

SpecViz: A 1D Spectral Visualization Tool

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Abstract

[SpecViz](#) is a Python tool for visualization and analysis of onedimensional spectra, similar to `splot` in IRAF. It is created specifically for data from the Near-Infrared Spectrograph (NIRSpec) and Mid-Infrared Instrument (MIRI) instruments on *Webb*, but can easily be used with spectra from other instruments. SpecViz provides a responsive visual environment in which users can quickly zoom in and out of regions of a 1D spectrum and make measurements of emission and absorption lines with mouse clicks. New features are being added with each release and we encourage the community to join our development effort.

Features

The SpecViz tool is shown in action in a screenshot in Figure 1. In this screenshot, an absorption line in a spectrum is being fit.

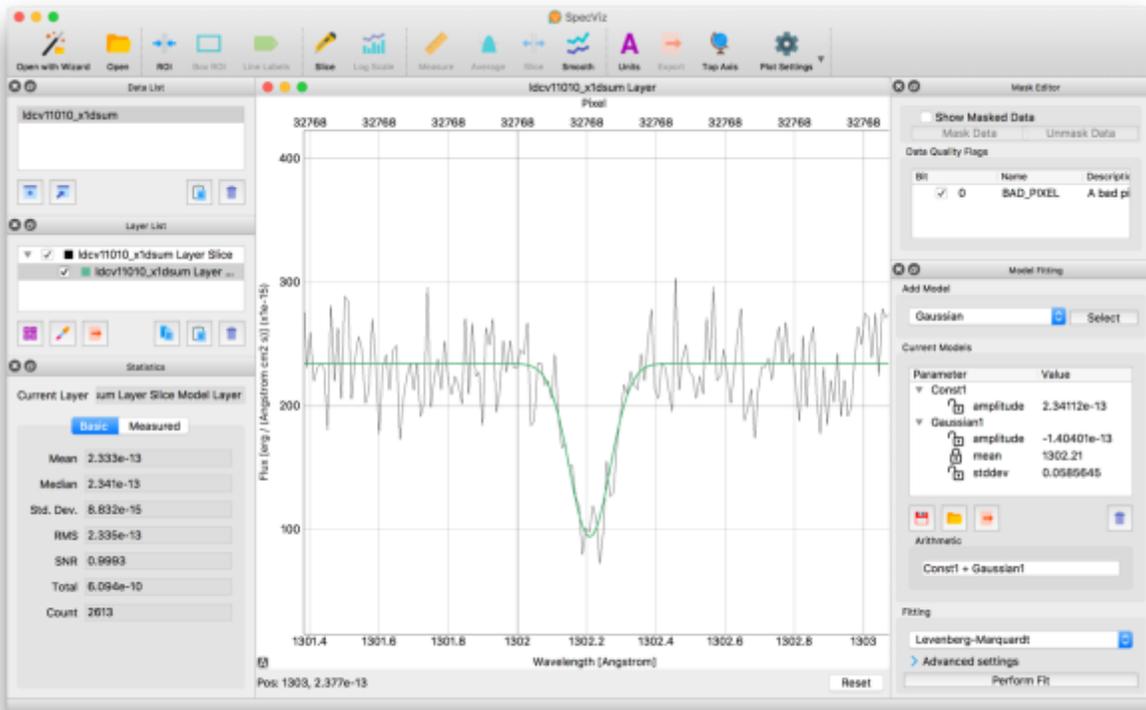


Figure 1: A screenshot of SpecViz in action is shown. In this workflow, a single spectrum is loaded, and Gaussian and constant models are fit to an emission line and a flat continuum. The functions being fit are described in the middle panel on the right. Parameters describing these functions can be held fixed (if the lock symbol is engaged) or allowed to float freely.

Features of SpecViz include the ability to: quickly zoom in and out of a spectrum, change the units of either axis, toggle between wavelength and velocity (via changing the units), fit Astropy models (e.g., Gaussian, Gaussian absorption, power law, spline) with Astropy fitters (Levenberg-Marquart or Simplex), and obtain basic statistics over a specified region. Although sensible default values are set initially for the Astropy fitters, an "Advanced Settings" option allows for fitter parameters to be edited. In addition, modified spectra and models fit to data can be saved to disk.

A video demonstration of SpecViz is available [here](#). It shows the loading of an example spectrum, and simultaneous fitting of two Gaussians and a flat continuum. The resulting best fit model is then subtracted from the spectrum.

Data Loader

All *Webb* data will automatically load into SpecViz. For spectra of other provenance, a data loader "wizard" is provided. The wizard makes it straightforward to read a wide variety of FITS files with different conventions for storing spectra, masks, and uncertainties. This is because most fits files adopt different standards. A screenshot of the wizard is in Figure 2.

