Ideas and preparatory works for the final archiving of FIFI-LS data in Germany

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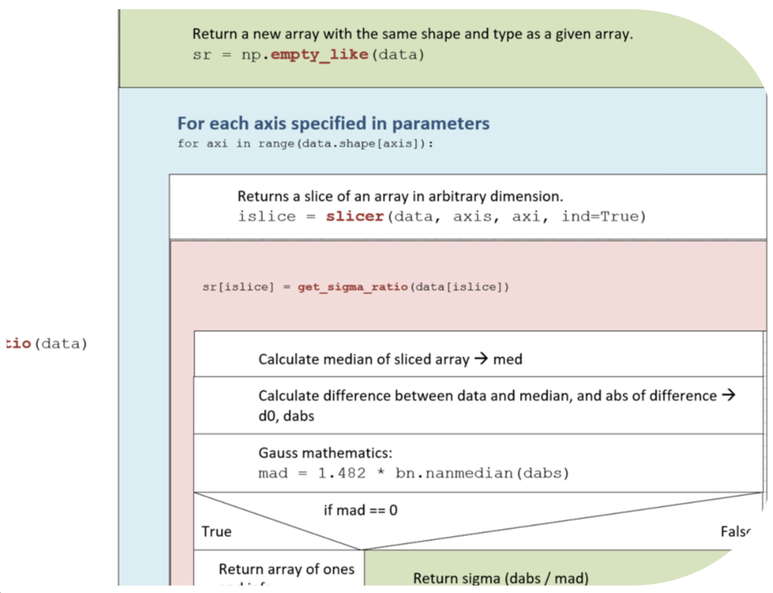
Abstract

After the development of the SOFIA pipelines was stopped shortly after the end of SOFIA observations, the FIFI-LS (Fischer et al. 2018, Colditz et al. 2018) team at the Deutsches SOFIA Institut got acquainted with the FIFI-LS part of the pipeline and implemented new functionalities. These developments are mandatory for the "On The Fly" observation mode, that was used for the SOFIA Legacy Project LMC+ to to map a large part of the "Southern Molecular Ridge" in the Large Magellanic cloud. Still other data will benefit as well from the improvements.
We also show our ideas how to present FIFI-LS data in a German archive to support collaboration with and withing the community.
We want to get feedback regarding usability and requirement ideas from the users!

Reverse Engineering



In order to gain a deep understanding of the code structure and functionalities of the Redux pipeline we prepared Nassi-Shneiderman-like drawings for each module of the SOFIA Redux (Vacca et al. 2020) code for FIFI-LS when we implemented new features. We chose Nassi-Shneiderman over UML etc. as it is easier to portray the existing complex code structure with many nested for-loops, functions and options based on user selectable parameters in the pipeline.

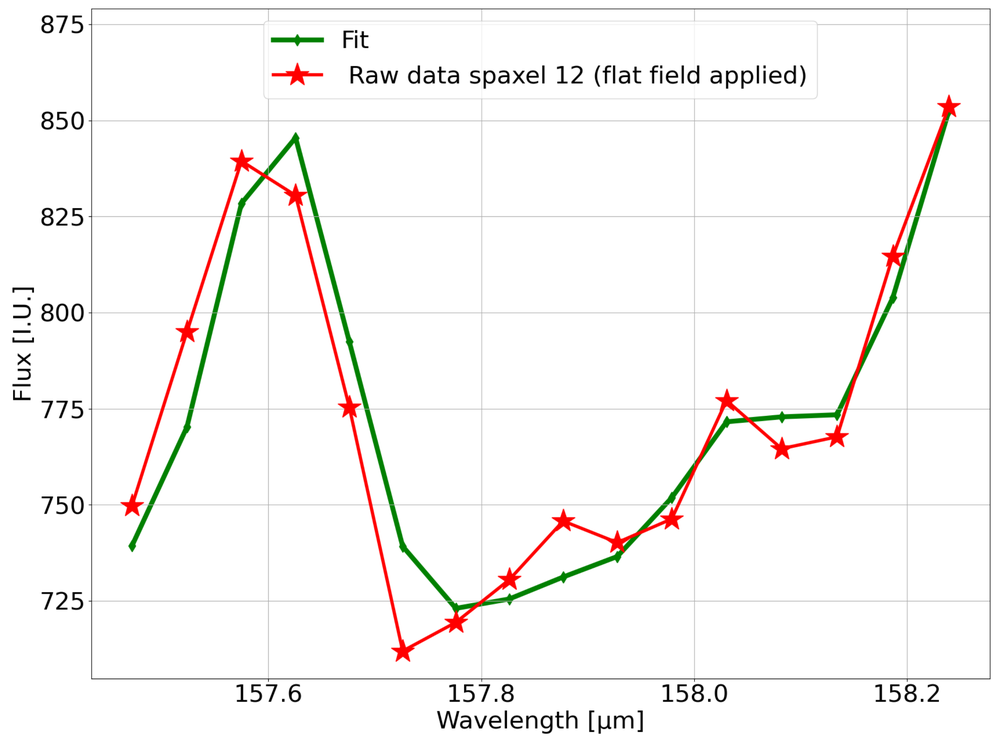
Lessons learned:

