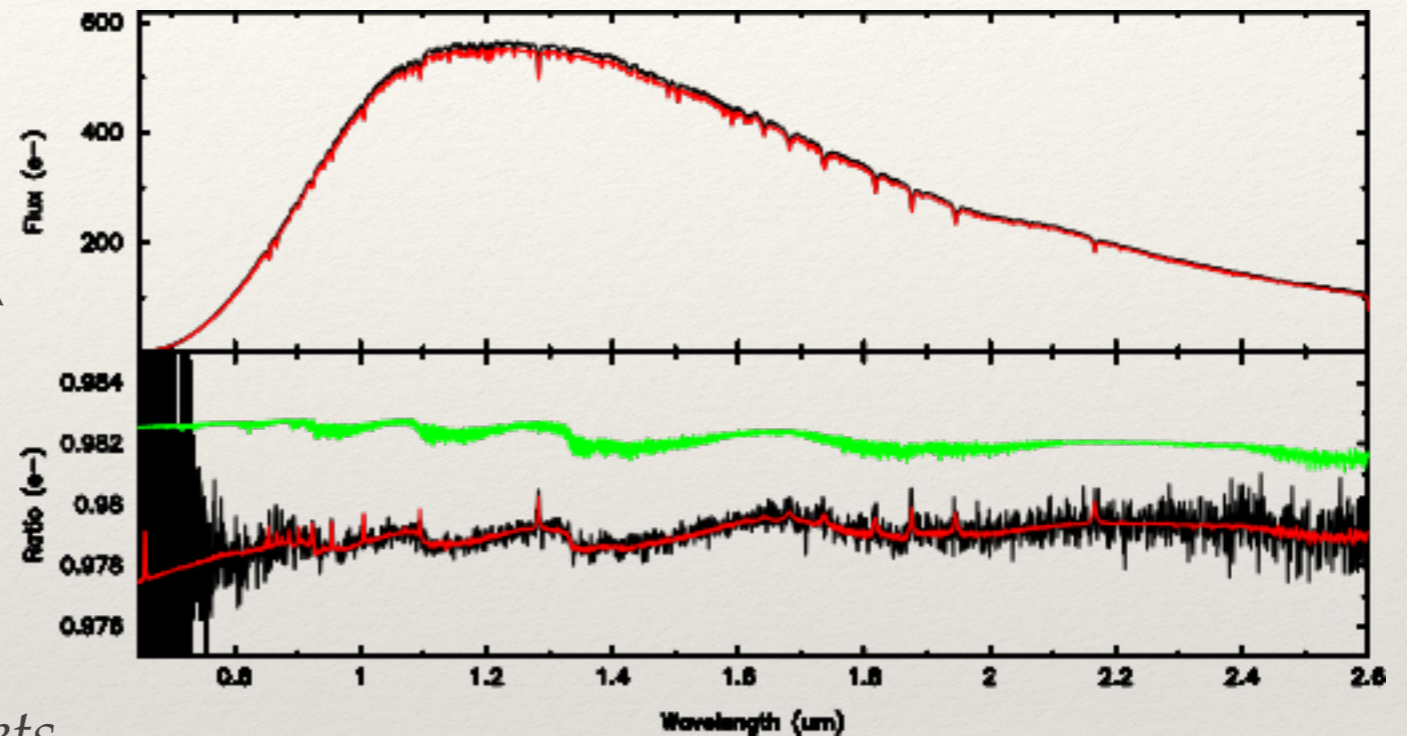


- Position Trace
- Wavelength dependent PSF convolution
- Stellar Models
 - limb-darkening
- Transit-model



Simulating Transiting Extrasolar Planets

NIRISS-SOSS Sims

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 Loïc Albert
 René Doyon
 David Lafrenière
 Antoine Darveau-Bernier

Source Codes

- ❖ All source code is available at: github.com/jasonfrowe/JWSTNIRISS
- ❖ Documentation is a work in progress.
- ❖ Simulation Data:
- ❖ <http://maestria.astro.umontreal.ca/niriss/SOSS2D/>

Screenshot of the GitHub repository page for `jasonfrowe / JWSTNIRISS`.

The repository is titled "Tools for the NIRISS Instrument onboard JWST". It shows 43 commits, 5 branches, and 0 releases.

