

SOFIA

Data Reduction Pipeline Status

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- for the Data Processing System (DPS) team
- 8/10/21

DPS Software



The DPS software team produces and maintains:

- data reduction pipelines for all facility class instruments
- infrastructure tools to facilitate automated data reduction, storage, and transfer to the IRSA archive
- data QA support tools for updating metadata, creating reports, and analyzing data products.

The team:

- 5 software engineers, 1 part-time systems engineer
- in coordination with the data systems science lead.



Facility Class Pipelines

- DPS supported instruments:
FORCAST, FIFI-LS, FLITECAM, HAWC+, and EXES (in transition).
- Pipelines were originally developed in a variety of languages:
IDL, Python, Java, C, and FORTRAN.
- For consistency, maintainability, interoperability, and modernization, we are working toward reimplementing them all in Python with standard scientific libraries in a single, integrated package.



Facility Class Pipelines: Status

- FORCAST: Fully reimplemented in Python.
- FIFI-LS: Fully reimplemented in Python.
- FLITECAM: First Python version complete; release expected in September 2021.
- HAWC+: One remaining component to reimplement; release expected before 2022.
- EXES: IDL pipeline received July 2021; reimplementation will commence in 2022.



Public Release

Python pipelines are now available to the SOFIA community as an open-source package, called SOFIA Redux.

This public release enables the user community to better understand SOFIA data reduction, customize their own reductions, and provide feedback to the pipeline team.

- First release: v1.0.0, July 15, 2021, including FORCAST and FIFI-LS support.
- Source code is available via the [SOFIA-USRA GitHub repository](#).
- [Installation](#) via standard Python distribution tools is available:

```
pip install sofia_redux
```



Public Release: Features

- Extensive [software documentation](#) is available online, including user manuals for every pipeline.
- Tutorials for introductory pipeline usage with sample data sets are also available, via the [SOFIA website](#).

SOFIA Redux Documentation – x +

sofia-usra.github.io/sofia_redux/index.html

SOFIA Redux: docs

sofia_redux v1.1.dev0 » next »

SOFIA Redux Documentation

User and Developer Documentation

- [SOFIA Redux](#)
 - [Introduction](#)
 - [Getting Started](#)
 - [Tutorials](#)
 - [Manuals](#)
 - [Submodules](#)
- [Manuals](#)
 - [FIFI-LS Redux User's Manual](#)
 - [FIFI-LS Redux Developer's Manual](#)
 - [FORCAST Redux User's Manual](#)
 - [FORCAST Redux Developer's Manual](#)

Project Details

- [Full Changelog](#)
- [Authors and Credits](#)
- [License](#)

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Public Release: Features

- Full-featured interactive pipeline interface.
- Batch-mode interface also available.

The screenshot displays the Redux software interface, titled "Redux". The main window has a menu bar with "File", "Parameters", "Display", and "Settings". Below the menu bar, it indicates "DRIP v2.3.1.dev0 for FORCAST in Spectroscopy mode".

Loaded files:
rFT432_0101.fits
rFT432_0102.fits
rFT432_0106.fits
rFT432_0107.fits
rFT432_0108.fits
...
rFT432_0121.fits

Step through: 9. Trace Continuum

Step 9: Trace Continuum

1. Check Headers	Edit	Run
2. Clean Images	Edit	Run
3. Correct Droop	Edit	Run
4. Correct Nonlinearity	Edit	Run
5. Stack Chops/Nods	Edit	Run
6. Stack Dithers	Edit	Run
7. Make Profiles	Edit	Run
8. Locate Apertures	Edit	Run
9. Trace Continuum	Edit	Run
10. Set Apertures	Edit	Run
11. Subtract Background	Edit	Run

Data View | File Information | Log

Locate Apertures
2021-08-03 17:33:30.072920

Parameters:
save = False
method = auto
num_aps = 1
input_position =
fwhm = 3.0

Finding aperture positions from Gaussian fits.

