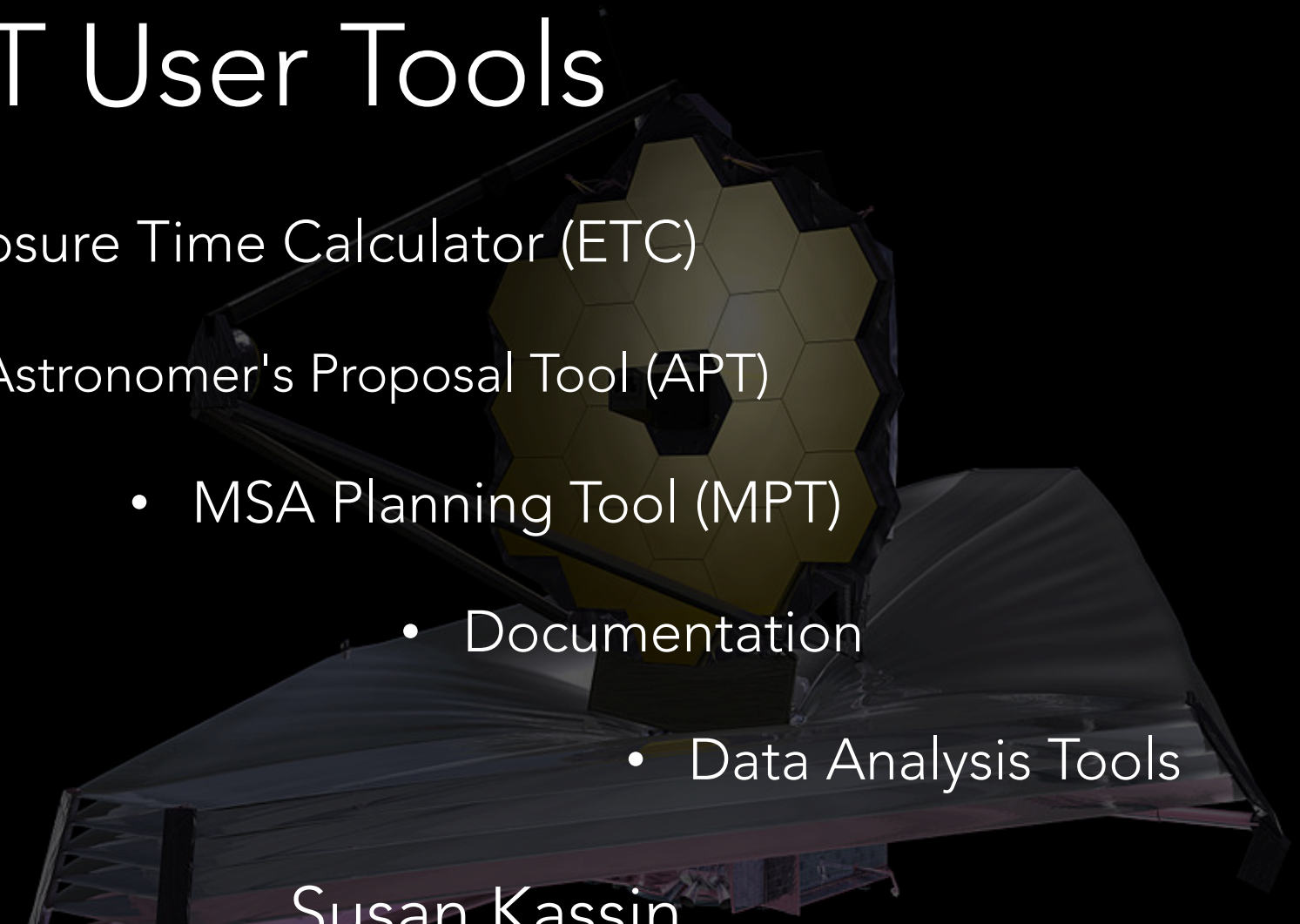
JWST User Tools

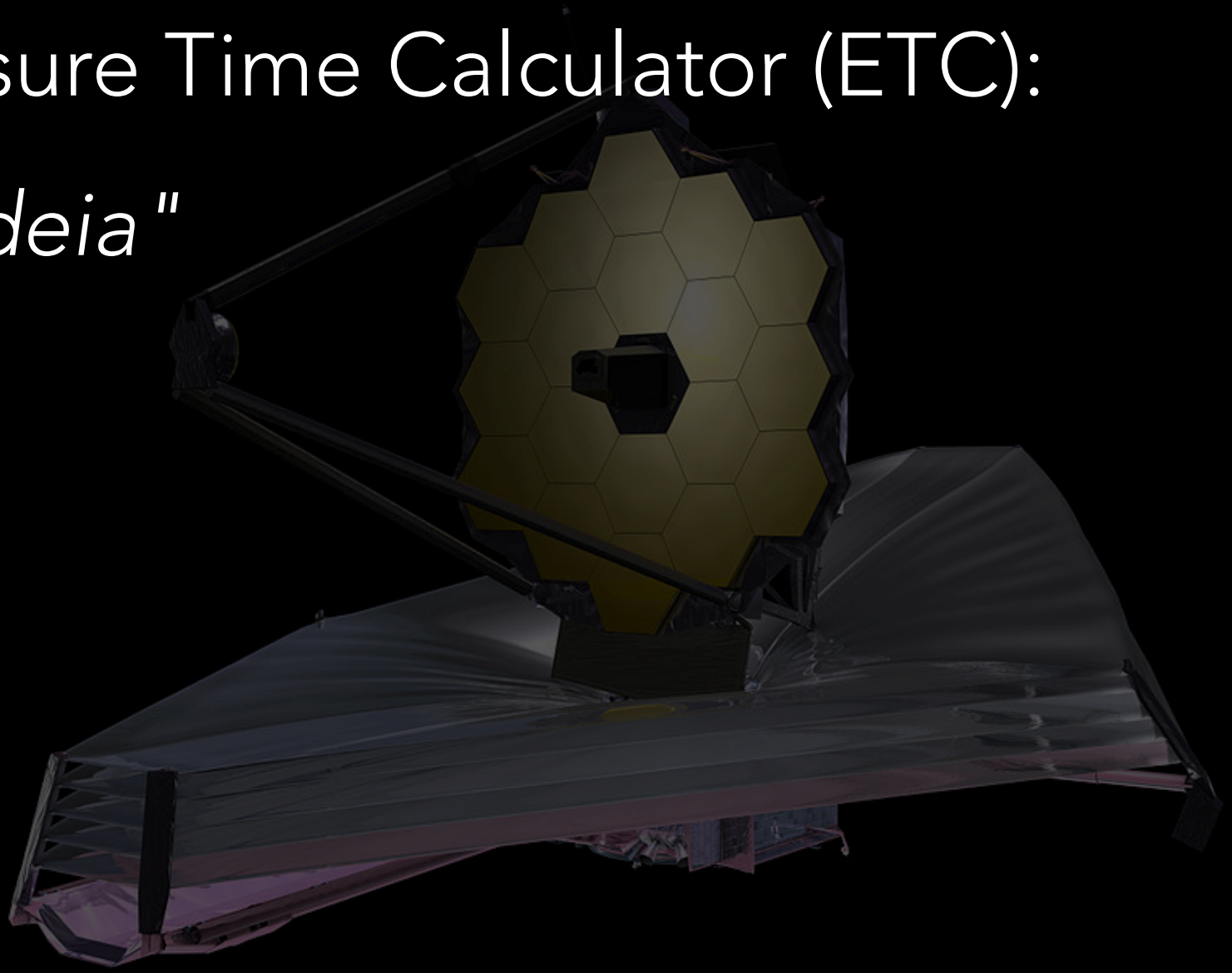
- Exposure Time Calculator (ETC)
- Astronomer's Proposal Tool (APT)
- MSA Planning Tool (MPT)
- Documentation
- Data Analysis Tools



Susan Kassin
(Space Telescope Science Institute)

Exposure Time Calculator (ETC):

"Pandeia"



JWST ETC: "Pandeia"

1. More functionality
   - model spatial and spectral directions simultaneously
   - set-up 2D "postage stamp scenes" and assign spectra to each source in them
   - uses realistic PSFs as a function of wavelength

2. User Interface
   - web-based
   - "copy & modify" flow, sensible defaults given
   - workbooks
     - each has a set of calculations and scenes
     - saved and persist for logged-in users
     - can share with collaborators

Development Version Available Later This Summer!