The commit history table shows the following entries:

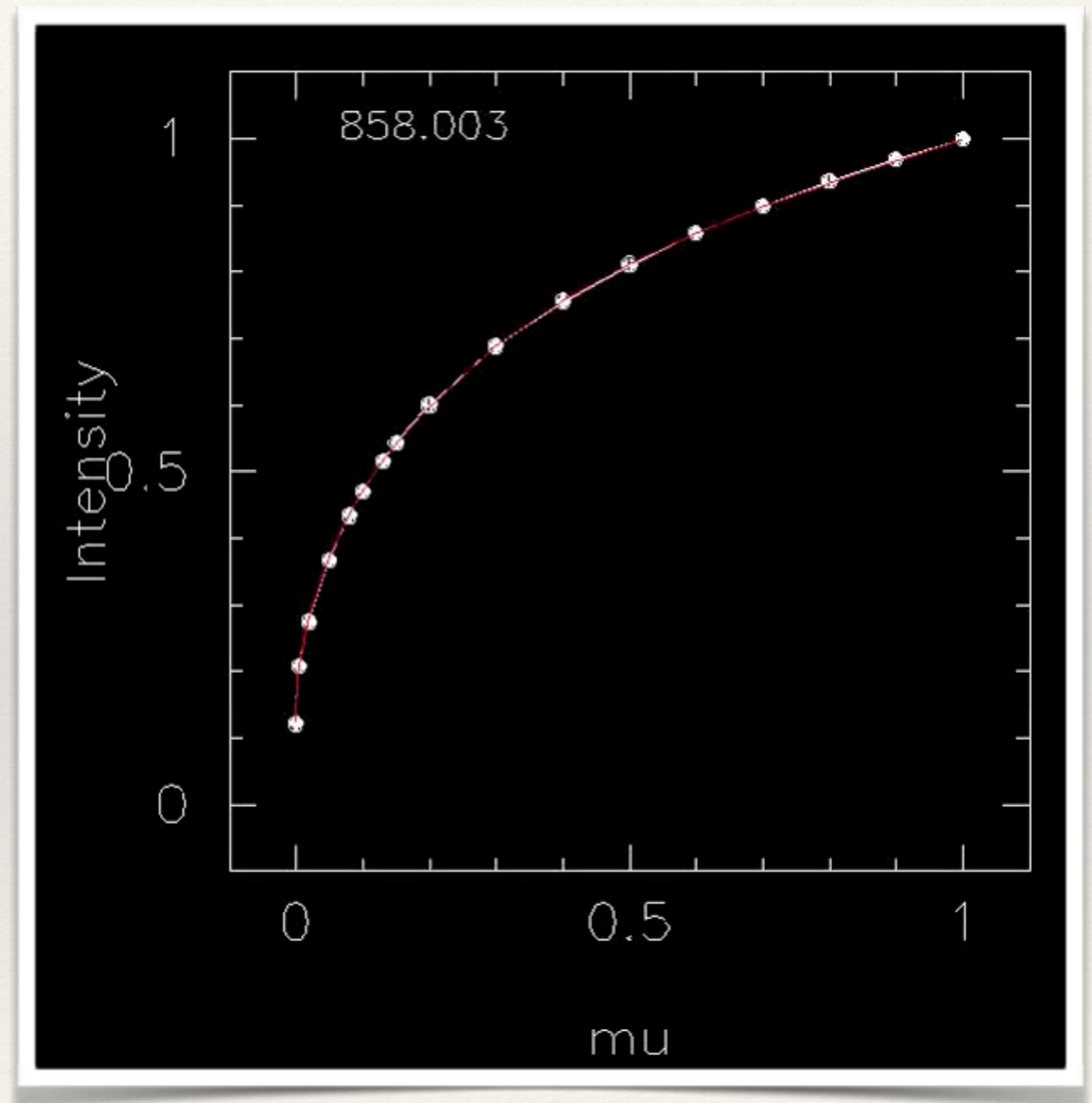
File/Folder	Commit Message
<code>ftools</code>	Adding FORTRAN tool base
<code>ramps2slopes</code>	Removing files
<code>samples</code>	Asadfasdf
<code>specgen</code>	Adding specgen routines
<code>trace</code>	Added Trace and Aperture Ex
<code>.gitignore</code>	Updated gitignore
<code>Examples and Checks.ipynb</code>	Asadfasdf
<code>LICENSE</code>	Initial commit
<code>README.md</code>	Initial commit
<code>jwstniriss.py</code>	Adding specgen routines

Steps.

