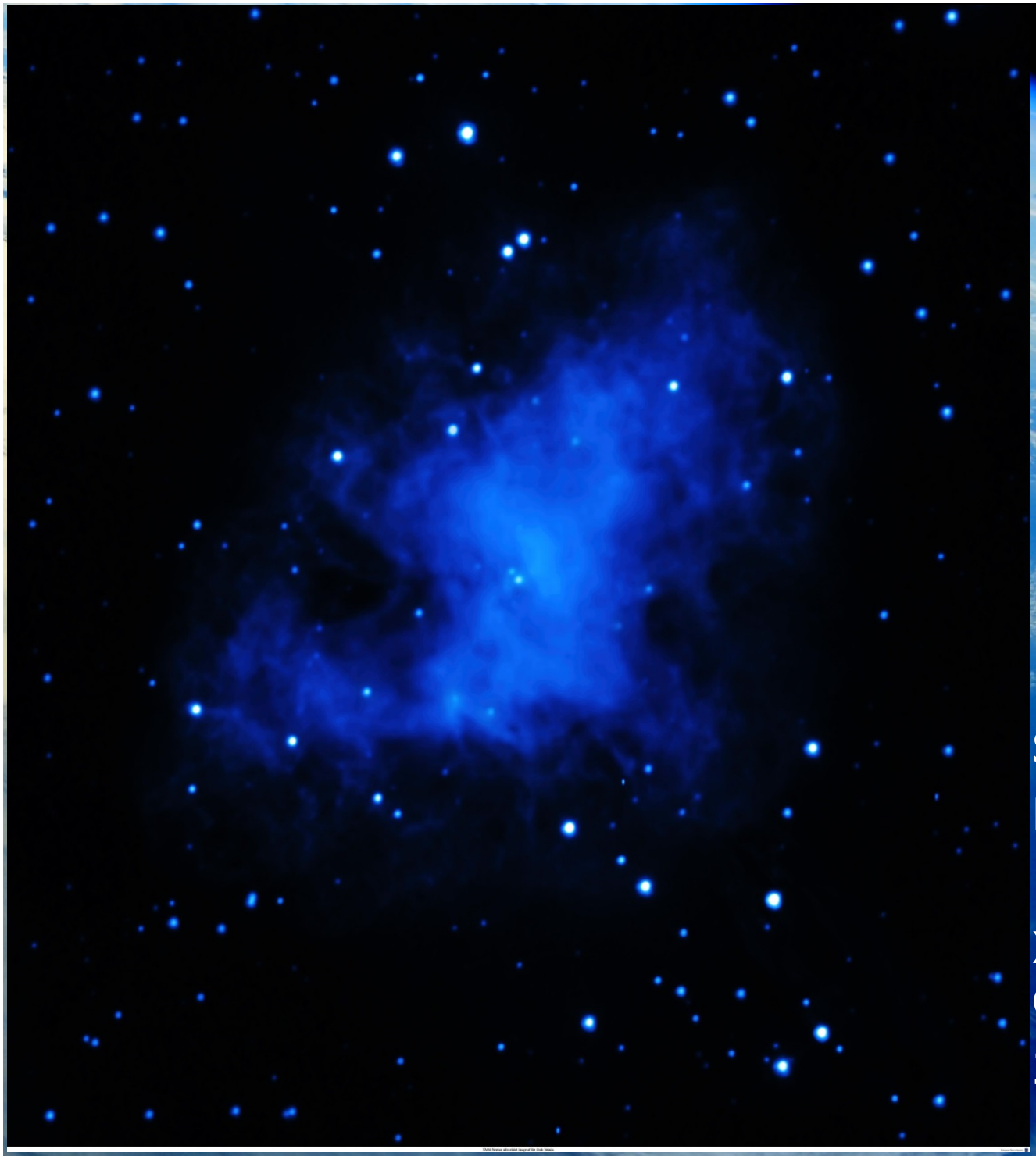


OM Calibration

Simon Rosen
ESAC

XMM-Newton Users Group meeting
2020 June 17-18

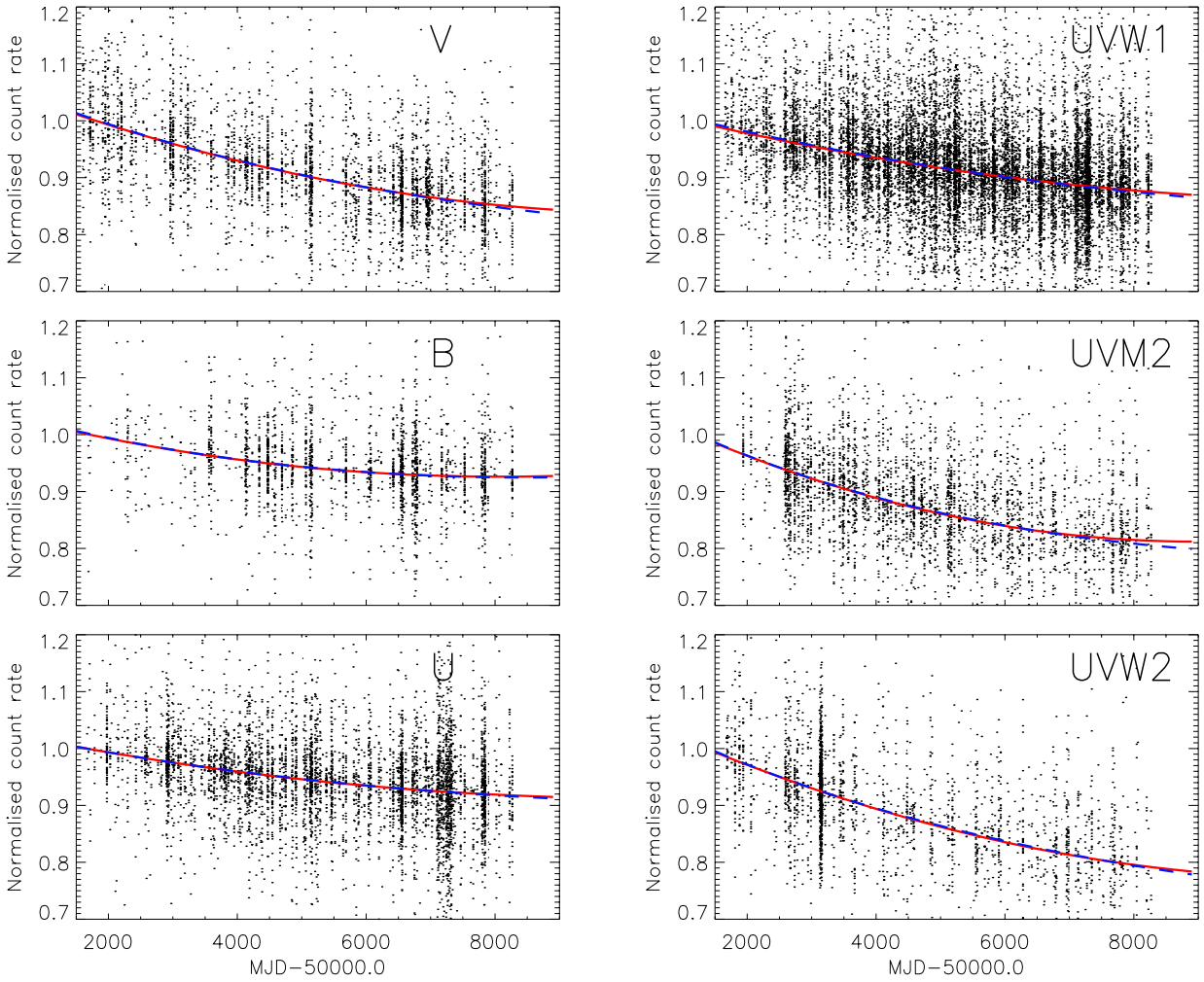
Outline

- OM calibration
  - Time-dependent sensitivity degradation
    - Photometric and Grism updates
  - Jupiter patch monitoring

- Forward look
  - OM SUSS5 catalogue
  - Exploration of OM calibration related issues
  - Pipeline enhancements

Time-dependent degradation of the OM sensitivity(filter photometry)

Based on fits to ‘constant’ sources in the SUSS4 catalogue.



