

# RSS MOS pipeline



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- See: <https://github.com/mattyowl/RSSMOSPipeline>
- Or: `pip install RSSMOSPipeline --user`

The screenshot shows the GitHub repository page for `mattyowl/RSSMOSPipeline`. The repository is public and has 3 stars, 3 watchers, and 1 fork. The main branch is `master` with 1 branch and 4 tags. The repository description is "Pipeline for reducing both longslit and multi-object spectroscopy from the Robert Stobie Spectrograph on SALT." The repository contains 87 commits. The file list shows the following files and their commit dates:

File	Commit Date
RSSMOSPipeline	21 days ago
bin	16 months ago
.gitattributes	3 years ago
LICENSE	8 years ago
MANIFEST.in	3 years ago
README.md	7 months ago
setup.cfg	3 years ago
setup.py	16 months ago
versioneer.py	3 years ago

The README.md file is displayed below the file list. It contains the following text:

## RSSMOSPipeline

Pipeline for reducing both longslit and multi-object spectroscopy from the Robert Stobie Spectrograph on SALT.

Please note this software is under development at the moment, and the instructions in this README file may not

The right sidebar shows the repository's statistics and release information. The "About" section states: "Pipeline for reducing both longslit and multi-object spectroscopy from the Robert Stobie Spectrograph on SALT." The "Releases" section shows the latest release is `0.4.0` (Latest), published 21 days ago, with 2 releases in total. The "Packages" section shows no packages published. The "Languages" section is also visible.

# What does it do?

- A fully automated\* pipeline, written in pure python, for extracting wavelength calibrated 1d spectra from RSS MOS or longslit observations
- To see available options for the main pipeline script, run `rss_mos_reducer -h`
- Steps:
  - make master flats
  - cut into slitlets (using the master flat if MOS) or pseudo-slits (by identifying object traces in longslit data)
  - apply the flat field
  - find the 2d wavelength solution and rectify 2d spectra
  - extract and stack all the 1d spectra (or stack the 2d spectra and extract 1d spectra)

(\* if a reference wavelength calibration model has already been made - see the `README.md` file in the repository for the current list)

# How to run

- Download the `product` data for your observations - if you want to play with some MOS data, there are a couple of masks worth of cluster observations here:

<https://www.dropbox.com/s/61d1hhuww48tt2v/J0034RSSData.tar.gz?dl=0>

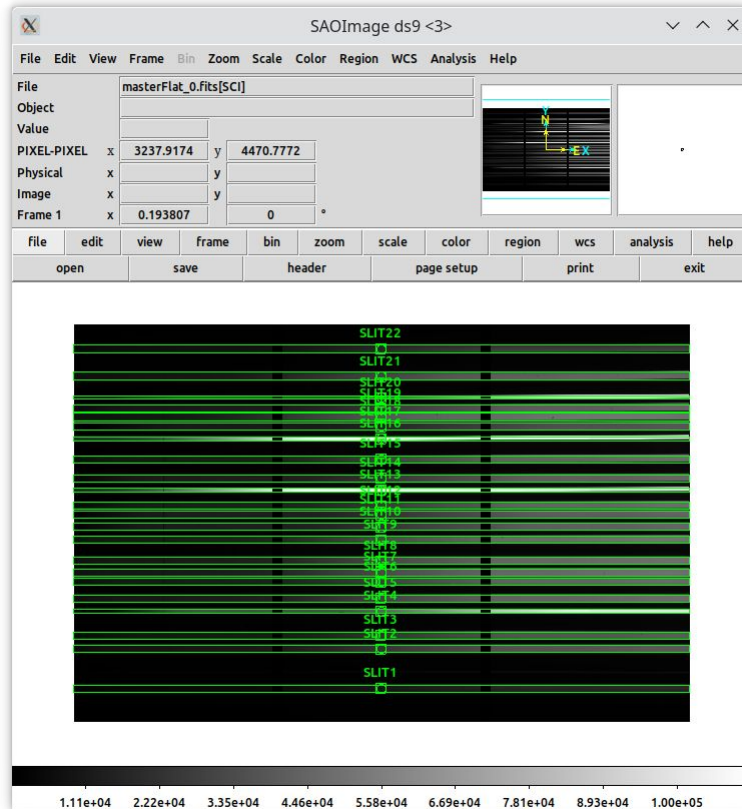
- Check what masks are available:
  - e.g. `rss_mos_reducer product reduced list`

```
2022-11-15 07:37:49,139 - RSSMOSPipeline - INFO - started: 2022-11-15T07:37:49.139582
2022-11-15 07:37:49,139 - RSSMOSPipeline - INFO - parameters: Namespace(rawDir='product', reducedDir='reduced', maskName='list', threshold=0.1, longslitThreshold=2.0, iterativeMethod=False, subFrac=0.8, excludeMasks='', extensionsList='all', skipDone=False)
2022-11-15 07:37:49,139 - RSSMOSPipeline - INFO - Reading image headers (cache file location: product/imageInfo.pkl)
Found 3 masks:
ACT-CL_J0034.4+0225_P002131N01  True  /home/matty/.local/lib/python3.10/site-packages/RSSMOSPipeline-0.4.0+0.g8b18f00.dirty-py3.10.egg/RSSMOSPipeline/data/modelArcSpectra/RefModel_PG0900_Ar_2x2_1.p
le
ACT-CL_J0034.4+0225_P002131N02  True  /home/matty/.local/lib/python3.10/site-packages/RSSMOSPipeline-0.4.0+0.g8b18f00.dirty-py3.10.egg/RSSMOSPipeline/data/modelArcSpectra/RefModel_PG0900_Ar_2x2_1.p
le
EG21_PL0400N001
```