1. Use a polynomial model for trace-location and wavelength solution (**p2w, w2p**)
2. Add flux to an 2D oversampled image (10x) with a 1-pixel box PSF
 1. Flux is based on ATLAS-9 atmosphere model, Planet models from Björn Benneke and Mandel+Agol non-linear limb-darkening transit-model
 2. Flux is multiplied by instrument response (QE, blaze, ..)

Stellar Models

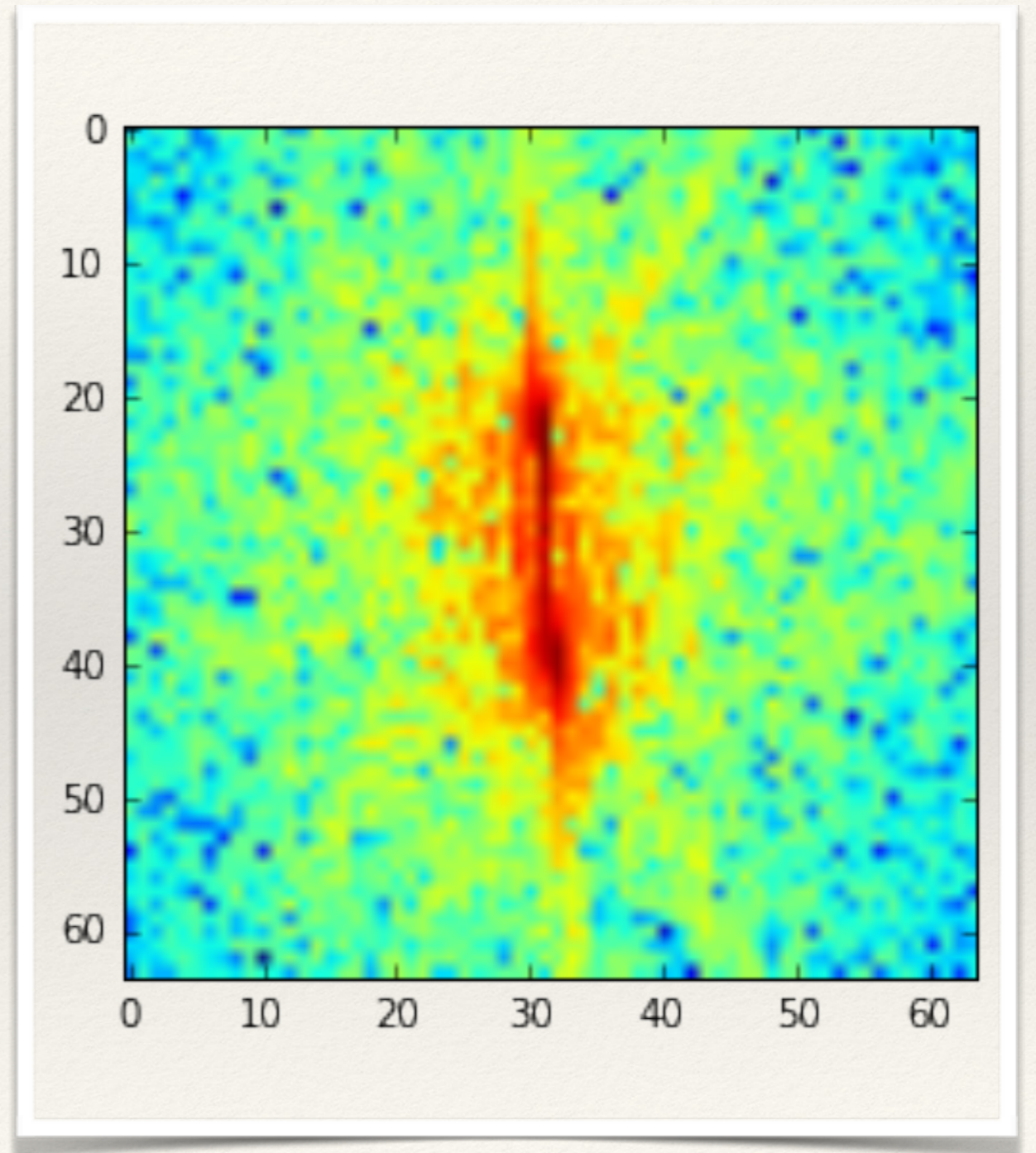
- ❖ ATLAS-9 Models
 - ❖ $R=500\,000$, $0.5\text{-}5.0\ \mu\text{m}$
 - ❖ Intensity Spectrum across stellar profile
 - ❖ fit 4-parameter non-linear limb-darkening law for each specific wavelength
- ❖ Limb-darkening fits are used to construct transit-models.