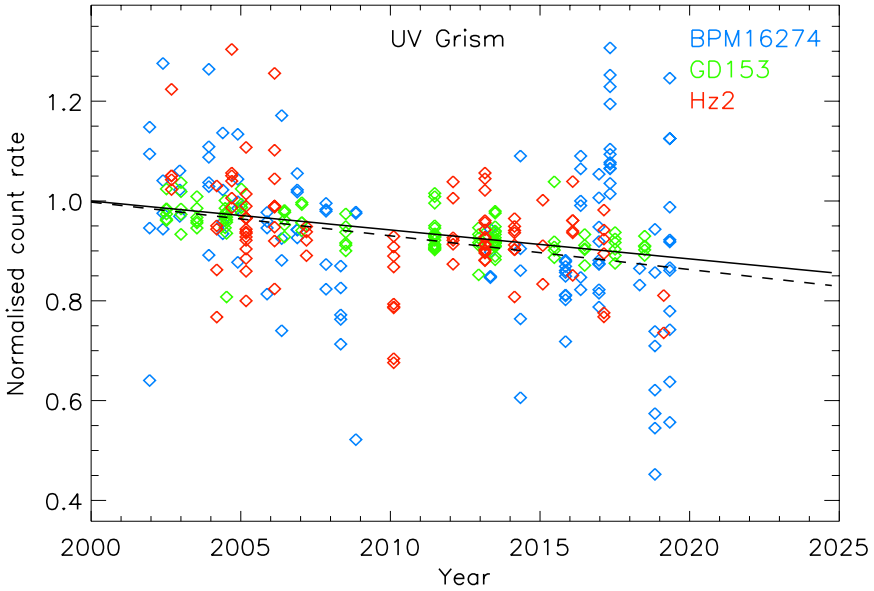
OM throughput (2020.0)

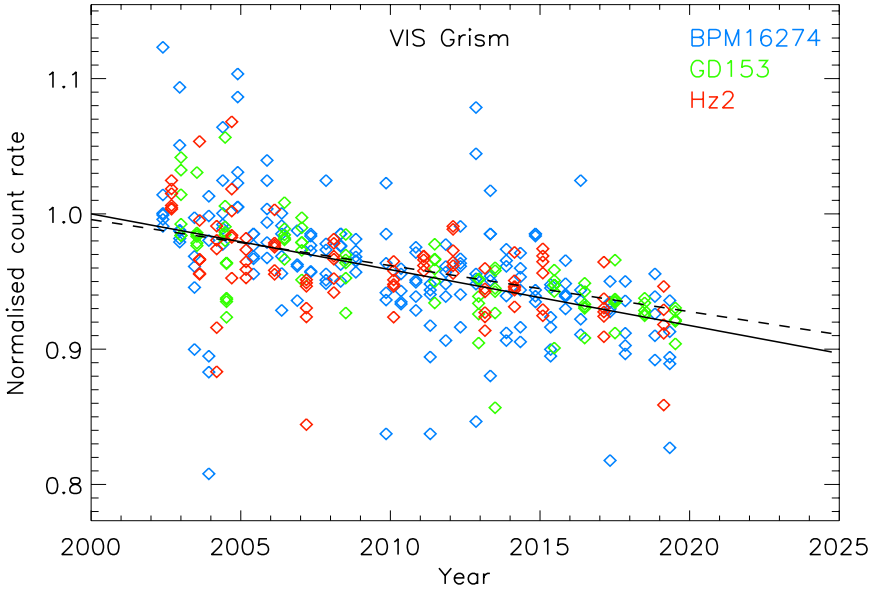
Filter	Throughput
V	0.84
B	0.93
U	0.92
UVW1	0.87
UVM2	0.81
UVW2	0.78

Updated in OM_PHOTTONAT_0008

Decline is corrected in SAS

Time-dependent degradation of the OM grism sensitivity





Measurements of spectra of 3 standard stars in 6 wavelength bands in each grism.