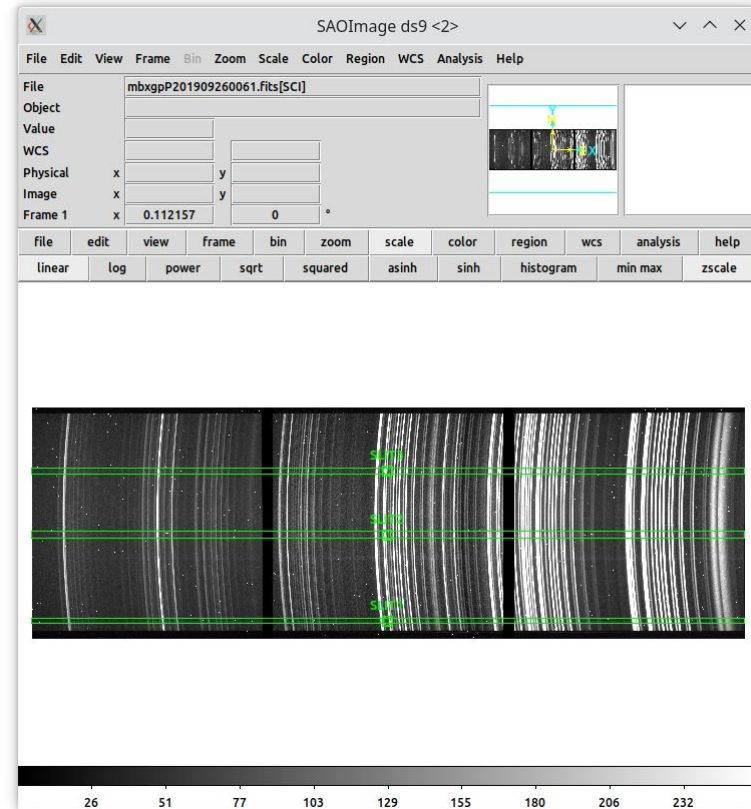
- Reduce your chosen mask (in this case has 4 x exposures):
  - `rss_mos_reducer product reduced ACT-CL_J0034.4+0225_P002131N01`  
[takes 11 min on my laptop]
- Or to use iterative sky subtraction:
  - `rss_mos_reducer product reduced ACT-CL_J0034.4+0225_P002131N01 -i`  
[takes 14.5 min on my laptop]
- You can also do, e.g., `rss_mos_reducer product reduced all`

# Slit or object identification

Check on master flats (MOS)



