HECTOR
Galaxy Survey

Data reduction overview

Sree & Madusha

Hector busyweek 2024

Hector Data Reduction working group

- The DR team develops a pipeline for Hector data and conducts various tests to improve the reduction
- We have a regular meeting in every 3 weeks
  - Any team members are welcome to attend
  - Summary of the DR meeting
  - https://docs.google.com/document/d/1hgF-H_GJgbqtwXj7LIwSwHxYe5EqBoIXIyoYyIGxQWo/edit

Efforts from the DR team

- Sree - coordinate DR WG, examine flat, tramline, flux calibrations, generate cubes
- Madusha - examine calibration frames, develop quick look tool, flux calibrations, CVD correction
- Scott - all the work on 2dfdr, tramline detection, being a mentor for all!
- Sam - develop tools for observing, communicate with data central team, 2d modeling of arc solutions
- Henry - fibre swapping, improve multiprocessing, cube sizes
- Sarah - test telluric corrections
- Matt - throughput with sky lines
- Di - examine defocussed flat
- Gabby - checking cubes, emission pipeline
- Julia - fibre swapping, being a mentor for all tasks
- Stefania - wiki setup, data central cloud works, bad pixel masks
- Susie - resizing and removing empty cubes
- Pablo, Mina - test accuracy of wavelength solution
- Tom - confirming cube centre
- Yifan - measure PSF shape
- Pratyush - import_aat, QC transmission calculation

Key aspects of data reduction

- preprocessing
  - applied overscan correction but skipped bias, dark, lflat corrections
  - corrected wavelength solution with additional twilight-based calibration for AAOmega blue (ccd1). Spector blue (ccd3) has not gone through the correction and uncertainties are around 0.5-0.7 A
  - flat fielding using twilight flat for blue ccds if available and dome flat for red ccds
  - throughput calculations using twilight flat where available. If not, dome flat has been used.
  - optimal extraction

Key aspects of data reduction

- pre-cubing
  - apply both primary and secondary flux calibrations
  - apply telluric corrections with molecfit
  - a model correction applied for chromatic variation in distortion (CVD)
- cubing
  - adopt SAMI's drizzle methods
  - adoptive sized cubes
  - fully binned - default (unbinned), adaptive, annular, sectors binning

Observing runs to be considered

- 13 observing runs
  - 11 observing runs from Oct 2022 - Dec 2024
    - 221019_221030, 230417_230430, 230613_230626, 230710_230724, 230809_230814, 230906_230917, 231004_231009, 231106_231119, 231206_231219
    - we can apply secondary standard calibrations
  - two commissioning runs
    - 220817_220904 and 220914_220925
    - Should rely only on primary standard calibrations not having secondary stars at the centre of the bundle

data reduction status

- Fully reduced: 3 runs
- Lack of available primary standard stars: 3 runs
  - Madusha will work on it during busyweek
- Molecfit (telluric correction) failed: 3 runs
  - Madusha will work on it during busyweek
- Missing tile and robot files: 1 run
  - Sree will work on it during busyweek
- Issue on binning cubes: 3 runs
  - Sree will work on it during busyweek

rough estimation of target numbers

- Following tile file we allocated
- ~1900 galaxies on the observed tiles with more than 6 dithers during Oct 2022 - Dec 2023
- ~1750 galaxies have been observed with active bundles
- ~1500 galaxies passes QC for generating cubes (at least 6 dithers with FWHM<4" and transmission>0.333)

Test cubes for the busyweek

- https://docs.google.com/document/d/10J3-w8aB-5uwfnuKNRXm6AgBc1yE_yHBcv9xIHK-8zQ/edit
- test cubes from the following 3 runs:
  - 230809_230814, 231004_231009, 231206_231219
- Download cubes:
  - Data Central Cloud
    - rsync -zarv -e 'ssh -p 2232' hector@uploads.datacentral.org.au:/data/DR/busyweek/busyweek_Feb2024/testcubes ./
    - L3tMe!nPle@se

Release catalogue

- Release catalogue will be coming with cubes
- Includes basic information on the release of the cubes
  - Id, ccd, run id, cube filename, ra, dec, x centre, y centre, exp time, n dither, instrument (AAOmega or Spector), plate id, field id, probe id
- To be added
  - WAVES or Cluster regions?
  - FWHM?
  - Other ids such as GAMA? However, this may go into input catalogue.
- Q. (secondary standard) stars?
- Please make any suggestions for useful parameters for the release catalogue

Busyweek tasks

- Link to the busyweek google doc
- https://docs.google.com/document/d/10J3-w8aB-5uwfnuKNRXm6AgBc1yE_yHBcv9xIHK-8zQ/edit
- Maximum two people for one task

HECTOR
Galaxy Survey

Discussion of data next steps

Sree Oh and Madusha Gunawardhana

Hector busyweek 2024

Future steps

- Short term plan for the first internal data release v0.10
  - Naming conventions (12345_blue_A_v0.10.fits)
  - pipeline works on flux calibrations, telluric corrections, binning cubes etc.
  - Any urgent matters revealed from this busyweek

Future steps

- Mid term plan (& data paper)
  - Arc modelling (Sam)
  - Cubing methods (Madusha, drizzle, GP, CRR +Ned's method)
  - QC in the pipeline (FWHM, transmission) / QC coordinator?
  - Comparison with SAMI and MaNGA (need observations with ccd4)
  - Aperture spectra (need Re, PA, ellipticity)
  - Throughput improvement when using dome flats
  - Sky subtraction and illumination test
  - Running pipeline using DC server
  - Efficient way of cooperating input and release catalogues. probably through DC?
  - Alignments of RSS frames and distortion
  - Reduction time, file size
  - Reduce SAMI data with Hector pipeline
  - Modulation of 2dfdr (not led by the Hector team)
  - Data description paper
  - Public data release