OM grism throughput at 2020.0

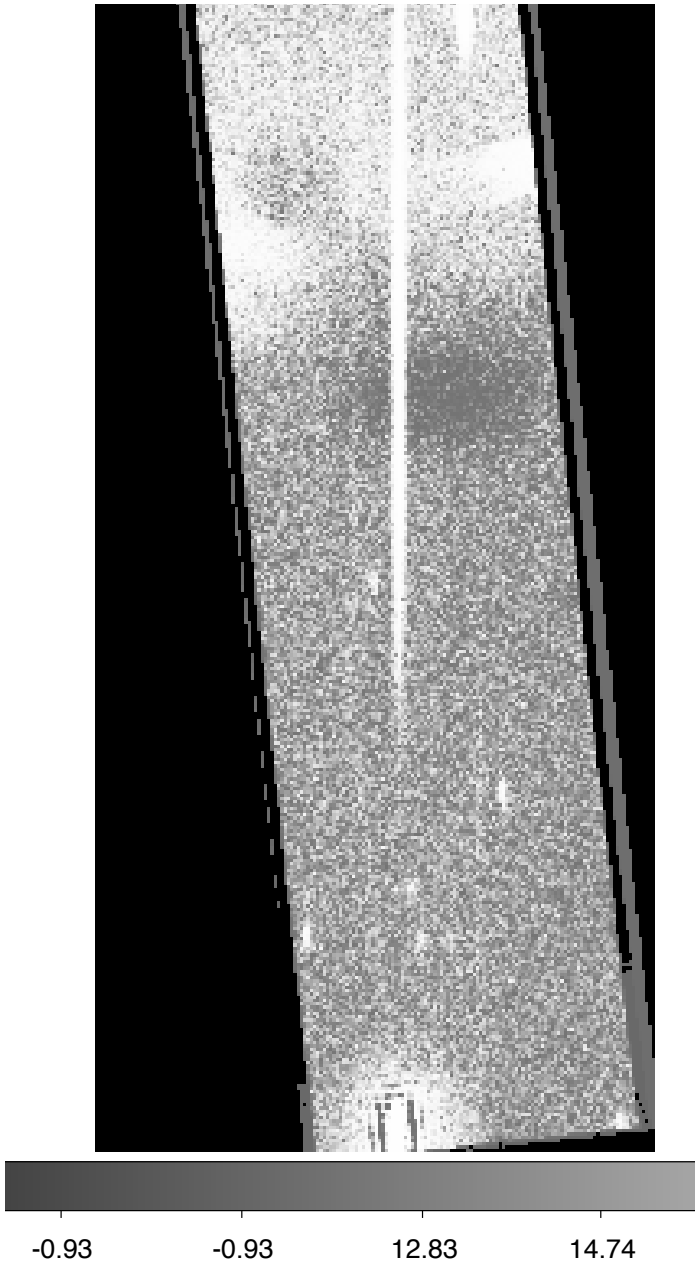
Grism	Throughput
UV	0.87
VIS	0.91

Updated to 2022 in OM_GRISMCAL_0006

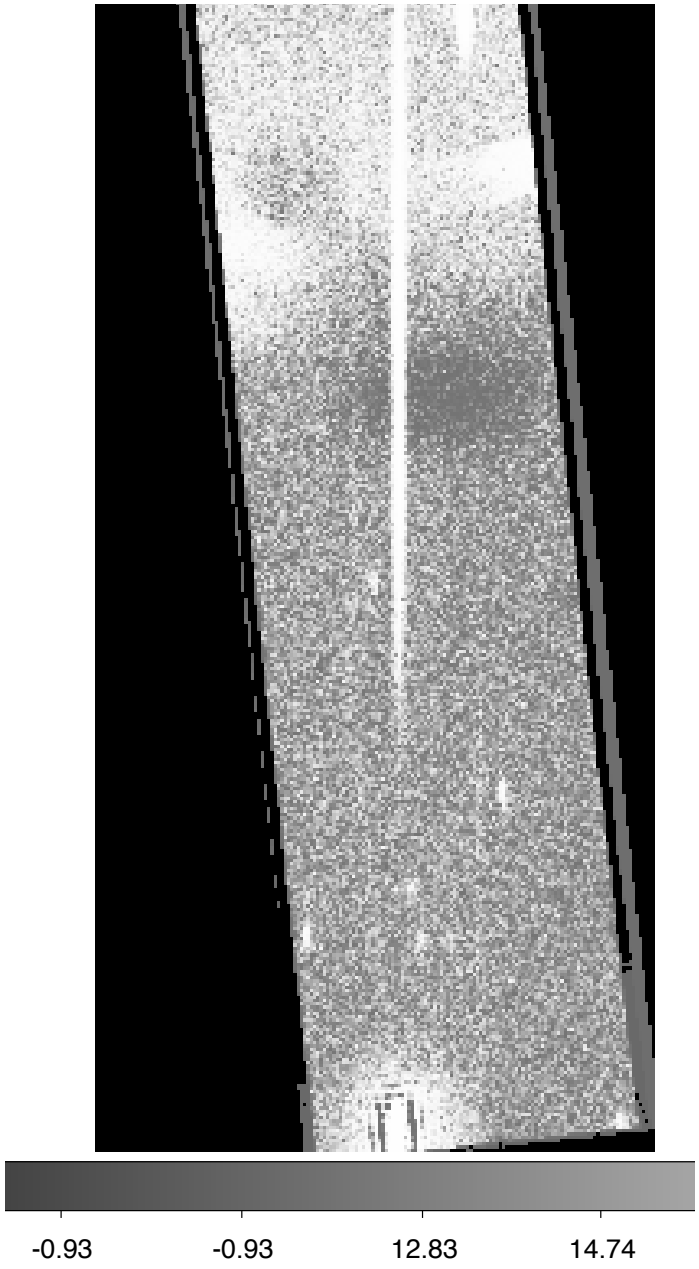