Specifying "Sources" and "Scenes"

Scenes & Sources tab

Calculations | Scenes and Sources | Uploaded Spectra

Select a Scene

ID	Name	Sources	# Calcs
1	Scene 1	1,2	7

All your scenes listed here

New | Add Source | Remove Source | Delete

Select a Source

ID	Plot	Name	Scenes	# Calcs
1	☑	s0 Calculation 35 s1	1	7
2	☑	s0 Calculation 35 s2	1	7

All your sources listed here

New | New Scene from Source | Delete

Source Editor

ID | Continuum | Renorm | Lines | Shape | Offset

Spectral energy distribution

- ○ Uploaded File
- ◉ Select: Blackbody Spectrum
  - at Teff: 4500 K
- ○ No Continuum

template spectra or read in your own

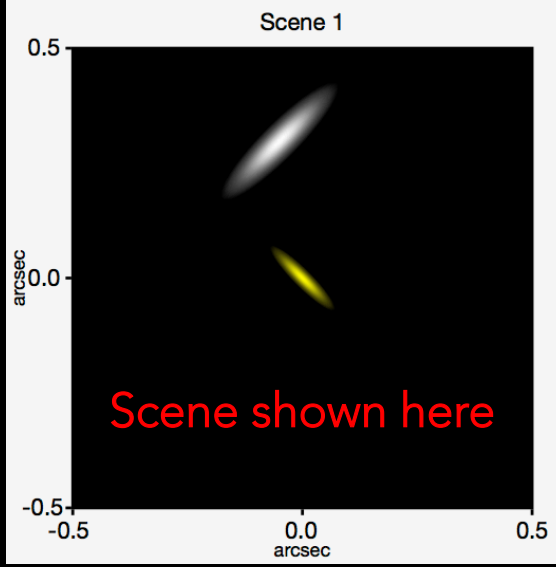
Redshift: 0

redshift it

Renormalization & lines applied after redshift

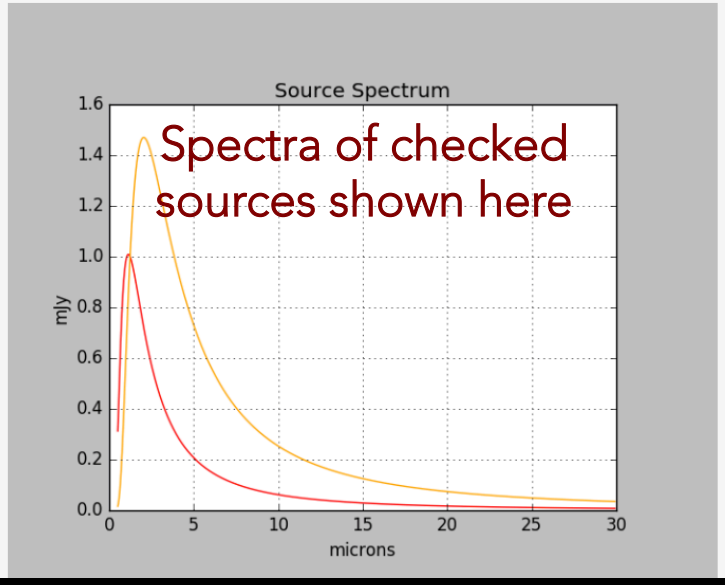
Reset | Save

Scene Sketch



Scene shown here

Source Spectrum Plots



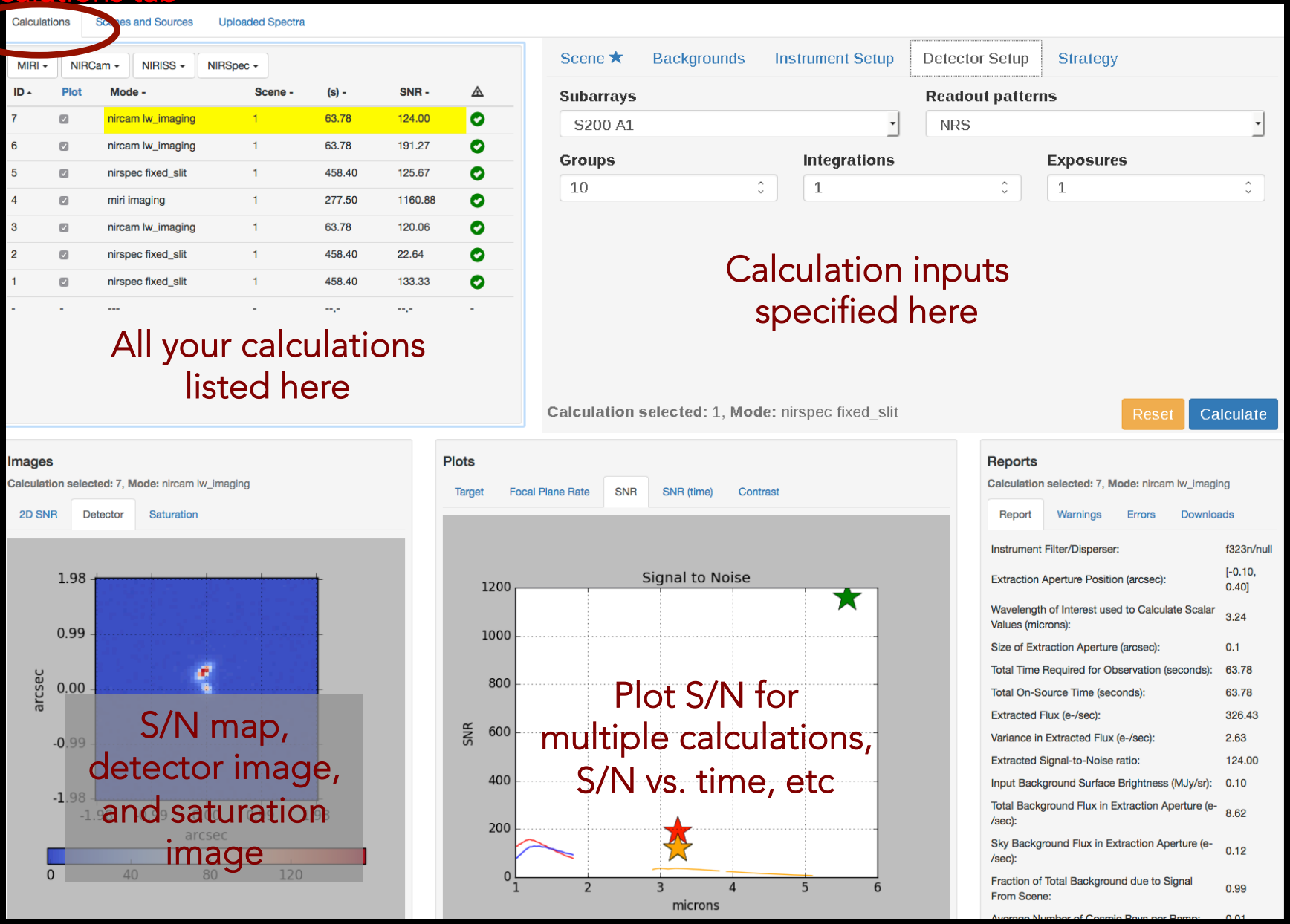
Spectra of checked sources shown here

Used in Calculations

ID	Name	Scene
1	nirspec_fixed_slit	1
2	nirspec_fixed_slit	1
3	nircam_lw_imaging	1
4	miri_imaging	1
5	nirspec_fixed_slit	1
6	nircam_lw_imaging	1
7	nircam_lw_imaging	1