<https://youtu.be/lPmSfokJsUM>

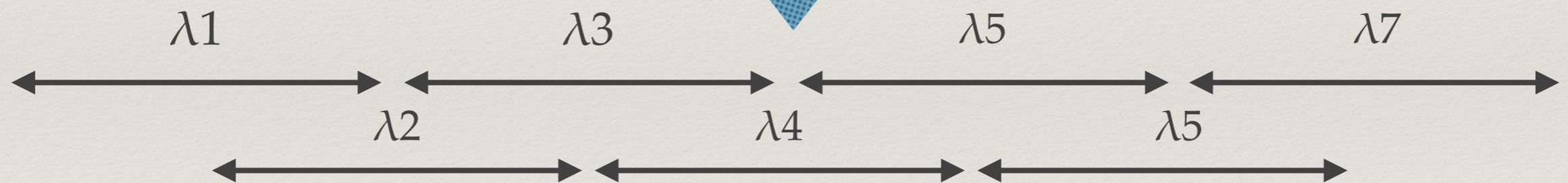
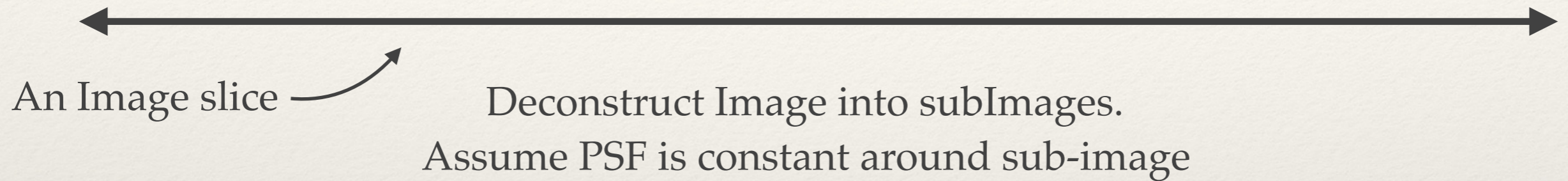
Steps.

3. Convolve the 2D image with instrument PSF via FFTs
 1. Deconstruct into a series of FFT to account for wavelength dependence of PSF
 2. Create linearly weighted average



Convolution

pixels(λ)



Convolve each sub-Image with matching PSF and take average to get convolved image









Convolved Image slice



Steps

4. Generate Time-series
 1. change impact parameter as a function of time
 2. convolve transit-model with integration time
5. Combine images into data cube
 1. simulations are currently noise free - blank slate.





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<u>Name</u>	<u>Last modified</u>	<u>Size</u>	<u>Description</u>
 Parent Directory		-	
 gj-436/	2017-02-15 15:59	-	
 gj-1132/	2017-02-15 15:55	-	
 gj-3470/	2017-02-15 15:56	-	
 hat-P-12/	2017-02-15 16:02	-	
 hd-209458/	2017-02-15 16:03	-	
 wasp-29/	2017-02-15 16:46	-	
 wasp-69/	2017-02-15 16:05	-	

Wrap-Up.

- ❖ For each simulation you will find a “readme.txt” explaining the files.
 - ❖ stellar models, data-cubes are available to work with.
- ❖ We are working on tools to add arbitrary noise
 - ❖ $1/f$, shot-noise, read-noise, ...
- ❖ Send us any questions, comments, corrections, problems, etc.. (we are friendly)

Index of /niriss/SOSS2D/gj-436

<u>Name</u>	<u>Last modified</u>	<u>Size</u>	<u>Description</u>
 Parent Directory		-	
 readme.txt	2017-02-15 15:58	184	
 soss_simulated_data/	2017-02-15 16:00	-	
 stellar_spectra/	2017-02-15 16:13	-	