Decline corrected in SAS

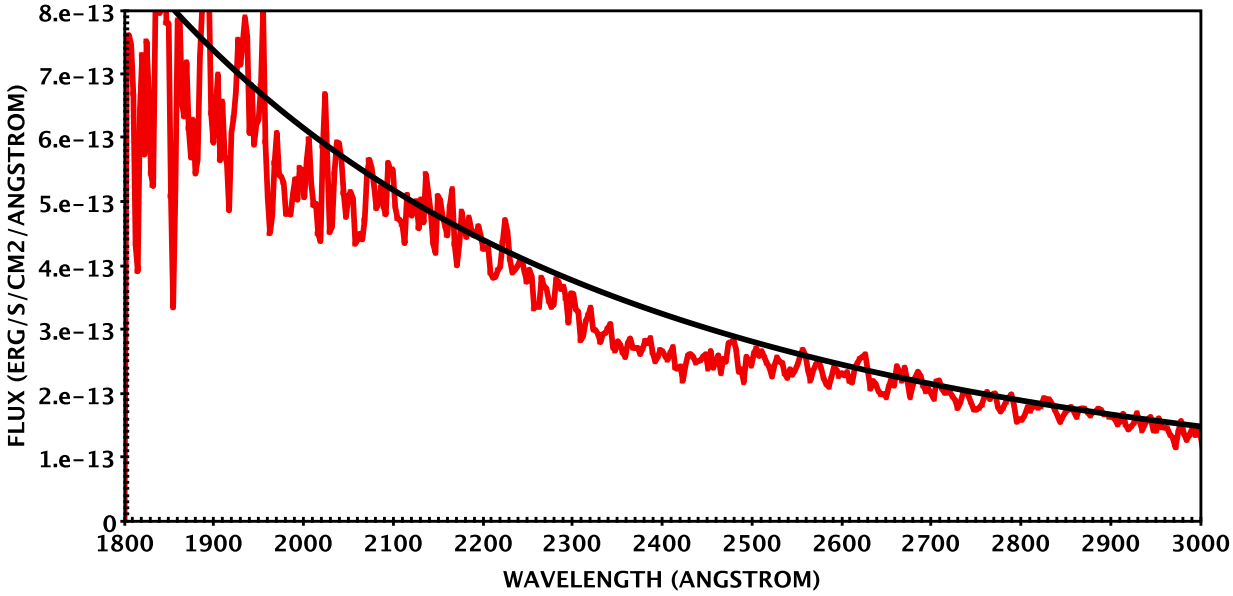
Spectra of some objects taken since July 2017 are affected by the Jupiter region.

