Overview of the HERMES reduction pipeline

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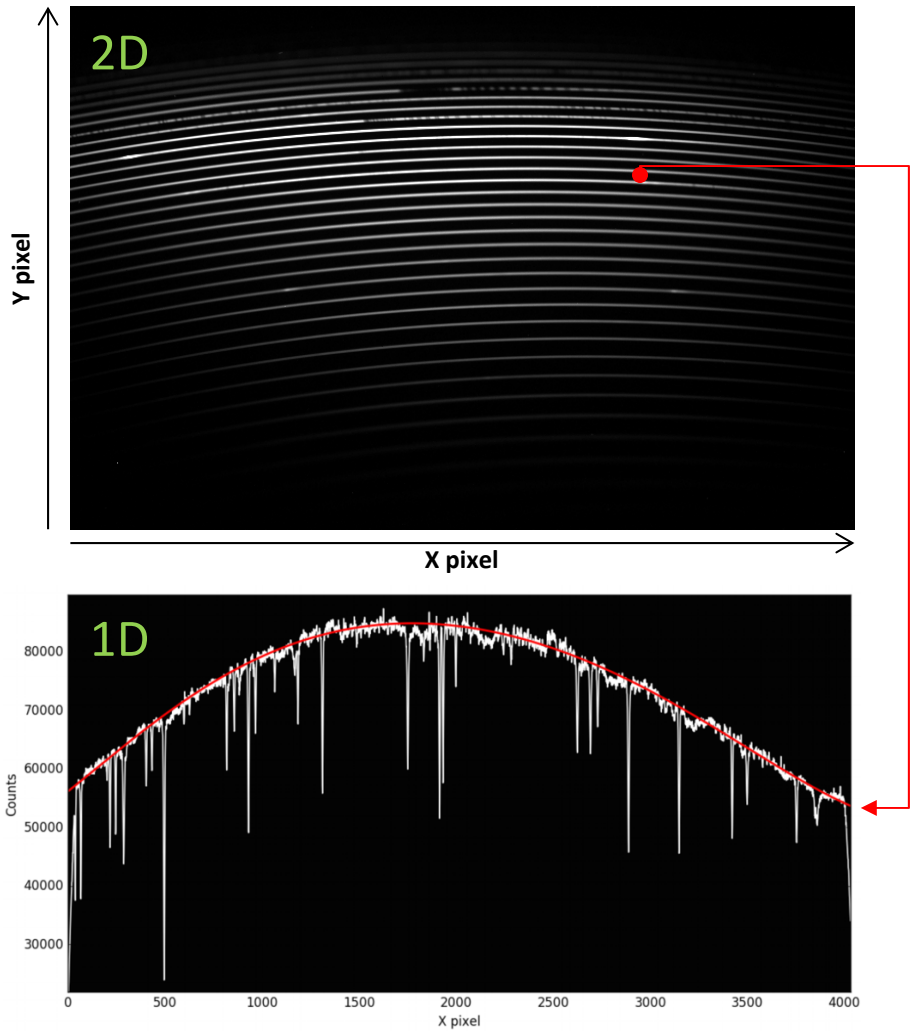
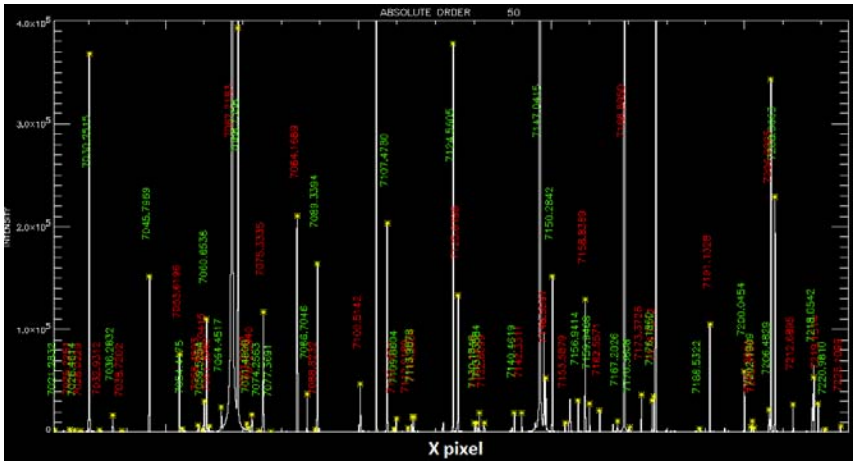
Reduction (1/2)

- Extract the data from the CCD
  - 2D ➡ 1D
  - Needs: order positions, cross-order profile, blaze function …



Reduction (2/2)

- Data calibration
  - Wavelength and flux calibration
  - Needs: Line identification, observation of standard stars.