- It is necessary to dig through the code line by line.
- Collaboration with the original developers and instrument scientists is crucial to understand some "whys".

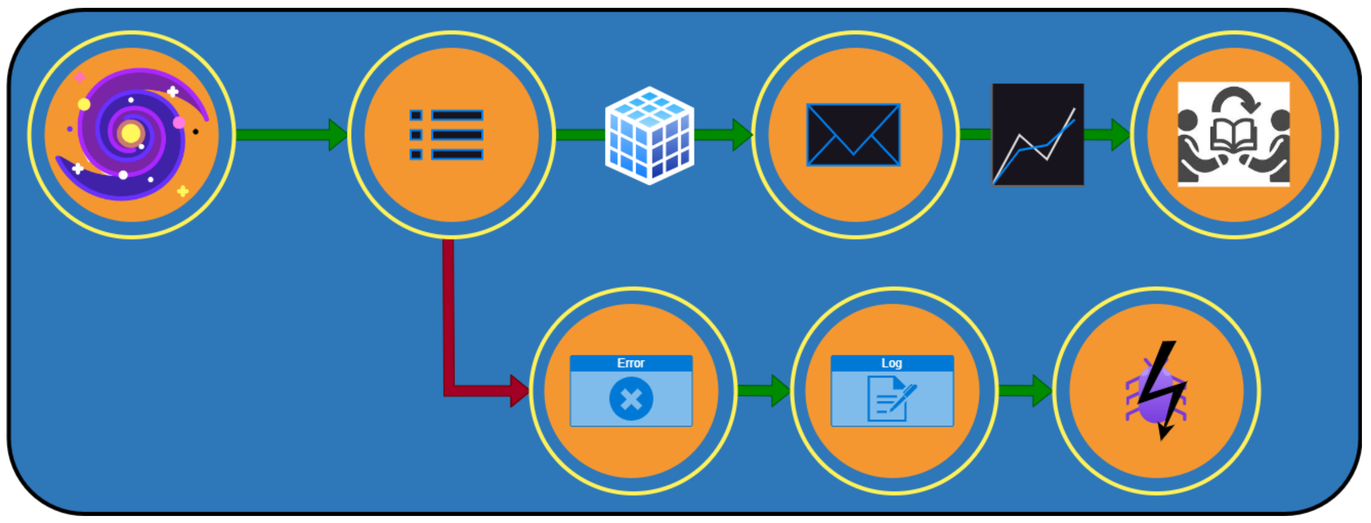
OTF Data Reduction - Telluric Scaling

- "On The Fly" (OTF) scanned observing mode needed pipeline development work, after mode was introduced for FIFI-LS at the end of the project for observations of bright extended objects like Large Magellanic Cloud (LMC)
- Telluric Scaling accounts for differences of line of sight precipitable water vapour (PWV) due to elevation changes coursed by large nod amplitudes.
- We fit the emission model (eq. 1) in Fischer et al. (2021) to the data of each of the 25 spatial pixels (spaxel) with 16 spectral values (spexel). The line fit parameters a, b and c were obtained according to eq.1 and the result for one central spaxel with [CII] data can be seen on the right.
- This allows us to separate the atmospheric emission from telescope and instrument background in the off-nod and therefor to scale it to the elevation of the on-nod.

$$Fit(\lambda) = a + b * \lambda + c * E(\lambda, T, PWV_{zenith}, alt, el) \qquad (1)$$



Automated Reductions



Idea: reductions on demand!

- User chooses project (e.g. LMC with FIFI-LS)
- User sets reduction parameters
- User gets email when reduction complete
- Reduction error: log to dev team
- User uploads line fit for publication referencing (optional)

Suggestions? Ideas? Wishlist?

Acknowledgement

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Literature

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