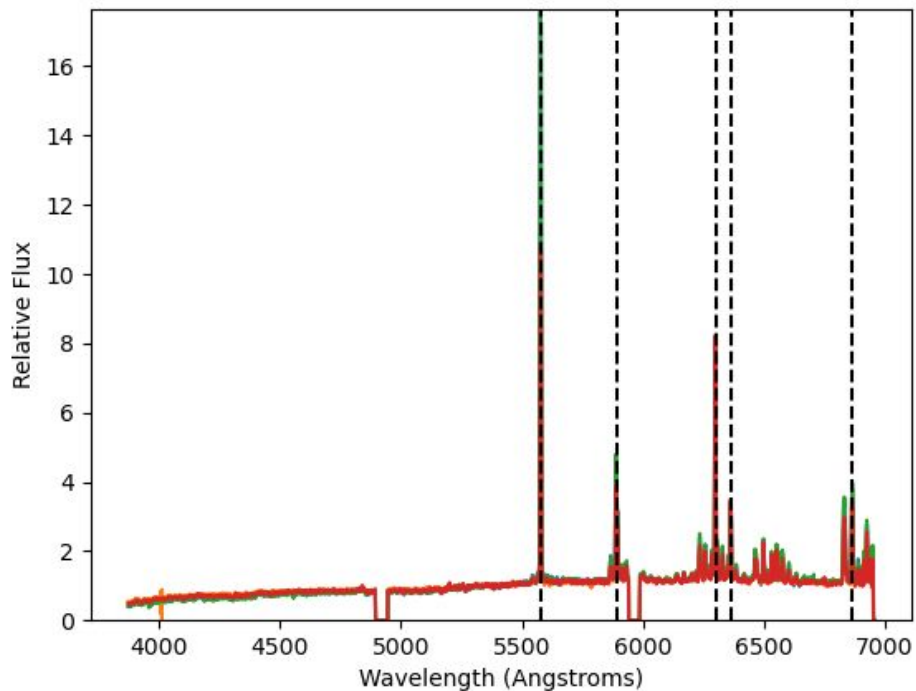
or object frames (longslit)



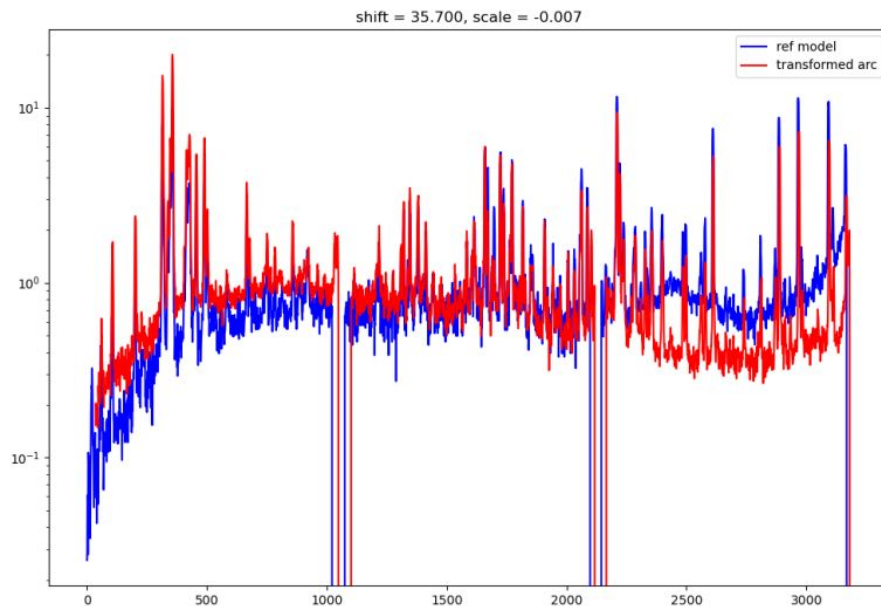
# Diagnostics

- Log file is written to the current working directory
- Sky line based wavelength calibration check results:
  - e.g.  
`reduced/ACT-CL_J0034.4+0225_P002131N01/diagnostics/skyWavelengthCalibCheck.csv`
- Number of arc features identified per slit:
  - e.g.  
`reduced/ACT-CL_J0034.4+0225_P002131N01/diagnostics/wavelengthCalibDiagnostics.csv`
- The `diagnostics/` directory also contains plots of:
  - comparison of transformed arc with ref model arc spectrum
  - transformed arc spectra with labelled features
  - wavelength calibration model prediction with arc lines wavelengths marked
  - sky spectra with known sky line positions marked
  - etc.