Jupiter region impact on grism data



Jupiter region impact on grism data



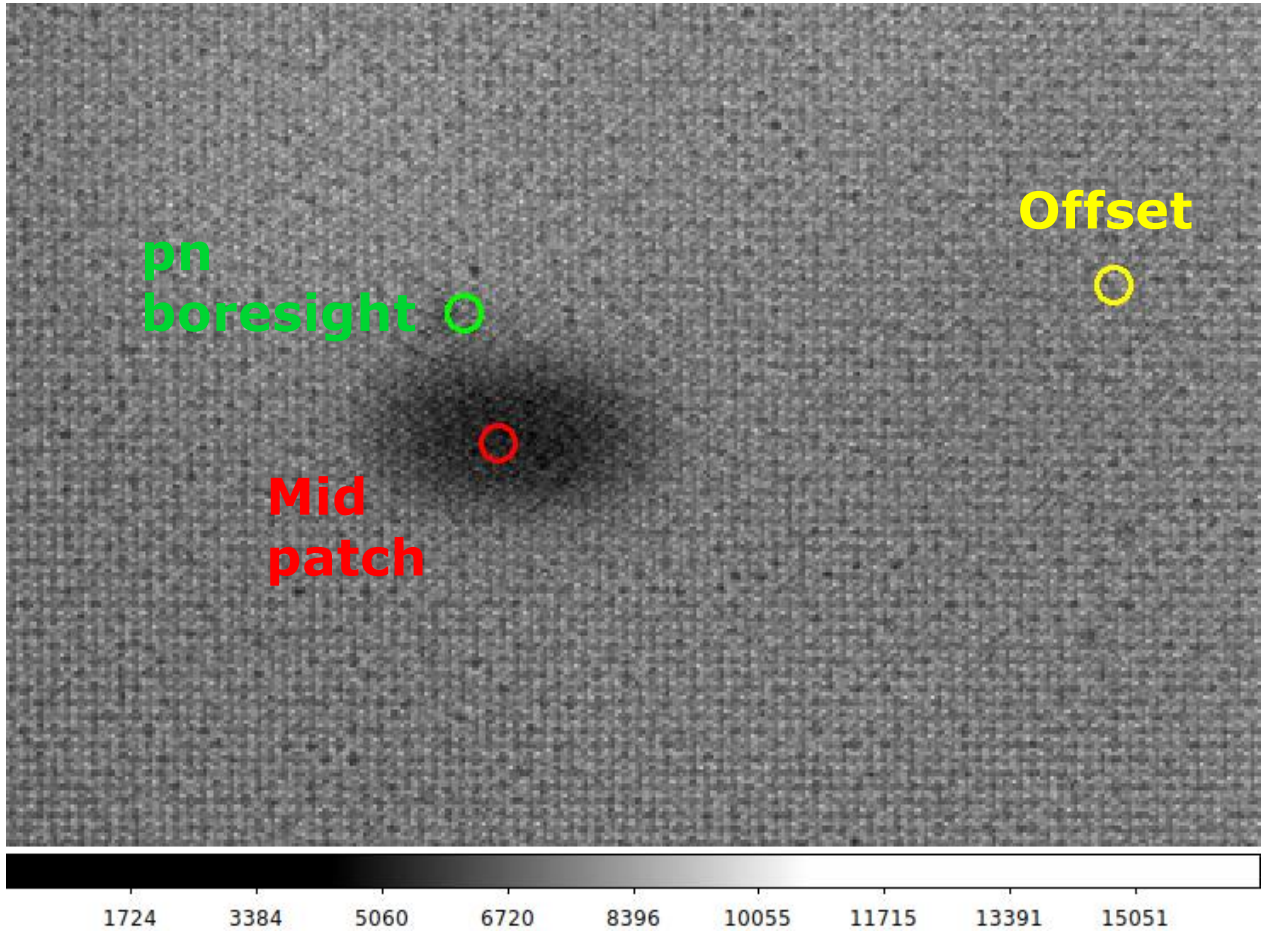


In default grism window, sources cross the Jupiter region where they can suffer up to 25% additional degradation

UV: ~2220Å-2600Å, max depth at ~2350Å