Principle: differential

Instrument model

- Calibration data obtained during a night of reference
- Reduced « manually »
- A set of reference frames and numbers.

Observations

- Calibration data obtained during the night
- Science exposures

Principe: differential

ent model

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g a night of reference

ced « manually »

of reference frames
umbers.

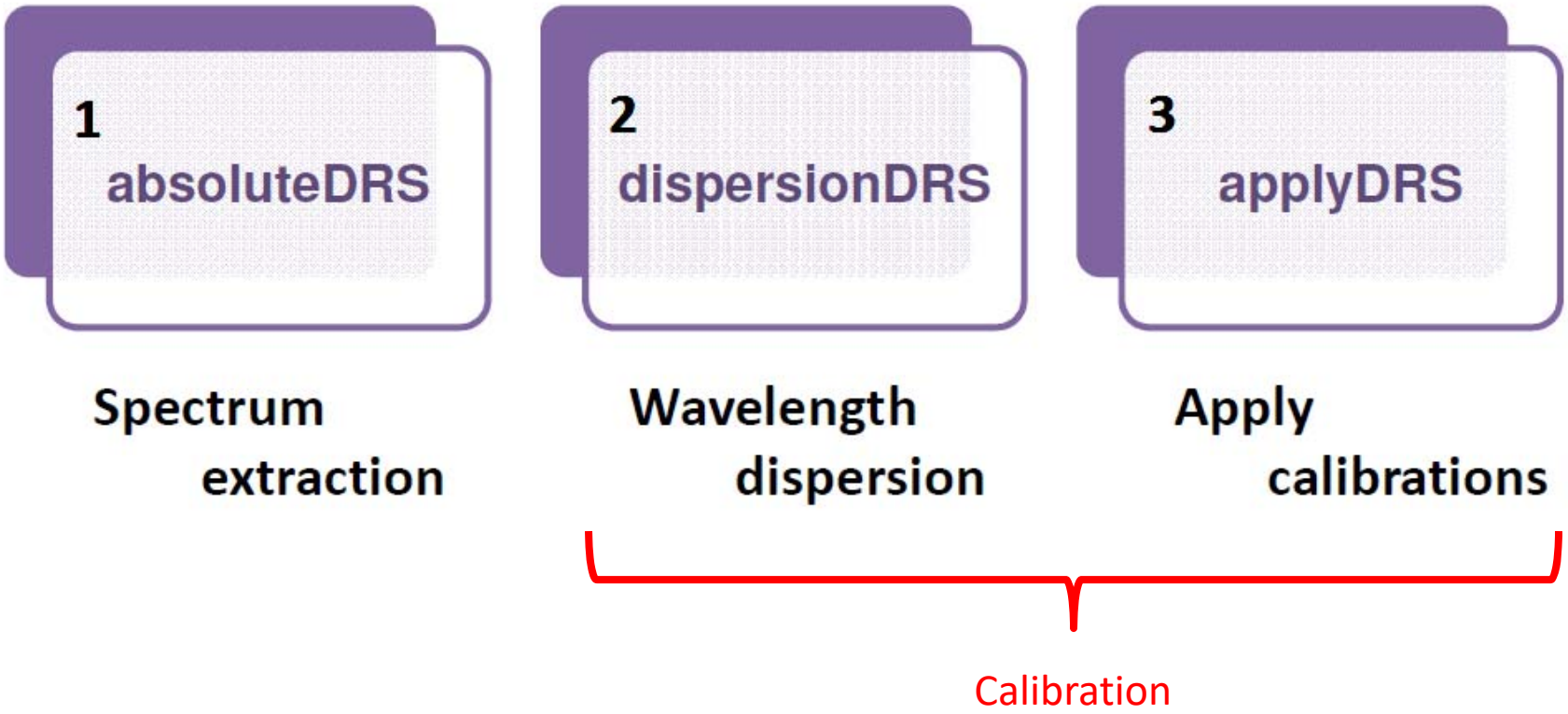
How the system evolved since the reference night:

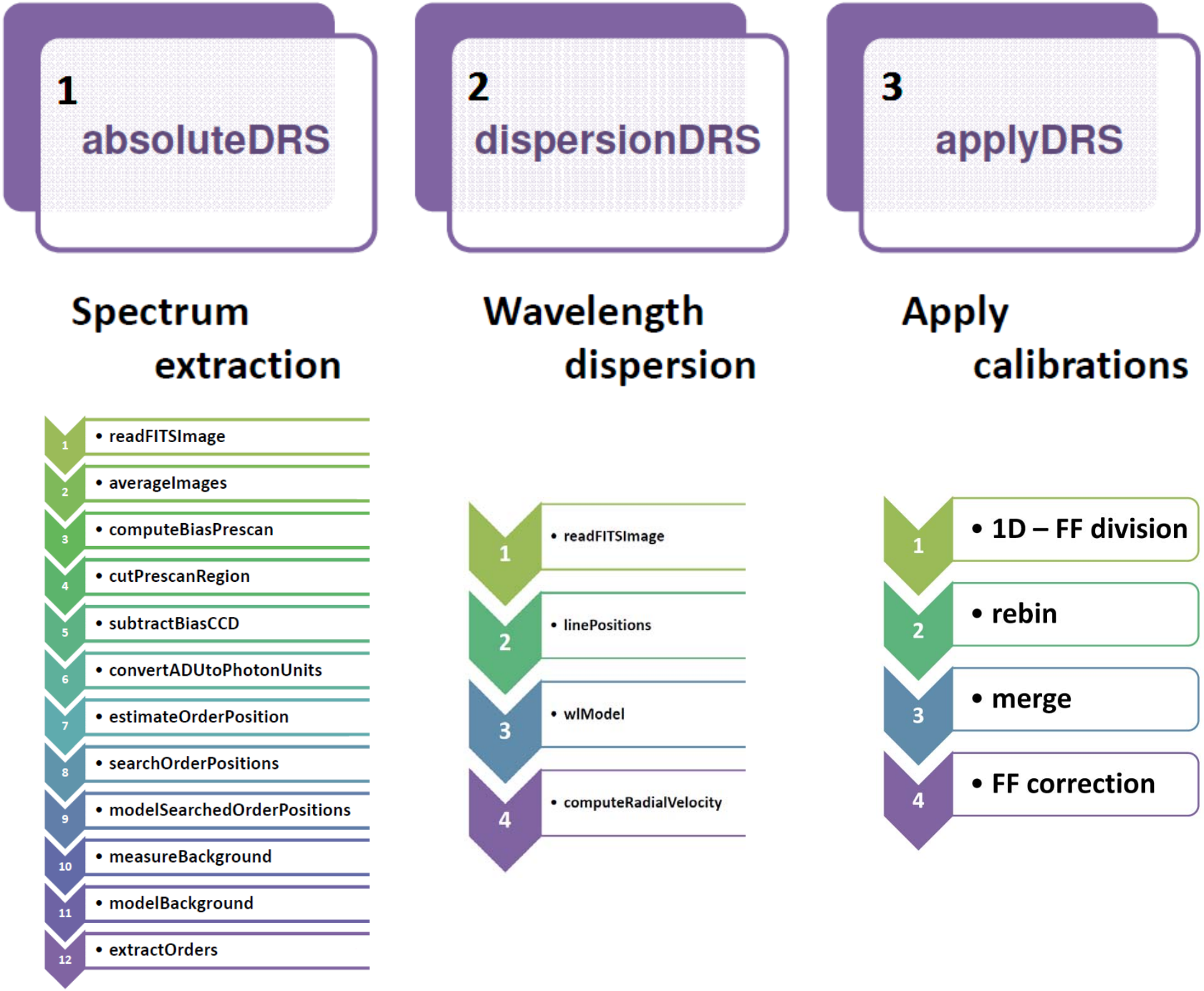
- Relative order positions
- Relative spectral line positions