Apertures found:
F0432_FO_GRI_05006326_FORG227_LOC_0101-0121.fits
122.290 arcsec (sign: 1, fit FWHM: 18.458)

Mean fit FWHM: 18.46 +/- 0.00 arcsec

Trace Continuum
2021-08-03 17:33:30.1795

Parameters:
save = False
method = fit to contin
fit_order = 2
fit_thresh = 4.0
step_size = 3

Fitting trace to continu
Wrote region file /Users,
== Pipeline step comple

Edit Parameters: Set Apertures

Save output
Extract the full slit
Refit apertures for FWHM
Aperture sign
Aperture radius
PSF radius
Background regions

Reset | Restore Defaults | Cancel | OK



Public Release: Features

- Integrated analysis and display tools can also be used as standalone tools.

Header for: F0432_FO_GRI_05006326_FORG227_CRM_0101-0121.fits

Extension: FLUX

```
SIMPLE = T / conf
BITPIX = -64 / arra
NAXIS = 2 / numbe
NAXIS1 = 236
NAXIS2 = 240
EXTEND = T
COMMENT / --- scaling ---
COMMENT / --- DCS OBSERVATION ---
DATASRC = 'astro' / (DCS)
OBSTYPE = 'OBJECT' / (DCS)
SRCTYPE = 'UNKNOWN' / pipe
KWDICT = 'DCS_SI_rev_F' / FITS
OBS_ID = 'P_2017-09-21_FO_F432R0101'
AOT_ID = 'UNKNOWN' / Astr
AOR_ID = '05_0063_26' / Astr
AORBSIX = 2 / AOR
AORFAOR = / sourc
COMMENT / --- DCS DATA PROCESSING ---
PROGSTAT = 'LEVEL_3' / Proc
HEADSTAT = 'MODIFIED' / Head
COMMENT / --- DCS MISSION MANAGEMENT ---
PLANID = '05_0063' / obser
DEPLOY = 'DAOF' / site
MISSION-ID = '2017-09-21_FO_F432' / missi
FLIGHTLG = '-9999' / flight
COMMENT / --- DCS ORIGINATION ---
ORIGIN = 'Cornell FORCAST data acqui
OBSERVER = 'UNKNOWN' / obser
OPERATOR = 'UNKNOWN' / tele
```

File Settings

Current directory: /Users/mjclarke/pipeline/proc/tutorials

Name	Date Modified
forcast_imaging	8/3/21 5:06 PM
F0278_FO_IMA_90007317_FORF112_COA_0262-0281.fits	8/3/21 5:06 PM
F0278_FO_IMA_90007317_FORF112_MRG_0262.fits	8/3/21 5:06 PM
F0278_FO_IMA_90007317_FORF112_MRG_0263.fits	8/3/21 5:06 PM
F0278_FO_IMA_90007317_FORF112_MRG_0280.fits	8/3/21 5:06 PM
F0278_FO_IMA_90007317_FORF112_MRG_0281.fits	8/3/21 5:06 PM
F0278_FO_IMA_90007317_FORF112_MRG_0282.fits	8/3/21 5:06 PM
F0278_FO_IMA_90007317_FORF112_TEL_0262.fits	8/3/21 5:06 PM
F0278_FO_IMA_90007317_FORF112_TEL_0263.fits	8/3/21 5:06 PM
F0278_FO_IMA_90007317_FORF112_TEL_0280.fits	8/3/21 5:06 PM
F0278_FO_IMA_90007317_FORF112_TEL_0281.fits	8/3/21 5:06 PM
F0278_FO_IMA_90007317_FORF112_TEL_0282.fits	8/3/21 5:06 PM
F0278_FO_IMA_90007317_FORF112_UND_0262.fits	8/3/21 5:06 PM
F0278_FO_IMA_90007317_FORF112_UND_0263.fits	8/3/21 5:06 PM
F0278_FO_IMA_90007317_FORF112_UND_0280.fits	8/3/21 5:06 PM
F0278_FO_IMA_90007317_FORF112_UND_0281.fits	8/3/21 5:06 PM
FORCAST_Files	8/3/21 5:05 PM
forcast_spec	8/3/21 5:13 PM
F0432_FO_GRI_05006326_FORG227_CMB_0101-0121.fits	8/3/21 5:13 PM
F0432_FO_GRI_05006326_FORG227_CRM_0101-0121.fits	8/3/21 5:13 PM
F0432_FO_GRI_05006326_FORG227_MGM_0101-0121.fits	8/3/21 5:12 PM