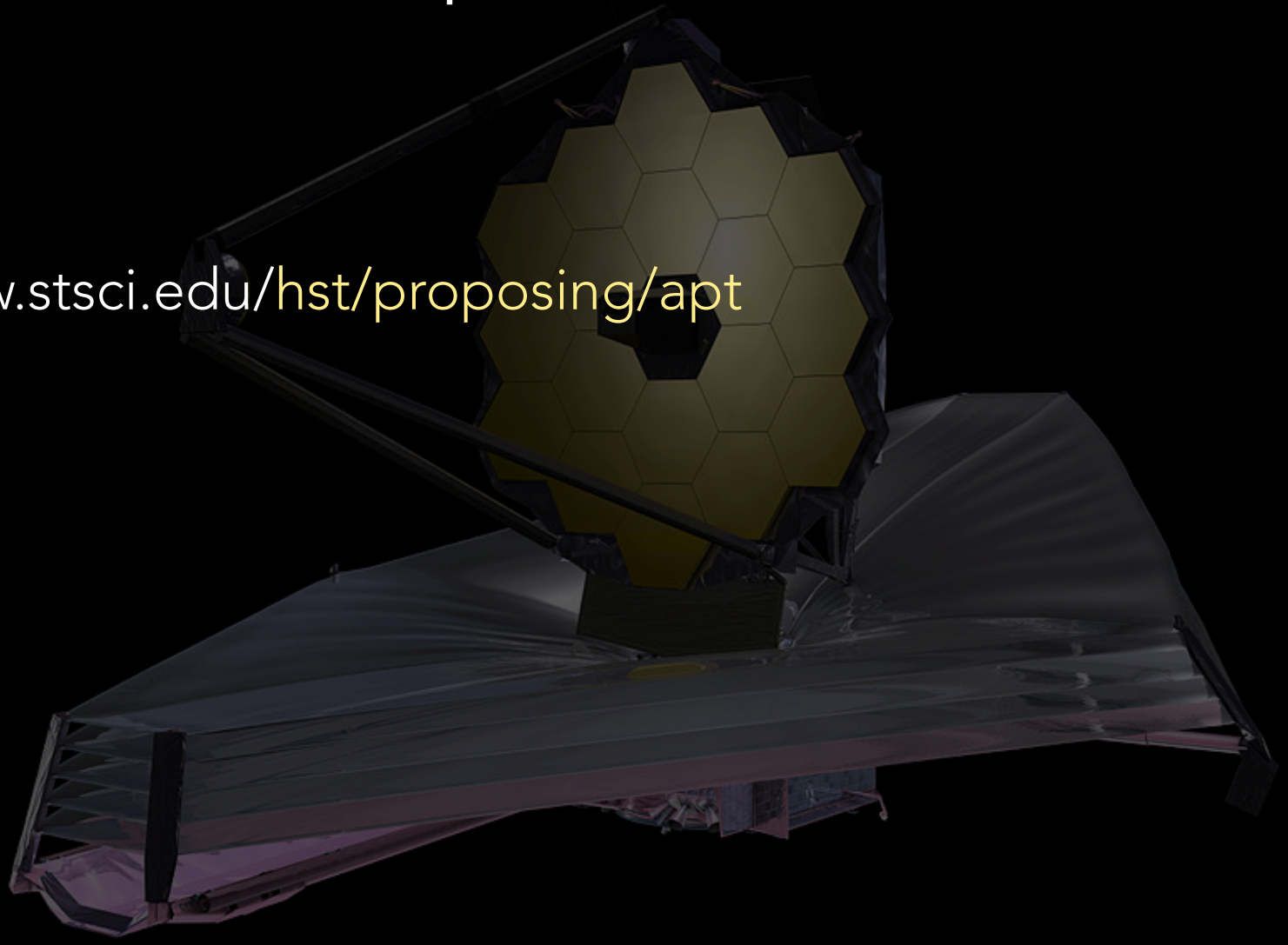
Performing calculations with scenes

Calculations tab

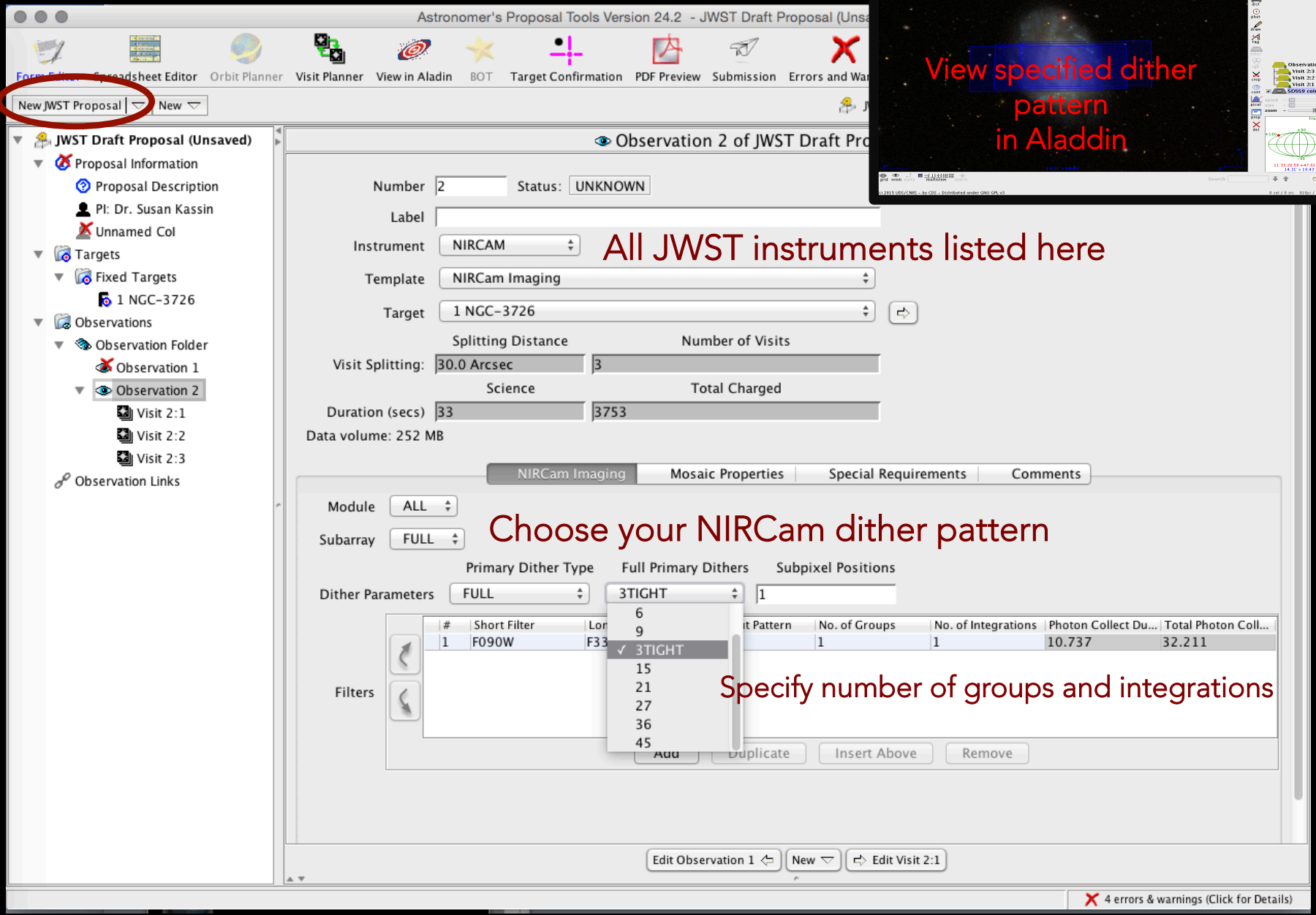


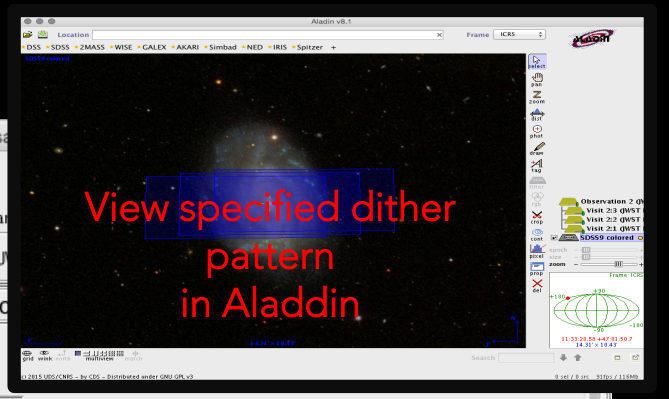
Astronomer's Proposal Tool (APT)

http://www.stsci.edu/hst/proposing/apt



Astronomer's Proposal Tool (APT)



