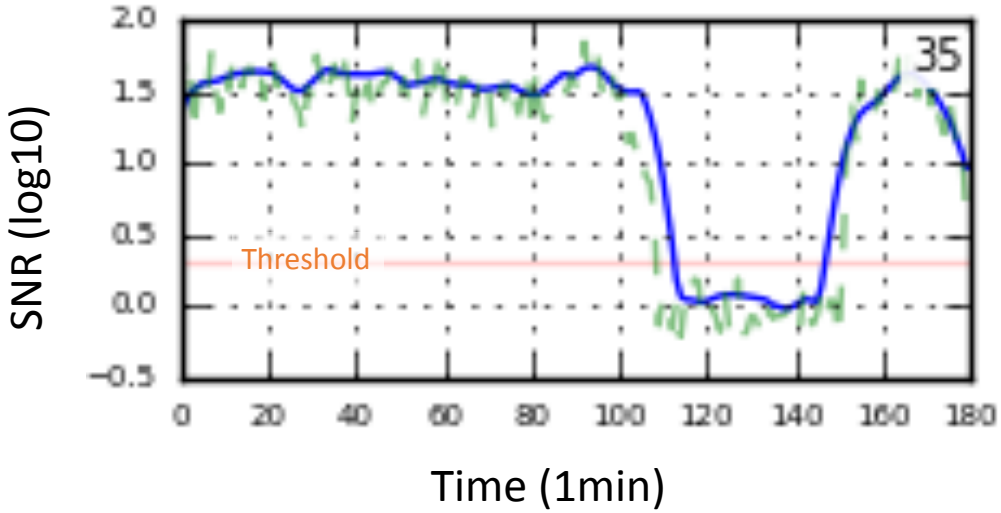
- From pre-proc images
  - Align spectrally fringes and x-chan
  - Extract x-chan flux from profile
  - *kappa-matrix (x-chan/fringe)*
  - Normalise x-chan to total flux in fringes
  - FFT the image at fringe frequencies
  - *Fringe cross-talk*



- Output RTS
  - Real time fringe fluxes = 15x R(t), I(t)
  - Real time x-chan flux = 6x P(t)

From RTS to OIFITS

- From Real Time Signals
  - Coherent integration
  - Correct for coherence loss due to GD
  - Discard data based on SNR, GD…
  - Ensemble average of VIS2, T3PHI…
  - Read uv and time from CHARA header



- Output OIFITS
  - Uncalibrated interferometric quantities (~1min integration time)

Typical interaction with pipeline

- Run the reduction blindly

```
cd my_data/
mircx_reduce.py
```

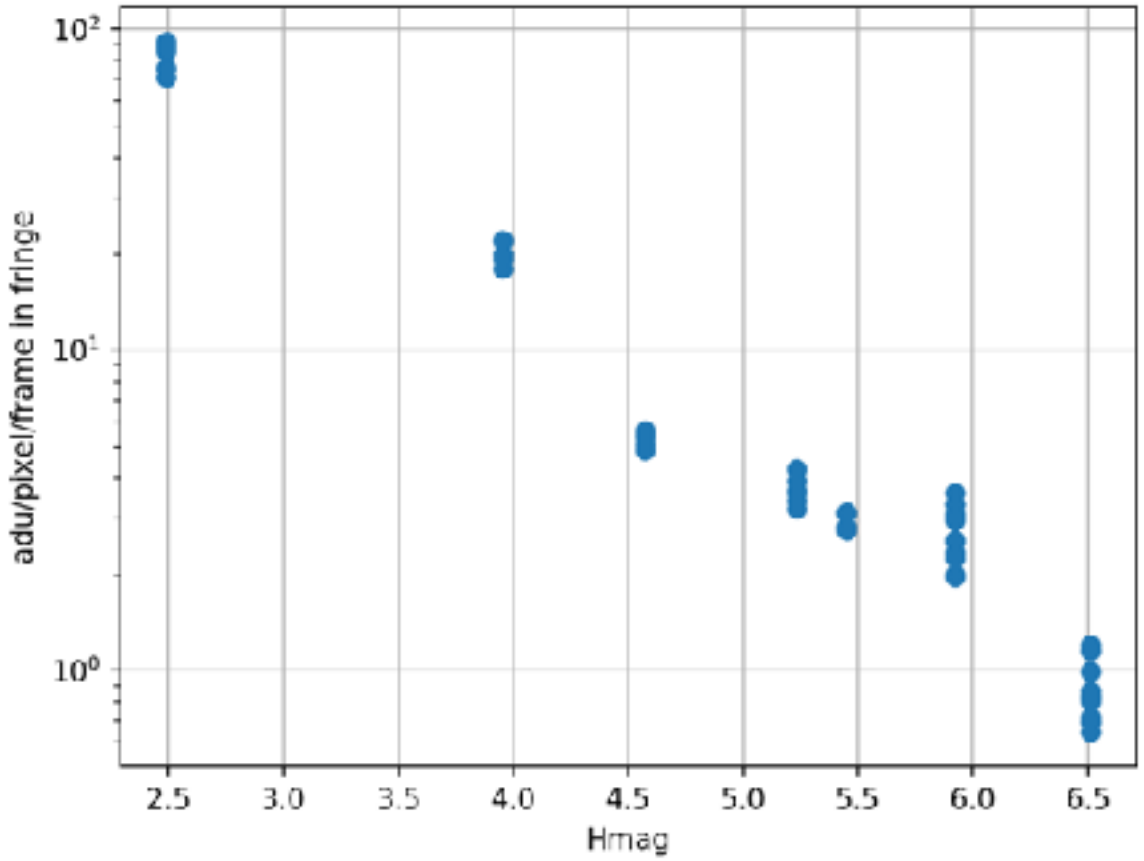
- Redo last part, with tuned parameter

```
mircx_reduce.py --preproc=FALSE --rts=FALSE --ncoherent=5 --threshold=2.0 --vis-dir=vis_for_test
```

- Calibrate visibilities

```
cd vis_for_test/
mircx_calibrate.py --calibrators=SAO_108344,0.8,0.1,HD_162757,0.88,0.1
```

Example of “Quality Control” analysis



Take away

- Architectures and basic operations are done.
- Download from CHARA gitlab, and run (python 2 or 3)

- Still missing necessary features and algorithms (e.g saturation).
- Automation is improved compared to current pipeline, but not yet to a ‘blind science-ready’ level.
- Willing to integrate into CHARA archive/pipeline system.