VIS:~3440Å-4180Å, max depth at ~3860Å

Dependent on offset from patch core

Monitoring the Jupiter depletion region



Jupiter observation in July 2017 (rev 3224)

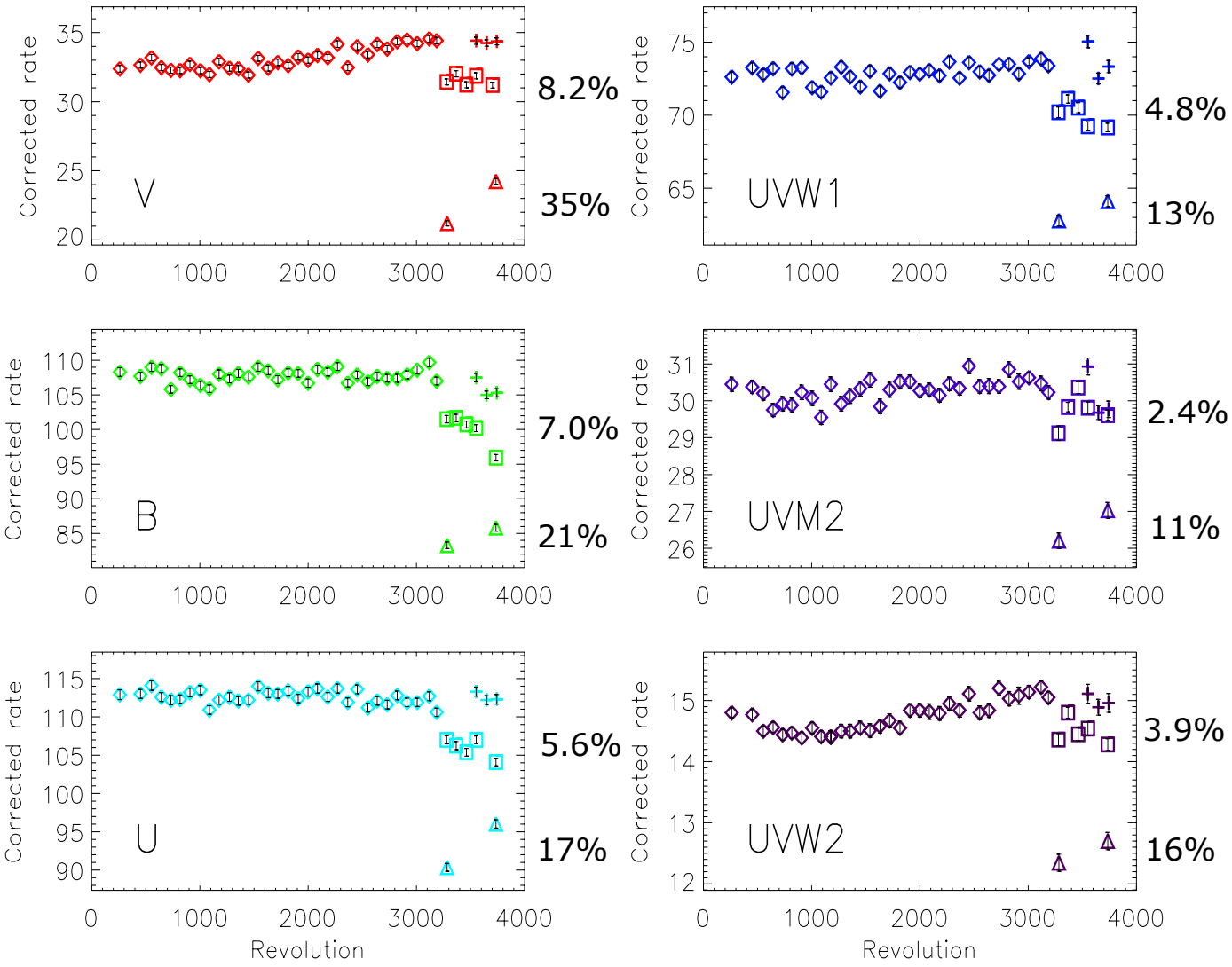
Area affected ~105” x 60” (~ 0.5% of FoV)