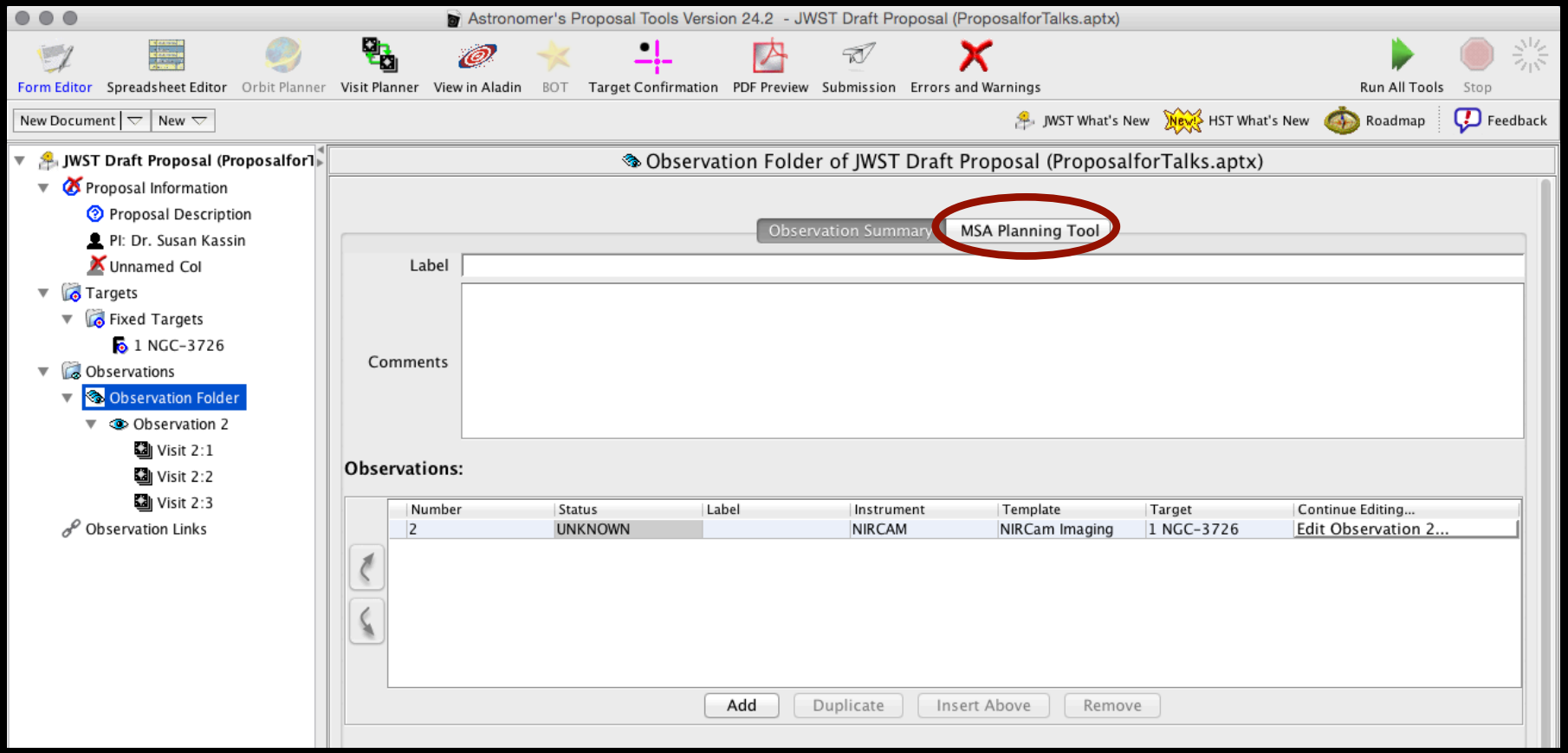


MPT: MSA* Planning Tool

Demos by Diane Karakla

*Micro-shutter array on NIRSpec

The MSA Planning Tool (MPT) is part of APT

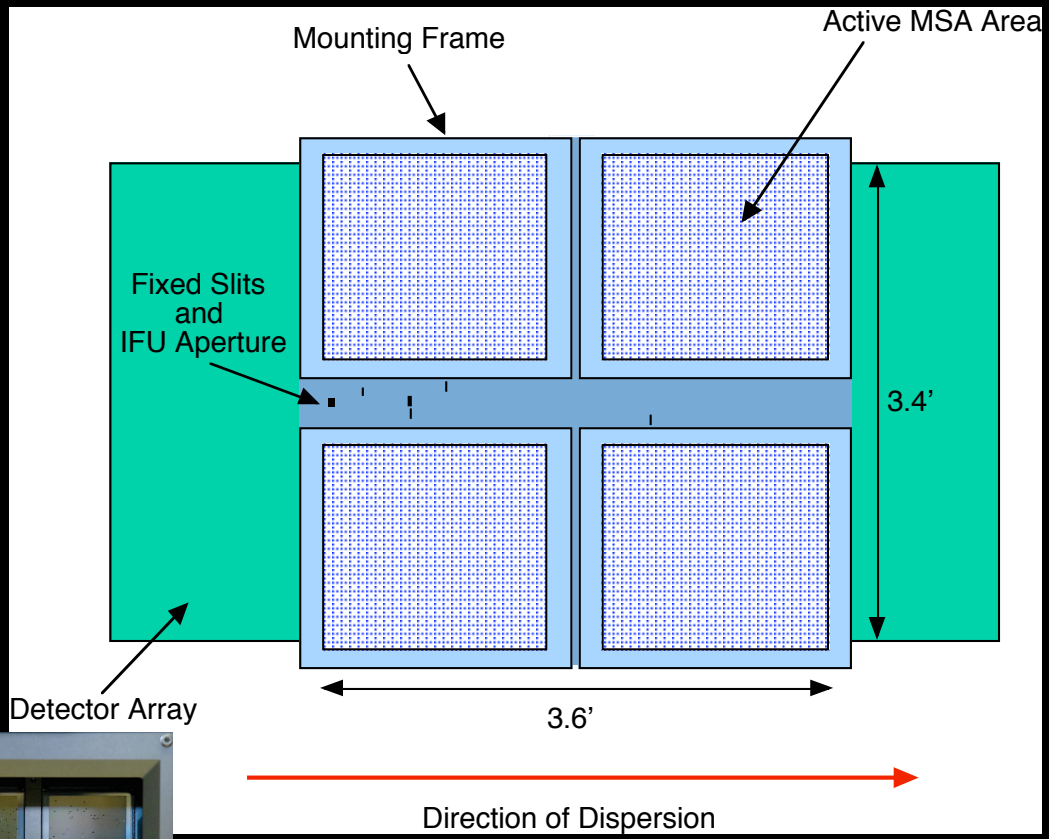


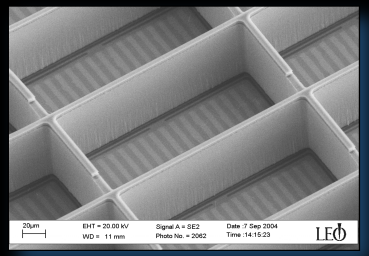
MPT is available now: http://www.stsci.edu/hst/proposing/apt

Micro-Shutter Array (MSA)

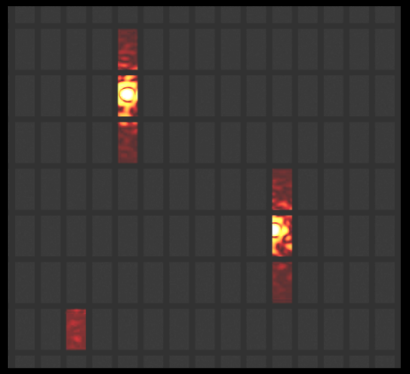
4 x 365 x 171 Shutters
9' square area

up to ~100 objects observable simultaneously

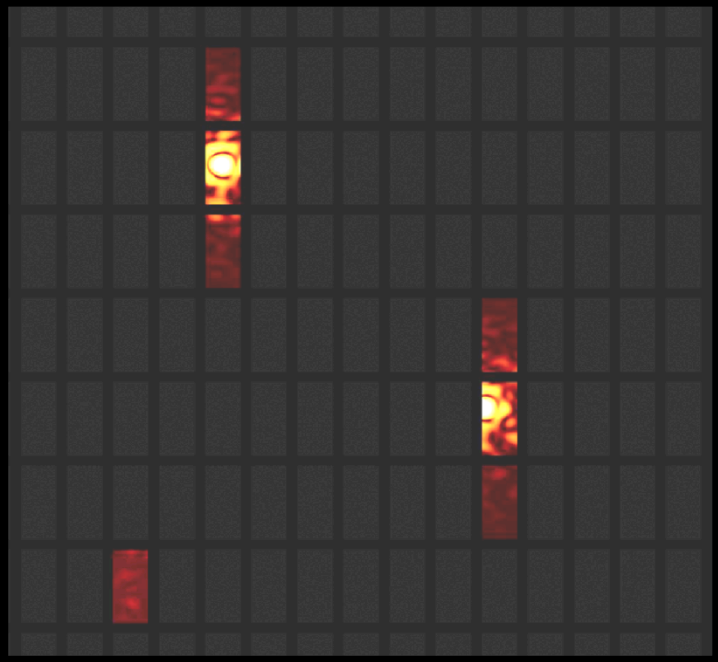




shutters are 0.2" x 0.46"



MPT (MSA Planning Tool) takes into account:



1. The MSA is a fixed grid
   - targets should not be placed behind bars

2. Failed shutters
   - stuck open, stuck closed, shorted rows and columns

3. Optical field distortion

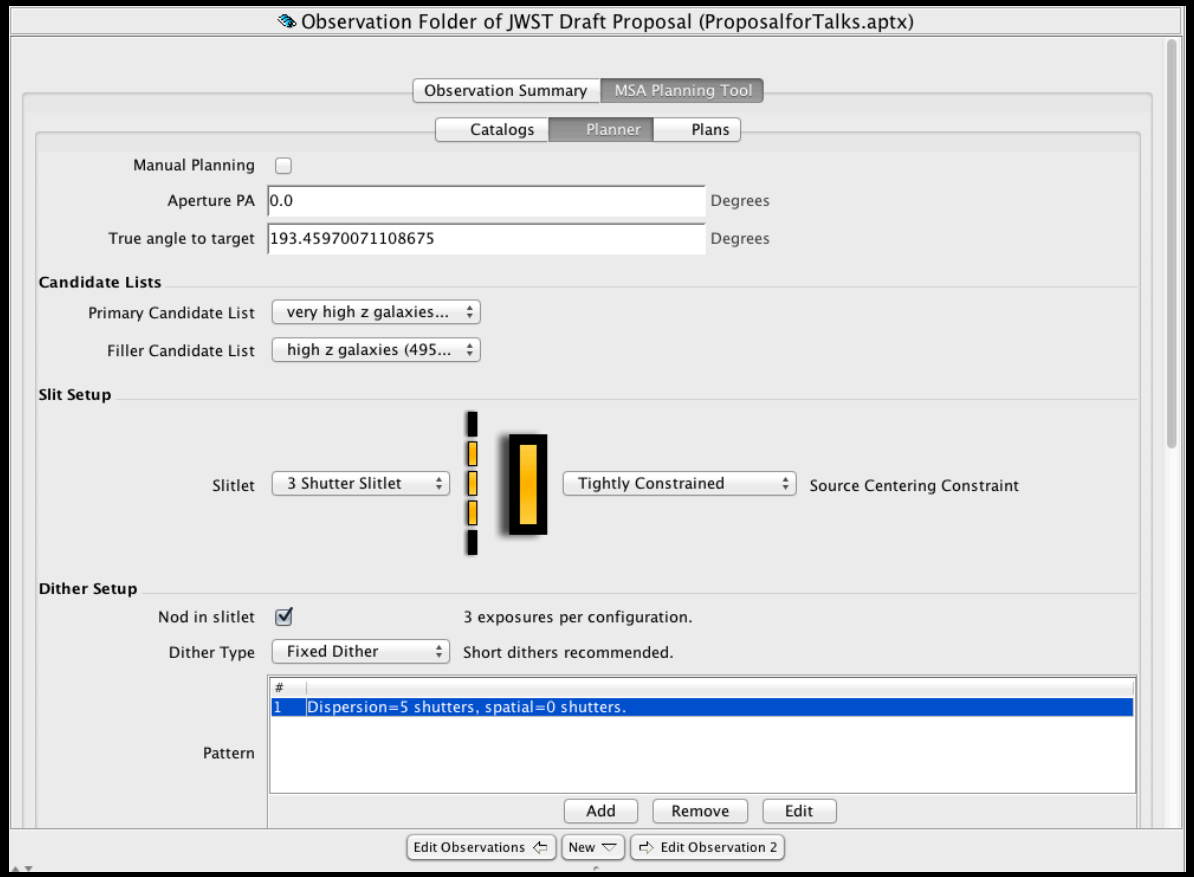
4. Detector gap
   - part of your spectra might get lost here