File filter: *.fits

SAOImage ds9

File: F0432_FO_GRI_05006326_FORG227_CRM_0101-0121.fits[FLUX]

Object: NGC 7009

Value: 3.5685

LINEAR-LINEAR-A x: 25.82292 y: 116.71459 z: 1

Physical x: 199.552 y: 149.472

Image x: 199.552 y: 149.472

Frame 1 x: 3.44166 y: 0 z: 0

file edit view frame bin zoom scale color region wcs analysis help

linear log power sqrt squared asinh sinh histogram min max zscale

The Eye of SOFIA

Spectral_flux [Jy] vs Wavepos [um]

Wavepos [um]	Spectral_flux [Jy]
18.61	16.4
18.61	34.48
18.6	18.6
16.4	16.4
28	28

X Cursor: 18.61 Y Cursor: 34.48 X Value: 18.6 Y Value: 16.4 Column: 28

Transmission vs Wavepos [um]

Wavepos [um]	Transmission
2.3	0.86
2.8	0.90
3.2	0.98



Public Release: Coming Soon

The FLITECAM pipeline will be released publicly immediately following internal release of the Python version.

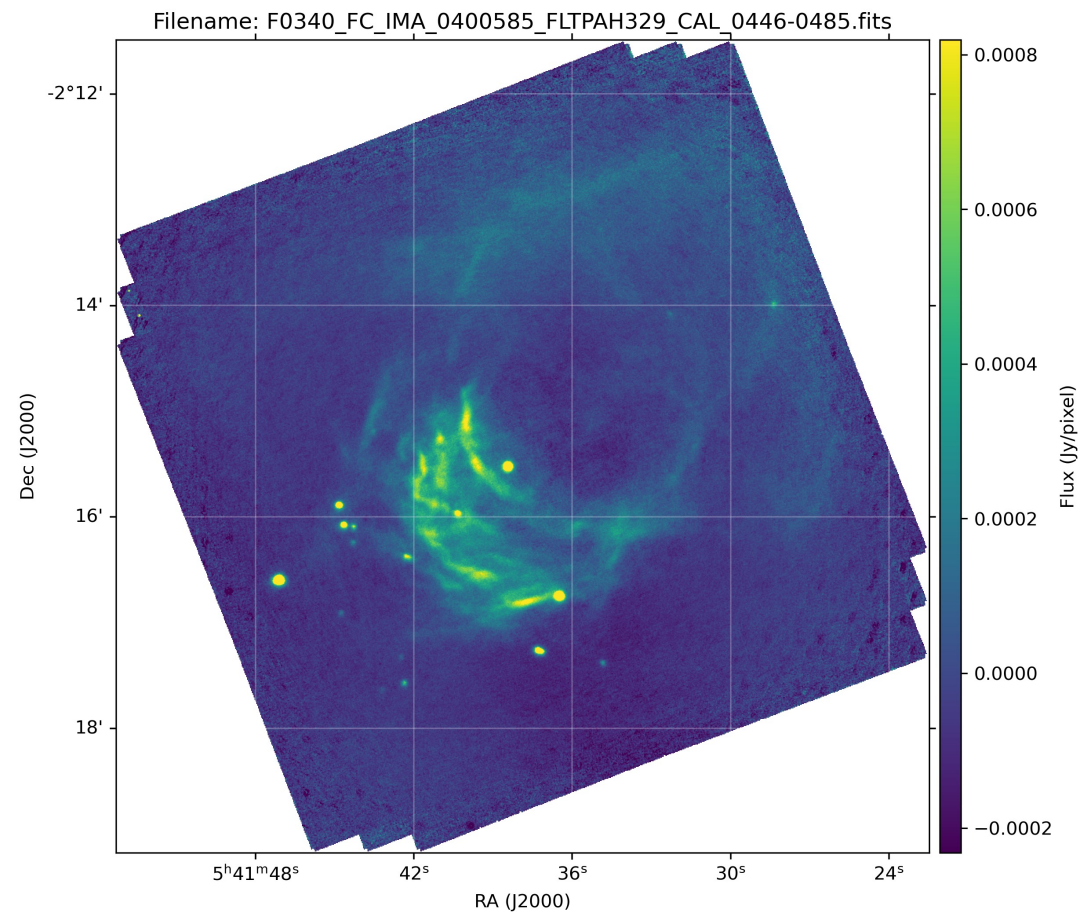
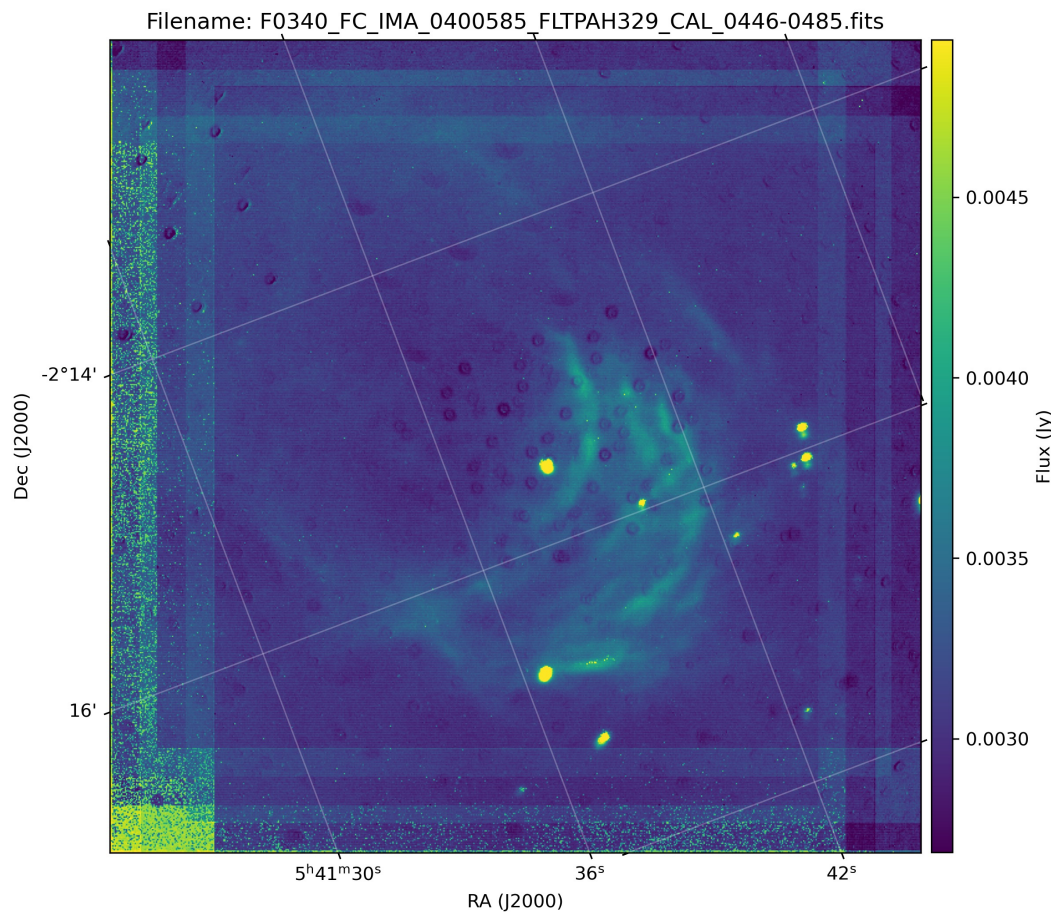
- New FLITECAM data products are more consistent with FORCAST, easier to understand.
- New pipeline algorithms implement several improvements, particularly for imaging products.

Public Release: Coming Soon



Object: NGC 2023, Filter: FLT_PAH_329

Object: NGC 2023, Filter: FLT_PAH_329



IDL: FLITECAM Redux v1.2.0

Python: FLITECAM Redux v2.0.0dev0



Public Release: Feedback

Questions? Feedback? Contributions?

- File a [ticket](#) on the GitHub project:
https://github.com/SOFIA-USRA/sofia_redux
- Send a message to the SOFIA helpdesk:
sofia_help@sofia.usra.edu