# Diagnostics



sky lines check



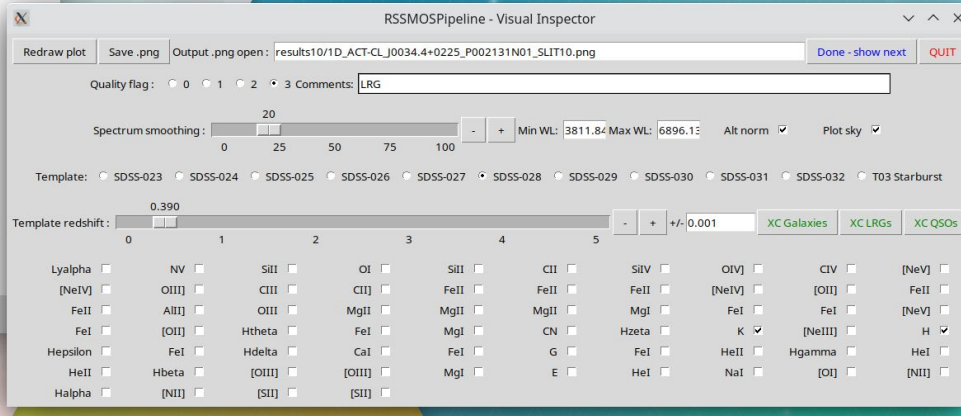
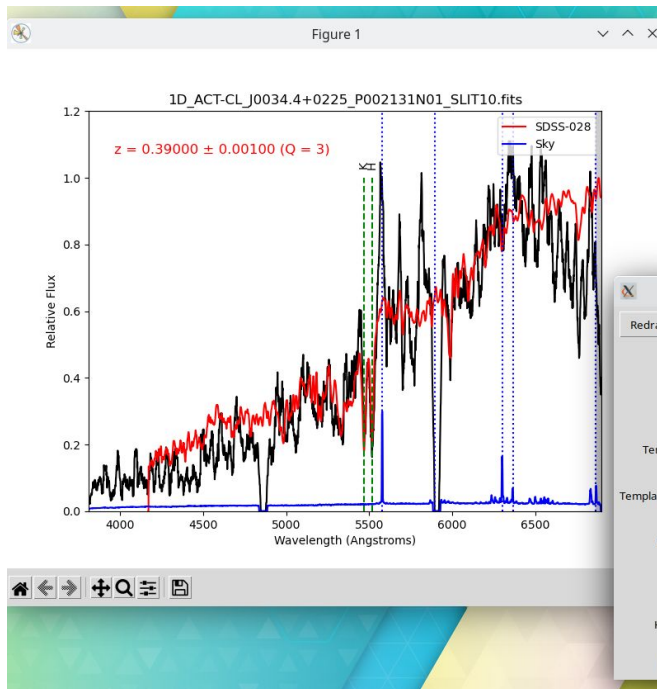
comparison of transformed arc with ref model



# Inspecting spectra

Tool for plotting spectral with templates overlaid (ancient code) - e.g.

```
cd reduced/ACT-CL_J0034.4+0225_P002131N01/1DSpec_2DSpec_stackAndExtract/  
rss_mos_visual_inspector 1D_ACT-CL_J0034.4+0225_P002131N01_SLIT*.fits results
```





# Final comments

- Caveat:
  - Published results using this pipeline (to my knowledge) only concern getting redshifts of galaxies (see [Hilton et al. 2018](#), [2021](#))
- Things that could be done:
  - Implement spectrophotometric calibration
  - Parsing slit mask XML file, to help with finding slits, and adding RA, dec coords to headers of 1D spectra
  - Parallelisation (not much benefit versus effort)
  - Make a more modern visual spectrum inspector, and add new cross correlation redshift code (or find one to use instead)
  - More docs
- Bugs:
  - Feel free to contact me with bug reports / requests for help (e.g. adding extra ref arc models)
  - The code *should* be fairly easy to hack away at and improve - it's pure python