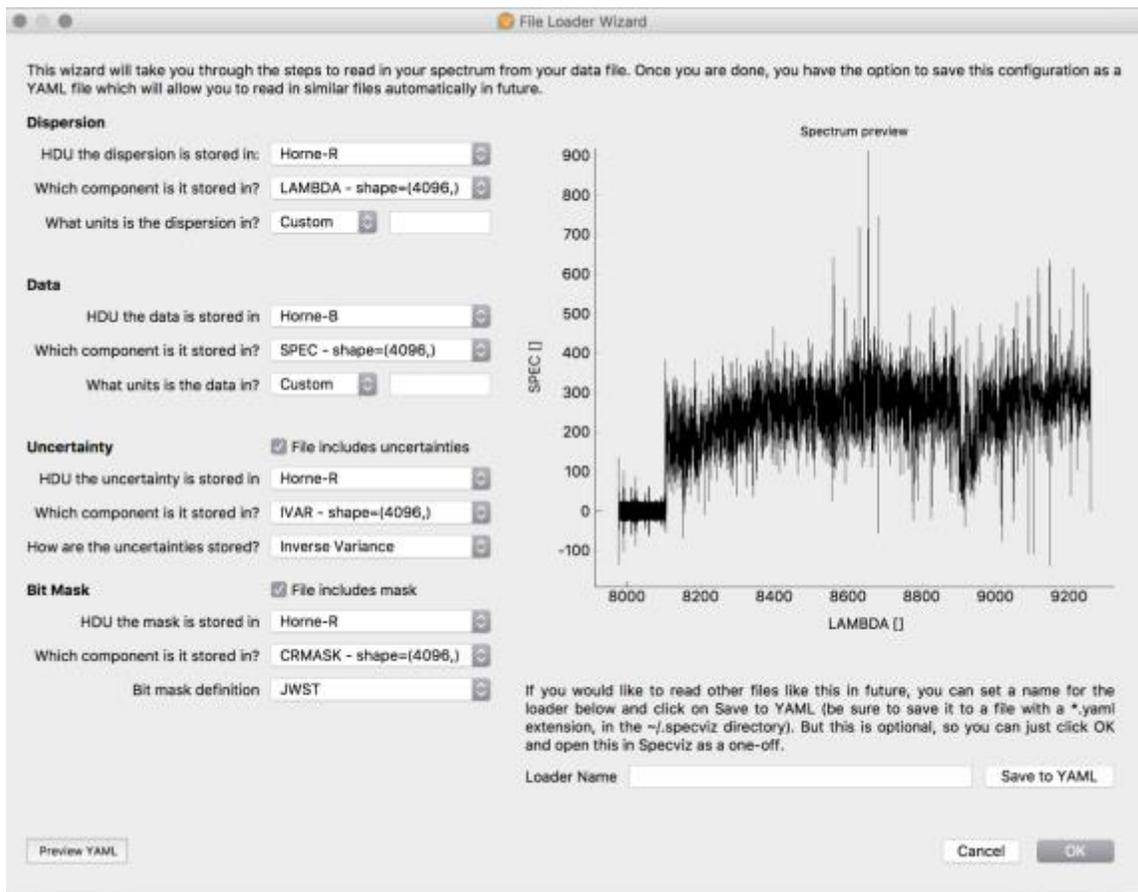


Figure 2: A screenshot of SpecViz's data loader "wizard" is shown. It allows the user to specify which of the keywords store the spectral dispersion, data, uncertainty (optional), and bitmask (optional).

Download & Installation

All *Hubble* and *Webb* user software, including SpecViz, is available via [AstroConda](#). AstroConda is a new distribution mechanism for all public Institute software.

Detailed installation instructions for downloading SpecViz are [here](#). In short, if AstroConda is installed on your computer, type the following command at any Bash terminal prompt:

```
conda install specviz
```

Future Features

There are many additional features which should be incorporated into SpecViz, not all of which can be implemented with the available resources. The community is encouraged to join our development effort to extend SpecViz to more workflows and use cases. The following additional features are planned by April 2018: read-out of Python fitting commands used, interaction with the Jupyter notebook and Python command line, smoothing, incorporation of data masks, incorporation of line lists, key bindings for common tasks (i.e., "hot keys"), and tying parameters of models together.

Development

The SpecViz front-end is designed using PyQt, which provides Python bindings for the cross-platform GUI framework Qt.

Most of the development for SpecViz occurs in "coding sprints." These are intense periods of two weeks in duration during which developers and scientists interact daily. The sprints begin with an hour long "kick-off" meeting during which the initial plan for the sprint is decided and agreed upon. At this meeting scientists and developers not involved with the rest of the sprint give important input.

We encourage members of the community to call in to kick-off meetings and even participate (remotely or in person) in the full sprints. For more information, please email the authors of this document and/or subscribe to the *JWST* Data Analysis Development Forum email list (send an email with the word "subscribe" in the subject line to jwst_dadf-subscribe-request@maillist.stsci.edu) where notices of all kick-off meetings are sent.