5. Spectra falling off of edge of detector

6. Differential velocity aberration (DVA)

Setting up MPT to Create Your Pointings

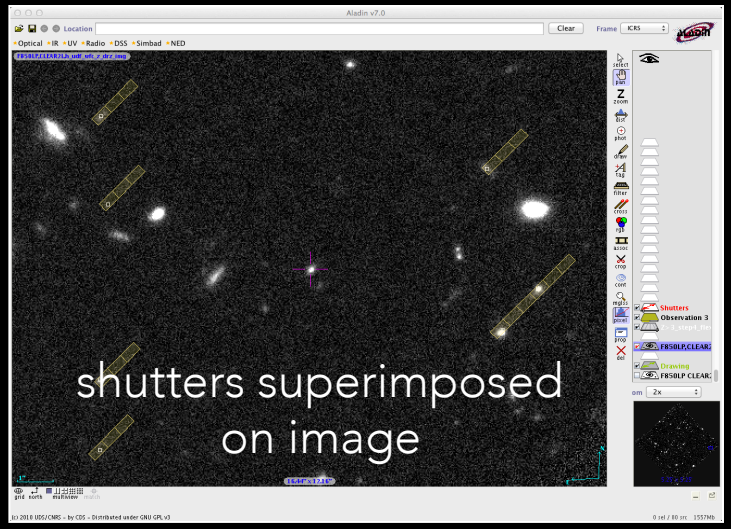
- Upload a catalog of:
  - primary sources with or without weights
  - filler sources
- Choose a slitlet shape
- Choose a centering
- Set-up your dithers
- Set exposures
  - number of groups & integrations
- Set size of search grid



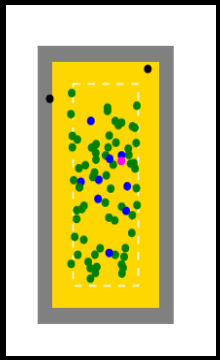
MPT Output

- MPT finds optimal pointings by summing source weights for each possible pointing, and choosing the pointings with the highest sums
- MPT visualizes each pointing as shown

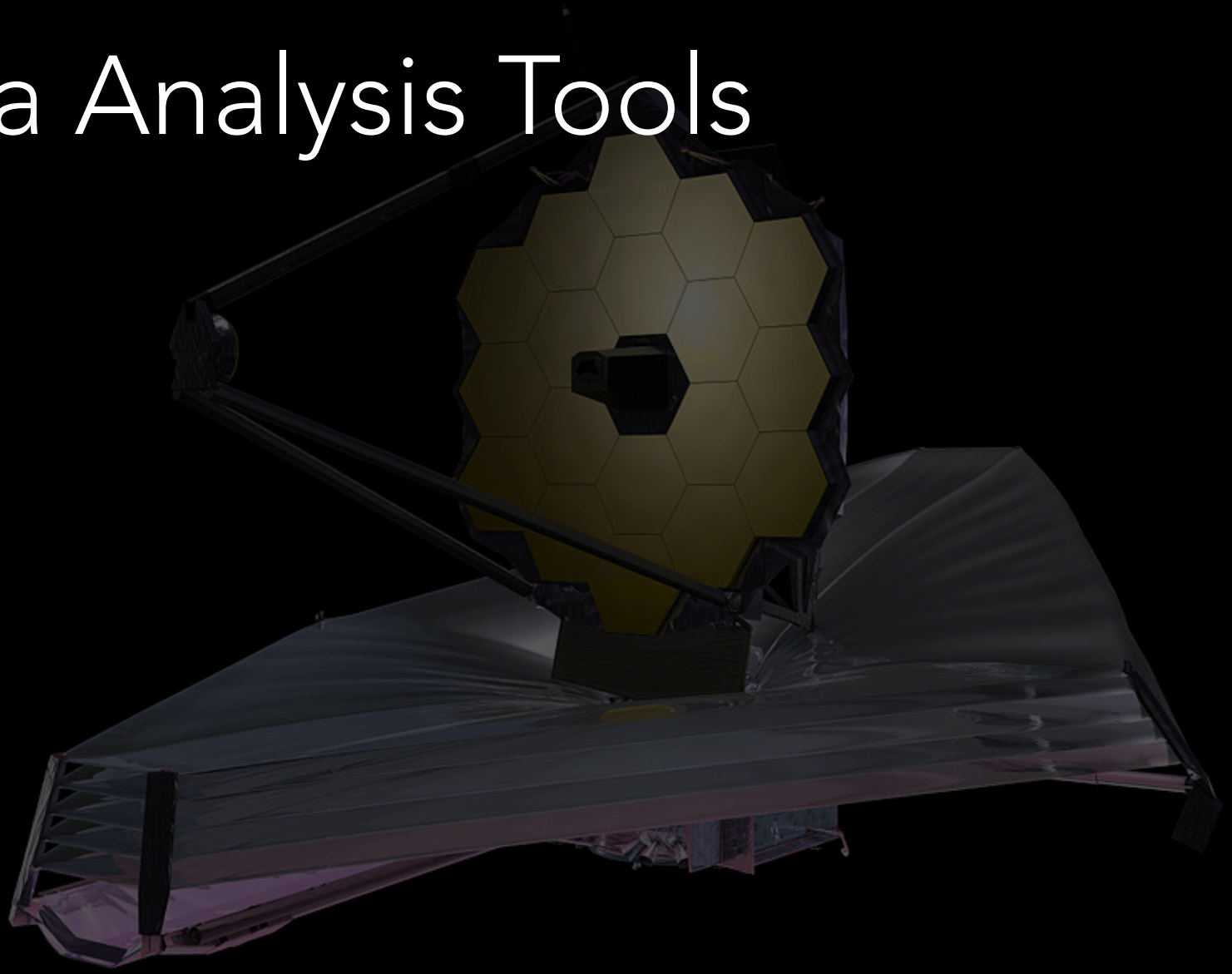
sources (observed or not) shown on the MSA shutters



location of all sources in their shutters



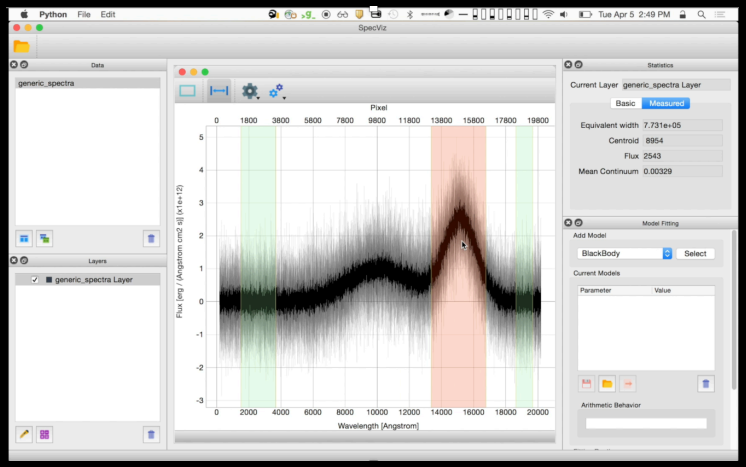
Data Analysis Tools

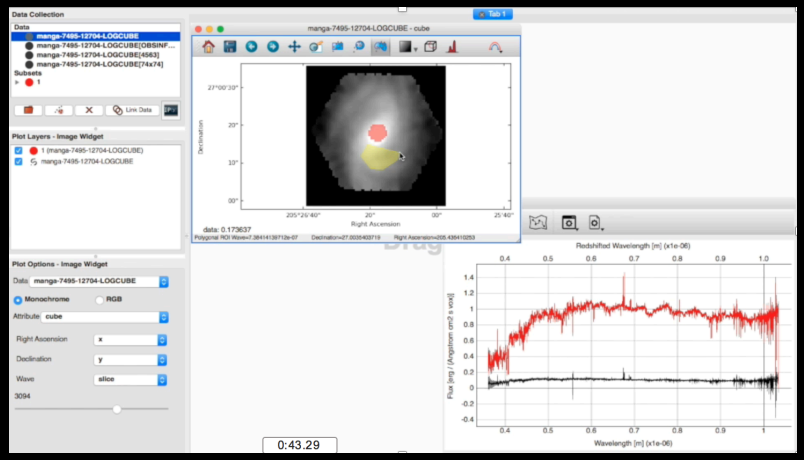


JWST Post-pipeline data-analysis tools

- JWST data analysis will be in Python/Astropy
  - Basic capabilities familiar with users of IRAF, STSDAS, and IDL will be available (many already are)