Observations

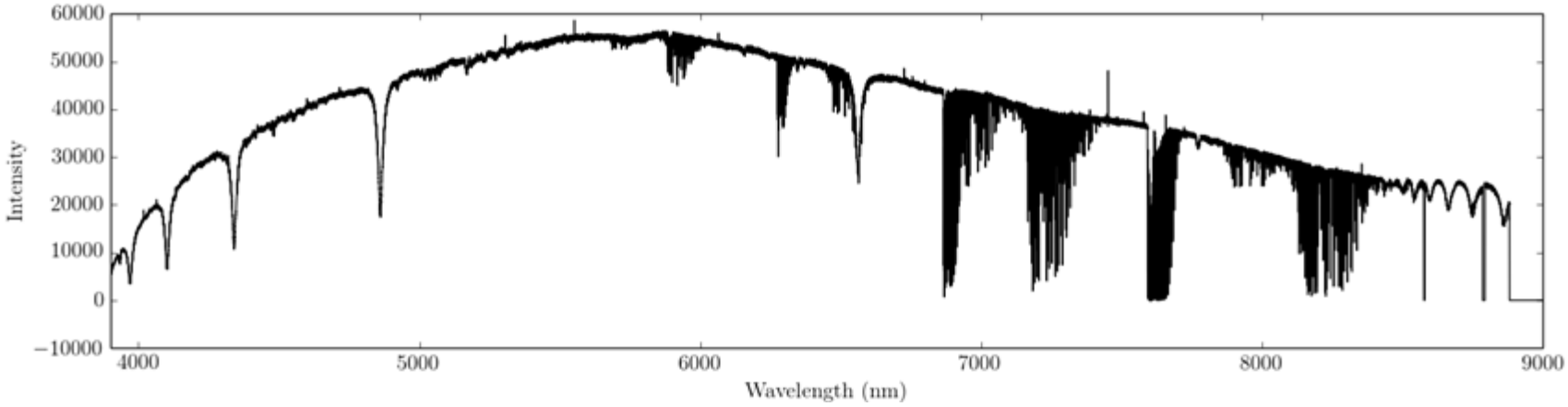
- Calibration data ob
  during the night
- Science exposures