But near the pn/RGS boresights locations.

Monitoring programme with standard stars at different positions.

Monitoring the Jupiter region

BPM 16274 – rates corrected for general TDS decline



- ◇ - Boresight before JE
- ◻ - Boresight after JE
- △ - Patch centre
- ✦ - Outside patch

- Change at boresight is broadly stable
- Not corrected in SAS

- Post-JE rates measured outside JDP consistent with previous trends

- B, U, W1, W2 trends flat.

- Clear rising trends in V & W2. Cause under investigation.

Forward look

- Production of the OM SUSS5 catalogue

Serendipitous UV Source Survey V5

- Version 5 (SUSS5) OM catalogue is in progress

- Preliminary draft contains
  - 8,863,922 detections (cf SUSS4: 8,176,156 - 8.4% increase)
  - 5,965,434 unique sources (cf 5,503,765)
  - 1,120,754 sources with > 1 detection. (cf 1,035,453)

- Next steps
  - Quality verification and scientific validation (~ 3 months)
  - Documentation (~1 month)
  - Release process (~1 month)

- Anticipate the catalogue will be available late 2020

Forward look

- Production of the OM SUSS5 catalogue
- Regular monitoring and updates from routine calibration, esp. time-dependent sensitivity degradation
- Pursue investigation into why some standard stars show a 2-5% flatter degradation trend compared to the bulk sources in V and UVW2 filters
- Ongoing effort to understand/resolve steps seen in imaging & fast mode photometry of brighter stars observed in the default configuration.
- Upgrades to the pipeline to
  i. produce OM spectral points for use with XSPEC
  ii. generate concatenated OM fast mode timeseries products (also SAS thread).
- Jupiter depletion patch
  - Exploration of approaches to correct photometry of sources within the reduced sensitivity patch

Summary

- Degradation in filters and grisms updated – decline continues to slow
- Continued monitoring of Jupiter region. Depth appears broadly stable in time in all filters.
    - Targets at boresight, and grism spectra, affected. Not corrected in SAS
- OM SUSS5 catalogue under construction. Anticipated in Q4 of 2020.
- Routine calibration monitoring continues (esp. bad pixels, sensitivity)
- Ongoing investigations into
    - flatter sensitivity decline seen in standard star data
    - flux steps in photometry of sources observed in central window of default imaging mode