- Visualization will be in Ginga & Glue





Areas of current development

Astropy

- Data formats, File I/O
- Tables, (parameter files)
- Units & quantities
- Models, fitting, filtering, statistics
- Coordinates, WCS, dates & times

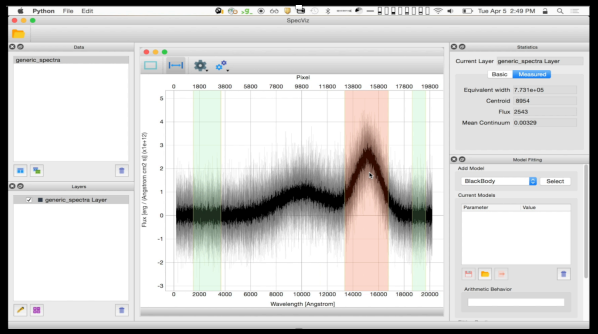
Workflows

- Jupyter (IPython) notebooks
- Linked datasets (Glue)

Python libraries

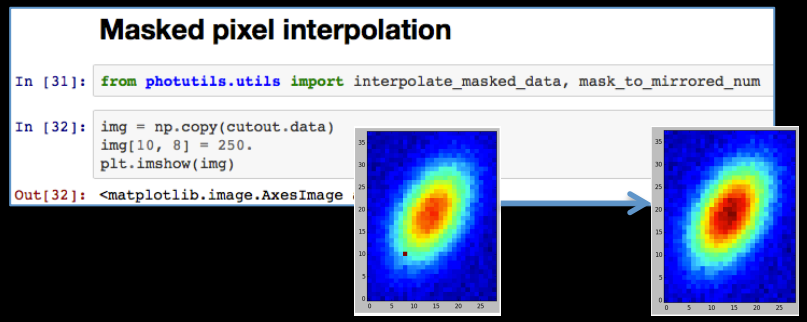
- Numpy, scipy, matplotlib
- Sci-kits, Sympy, PANDAS….

Areas of current development



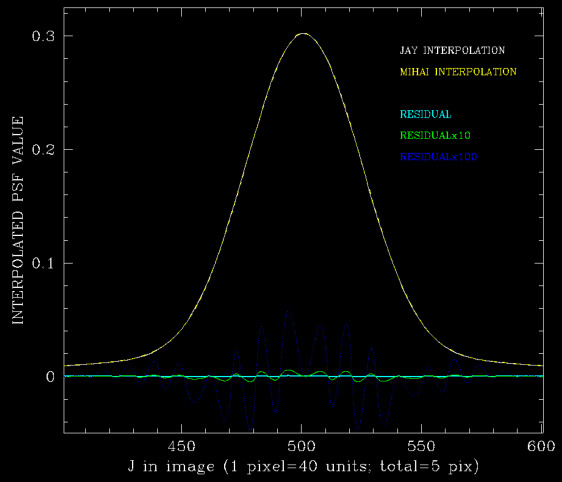
Visualization

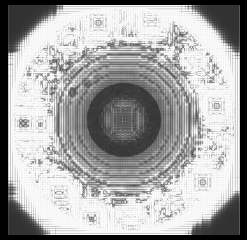
- SpecViz, MOSViz, CubeViz
- Imexam, Ginga plugins



Photutils

- Flexible, modular toolkit for detection, segmentation, measurement





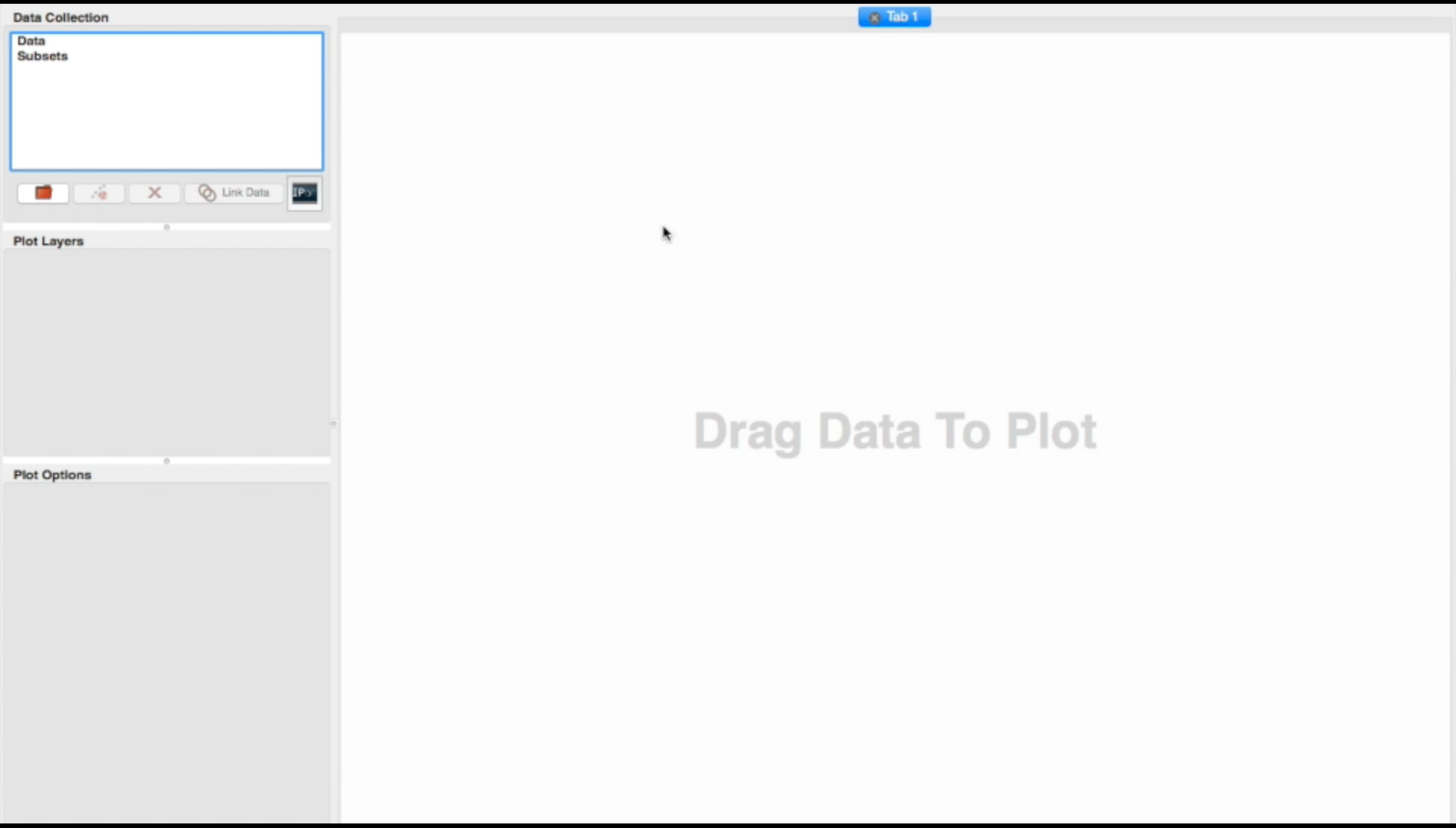
Multi-frame Analysis

- Simultaneous fits to multiple un-resampled images
  - Photometry, astrometry
  - Spectral modeling