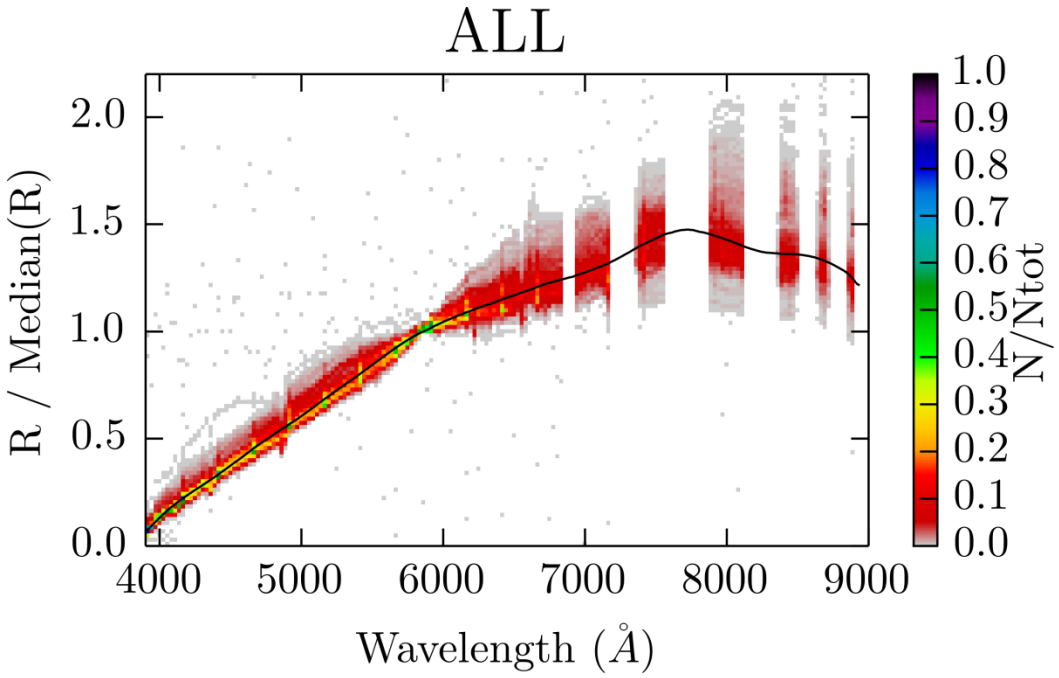
Operations overview



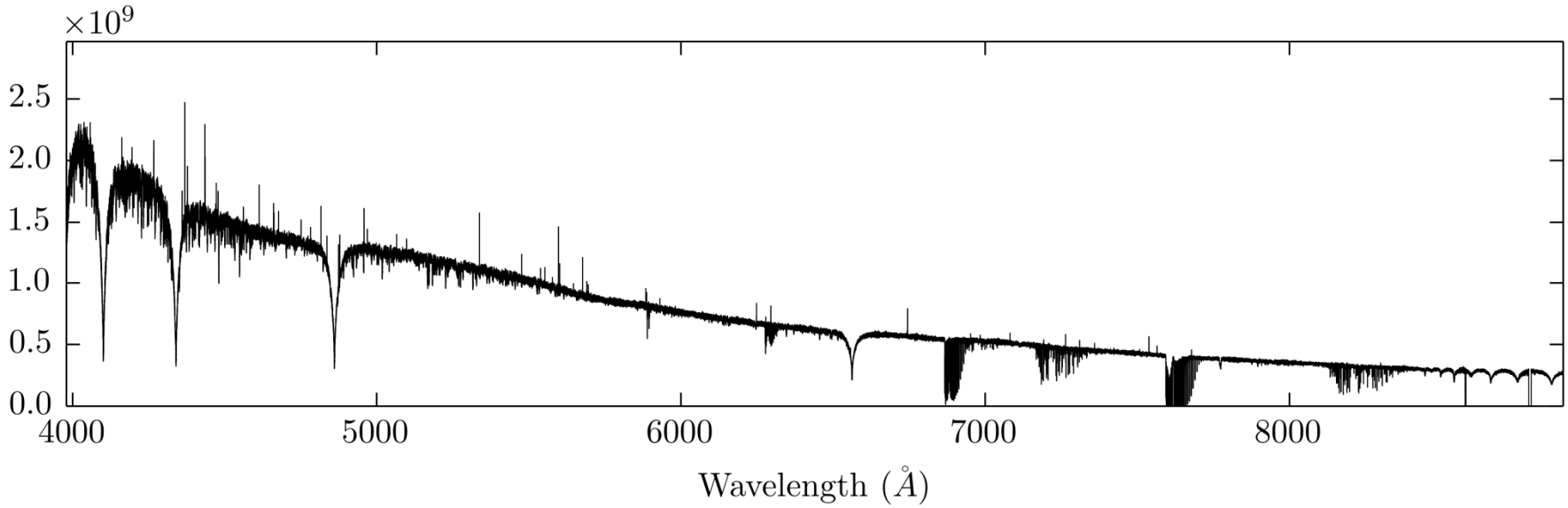

1
absoluteDRS
2
dispersionDRS
3
applyDRS
Spectrum extraction
1 • readFITSImage
2 • averageImages
3 • computeBiasPrescan
4 • cutPrescanRegion
5 • subtractBiasCCD
6 • convertADUtoPhotonUnits
7 • estimateOrderPosition
8 • searchOrderPositions
9 • modelSearchedOrderPositions
10 • measureBackground
11 • modelBackground
12 • extractOrders
Wavelength dispersion
1 • readFITSImage
2 • linePositions
3 • wlModel
4 • computeRadialVelocity
Apply calibrations
1 • 1D – FF division
2 • rebin
3 • merge
4 • FF correction

Pipeline product





mean partial instrument response


×10^9
2.5
2.0
1.5
1.0
0.5
0.0
4000
5000
6000
7000
8000
Wavelength (Å)

Conclusion remarks

- Pipeline written in Python (modularity, plotting, mathematical, fits … public libraries, well documented, but slow).
- Written in a few months. Possibility to adapt it and re-use it for another echelle spectrograph.
- Instrument monitoring is important

Model monitoring