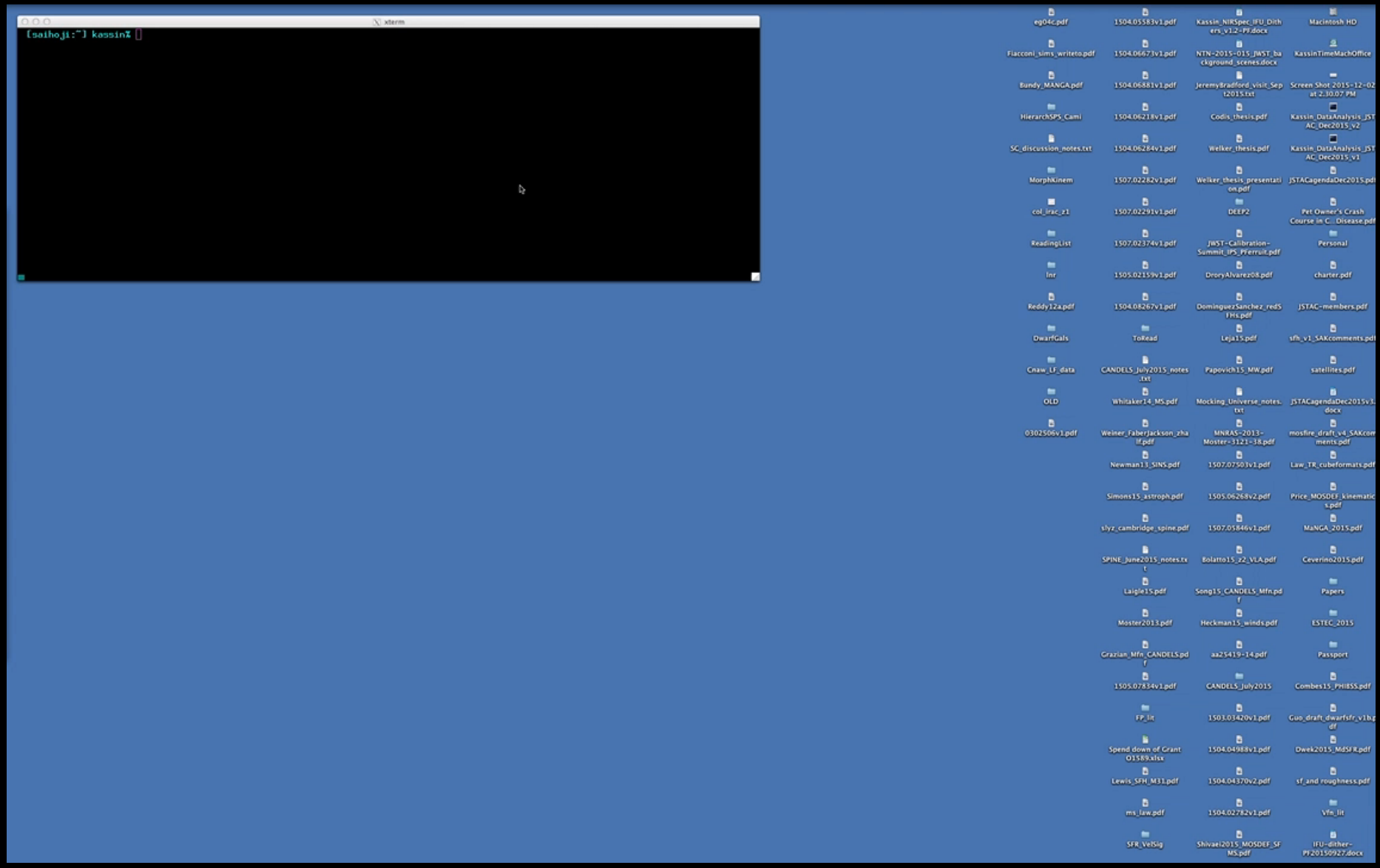
Visualization Tools

- SpecViz
- CubeViz
- MOSViz
- Glue image viewer

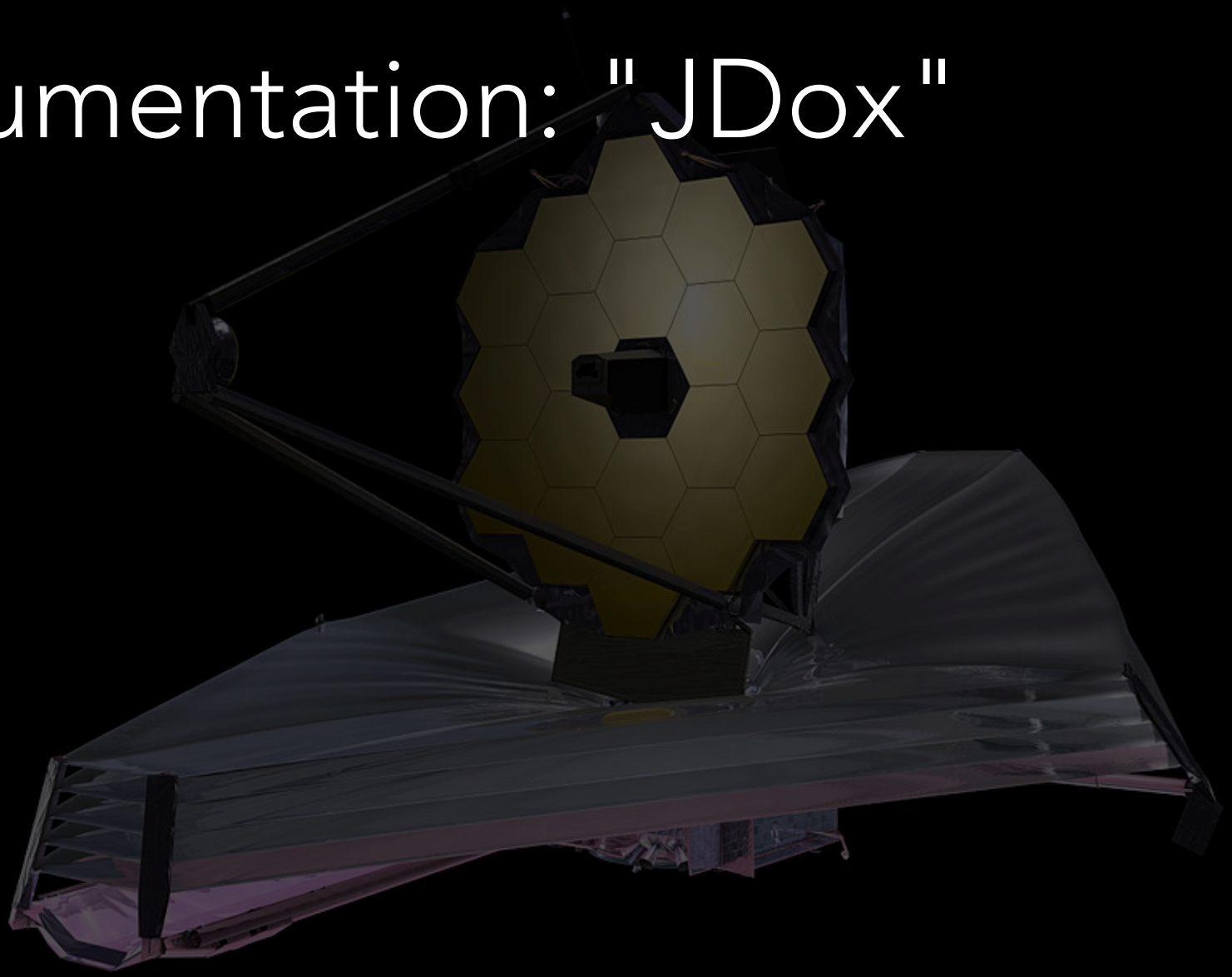
CubeViz


Data Collection
Data
Subsets
Link Data
IPy
Plot Layers
Plot Options
Tab 1
Drag Data To Plot

MOSViz


xterm
[saihoji:~] kassin%
eg04c.pdf
1504.05583v1.pdf
Kassin_NIRSpec_IFU_Dithers_v1.2-PF.docx
Macintosh HD
Fiacconi_sims_writeto.pdf
1504.06673v1.pdf
NTN-2015-015_JWST_background_scenes.docx
KassinTimeMachOffice
Bundy_MANGA.pdf
1504.06881v1.pdf
JeremyBradford_visit_Sept2015.txt
Screen Shot 2015-12-02 at 2.30.07 PM
HierarchSPS_Cami
1504.06218v1.pdf
Codis_thesis.pdf
Kassin_DataAnalysis_JSTAC_Dec2015_V2
SC_discussion_notes.txt
1504.06284v1.pdf
Welker_thesis.pdf
Kassin_DataAnalysis_JSTAC_Dec2015_V1
MorphKinem
1507.02282v1.pdf
Welker_thesis_presentation.pdf
JSTACagendaDec2015.pdf
col_irac_z1
1507.02291v1.pdf
DEEP2
Pet Owner's Crash Course in C...Disease.pdf
ReadingList
1507.02374v1.pdf
JWST-Calibration-Summit_IPS_PFerrsit.pdf
Personal
lnr
1505.02159v1.pdf
DroryAlvarez08.pdf
charter.pdf
Reddy12a.pdf
1504.08267v1.pdf
DominguezSanchez_redSFHs.pdf
JSTAC-members.pdf
DwarfGals
ToRead
Leja15.pdf
sfh_v1_SAKcomments.pdf
Cnaw_LF_data
CANDELS_July2015_notes.txt
Papovich15_MW.pdf
satellites.pdf
OLD
Whitaker14_MS.pdf
Mocking_Universe_notes.txt
JSTACagendaDec2015v1.docx
0302506v1.pdf
Weiner_FaberJackson_zhalf.pdf
MNRAS-2013-Moster-3121-38.pdf
mosfire_draft_v4_SAKcomments.pdf
Newman13_SINS.pdf
1507.07503v1.pdf
Law_TR_cubeformats.pdf
Simons15_astroph.pdf
1505.06268v2.pdf
Price_MOSDEF_kinematics.pdf
slyz_cambridge_spine.pdf
1507.05846v1.pdf
MaNGA_2015.pdf
SPINE_June2015_notes.txt
Bolatto15_z2_VLA.pdf
Ceverino2015.pdf
Laigle15.pdf
Song15_CANDELS_Mfn.pdf
Papers
Moster2013.pdf
Heckman15_winds.pdf
ESTEC_2015
Grazian_Mfn_CANDELS.pdf
aa25419-14.pdf
Passport
1505.07834v1.pdf
CANDELS_July2015
Combes15_PHIBSS.pdf
FP_lit
1503.03420v1.pdf
Guo_draft_dwarfsfr_v1b.pdf
Spend down of Grant O1589.xlsx
1504.04988v1.pdf
Dwek2015_MdSFR.pdf
Lewis_SFH_M31.pdf
1504.04370v2.pdf
sf_and roughness.pdf
ms_law.pdf
1504.02782v1.pdf
Vfn_lit
SFR_VelSig
Shivaei2015_MOSDEF_SFMS.pdf
IFU-dither-PF20150927.docx

Documentation: "JDox"



"JDox"

New JWST website will contain higher level mission information and JWST science content.

New documentation system motto:
"Every page is page one" (Mark Baker)

- short articles
- self-contained, one-level information
- hyperlinked network

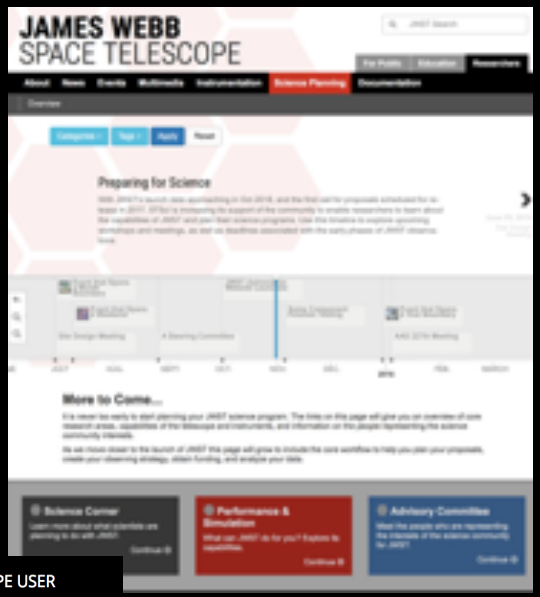
Think Wikipedia (but it's not a Wiki)

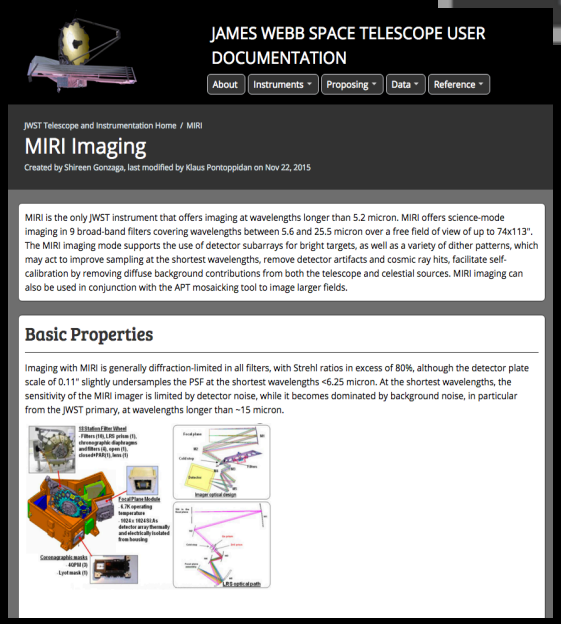
Searchable with Google

Multiple conceptual spaces:

- background articles
- planning cookbooks
- science policy
- engineering specs

First release of overview pages by end of summer, support for proposal planning in January.





MIRI Overview

INREVIEW PREPUBLICATION

The JWST Mid-Infrared Instrument (MIRI) provides imaging and spectroscopic observing modes from 5 to 28.5 µm.

MIRI

Mid-Infrared Instrument

Introduction

The JWST Mid-Infrared Instrument (MIRI) provides imaging and spectroscopic observing modes from 5 to 28.5 µm. MIRI will extend the scientific wavelength range of JWST beyond 5 µm. These wavelengths can be utilized for studies including, but not limited to: direct imaging of young warm exoplanets and spectroscopy of their atmospheres; identification and characterization of the first galaxies at redshifts >7; and analysis of warm dust and molecular gas in young stars and proto-planetary disks.

To achieve these goals MIRI offers a very broad range of observing modes, including:

- imaging
- low resolution slitted and slitless spectroscopy
- medium resolution integral field unit (IFU) spectroscopy
- coronagraphy

The MIRI focal plane is illustrated in Figure 1.

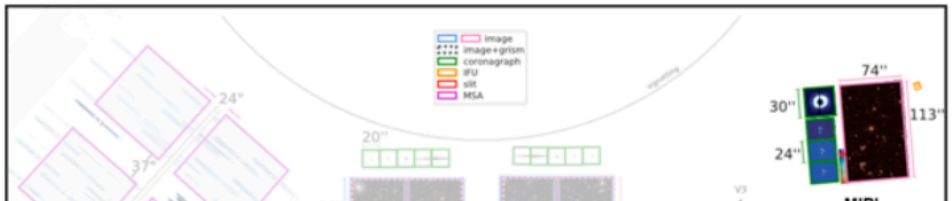


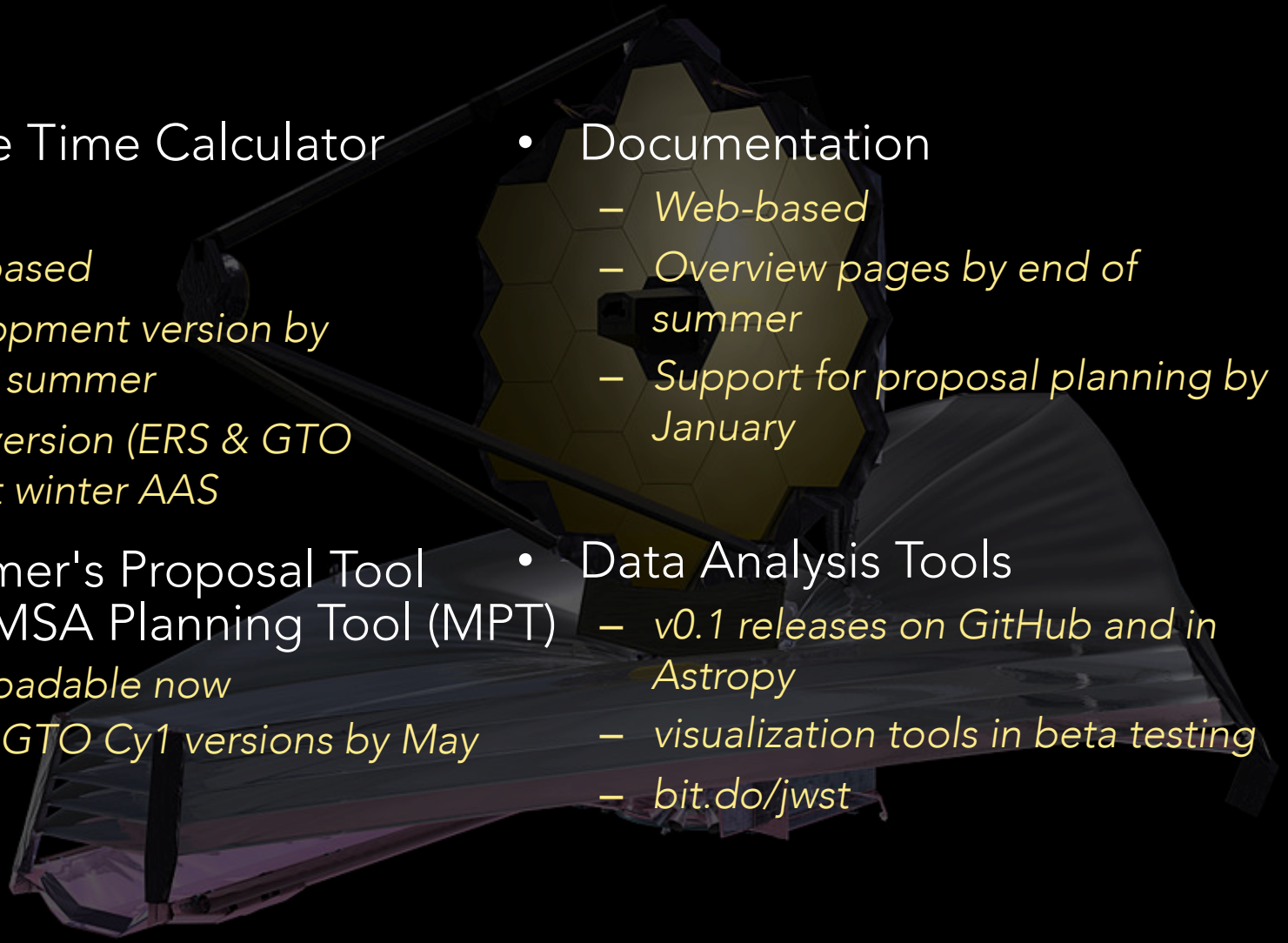
Table of contents

- Introduction
- Observational capabilities
- Optical elements
  - Imager
  - Medium Resolution Spectrometer (MRS)
- Sensitivity and performance
- Data calibration and analysis
- Acknowledgements
- Related links
- References

Observatory and instrumentation

- Mid-Infrared Instrument, MIRI
  - MIRI Overview
  - MIRI Observing Modes
  - MIRI Instrumentation
  - MIRI Operations

JWST User Tools



- Exposure Time Calculator (ETC)
  - *Web-based*
  - *Development version by end of summer*
  - *flight version (ERS & GTO Cy1) at winter AAS*
- Astronomer's Proposal Tool (APT) & MSA Planning Tool (MPT)
  - *downloadable now*
  - *ERS & GTO Cy1 versions by May 2017*
- Documentation
  - *Web-based*
  - *Overview pages by end of summer*
  - *Support for proposal planning by January*
- Data Analysis Tools
  - *v0.1 releases on GitHub and in Astropy*
  - *visualization tools in beta testing*
  - *bit.do/jwst*