



Astronomical Institute
of the Czech Academy of Sciences

PlatoSpec Data Management In the ESO Archives



Petr Škoda

Astronomical Institute of the Czech Academy of Sciences, Ondřejov

PlatoSpec Conference
Santiago, Chile
On Zoom
December 2th 2025

Credits

The presentation is based on many different sources – mainly the on-line published slides from IVOA meetings, EPRV group slides and docs, ADASS meetings, tutorials, manuals or pictures found on Internet.

PlatoSpec Agreement (MoU)



European Organisation
for Astronomical
Research in the
Southern Hemisphere

Organisation Européenne
pour des Recherches
Astronomiques
dans l'Hémisphère Austral

Europäische Organisation
für astronomische
Forschung in der
südlichen Hemisphäre

AGREEMENT

CONCERNING THE HOSTING AND OPERATIONS OF THE PLATOSpec TELESCOPE AT THE LA SILLA PARANAL OBSERVATORY IN CHILE

between the

1. **European Organisation for Astronomical Research in the Southern Hemisphere**

Karl-Schwarzschild-Strasse 2
D-85748 Garching bei München, GERMANY
Hereinafter referred to as "ESO",

on the one hand,

and the

PLATOSpec Consortium, hereinafter referred to as "PLATOSpec", represented by

The PLATOSpec Consortium will make all PLATOSpec **reduced data products** (calibrated images and calibrated light curves), as well as the **raw data** available to the ESO archive, for data products following the regular Phase 3 process as described at <http://www.eso.org/sci/observing/phase3.html>.

All reduced **(phase 3) data (1D spectra and RV curves)** will be made available to the ESO community through the ESO Archive in annual data releases, starting with first release 6 months after start of regular scientific operations.

From the time of delivery to the archive, a **proprietary period of one year** is granted to the PLATOSpec Consortium during which the PLATOSpec Consortium has exclusive use of its data generated in the preceding observing season. After this time, the data will be released through the ESO archive to the astronomical community free of any restrictions.

RAW Data

ESO Requirements

- Data directly from La Silla using Scientific Data Transfer
- FITS headers
 - PlatoSpec FITS Headers WG – Daniel Sebastian (TLS)



European Organisation for Astronomical Research in the Southern Hemisphere

Programme: Directorate of Operations (DOO)

Project/WP: Observation Metadata Mangement

Data Interface Control Document

Document Number: ESO-044156

Document Version: 8

Document Type: Specification (SPE)

Released On: 2025-03-05

Document Classification: Public

Contents	
1. Introduction	7
1.1 Purpose and scope	7
1.2 Applicable Documents	7
1.3 Reference Documents	8
1.4 Glossary	9
1.5 Abbreviations and acronyms	11
1.6 Conventions used in this document	12
1.7 Acknowledgements	13
1.8 Release notes	14
2. Overview	15
3. Data structures	16
3.1 Raw observation and processed frames	16
3.1.1 FITS files	16
3.1.1.1 Storage Format	16
3.1.1.2 Ordering of HDUs	17
3.1.1.3 Headers	17
3.1.1.4 File names	18
3.1.2 Text dumps of FITS headers	18
3.2 [VLT] Log files	18
3.3 [VLT] VLT parameter files	19
3.4 Compound file types	19
3.4.1 TAR ("Tape Archive") files	19
4. Keyword Description	20
4.1 Primary FITS keywords	20
4.2 Coordinate system keywords	26
4.2.1 Pixel coordinates	26
4.2.2 Celestial coordinates in imaging data	28
4.2.3 Spectral coordinates	29
4.2.4 Coordinate transformation uncertainties	30
4.2.5 Example of use of alternate coordinate systems	30
4.3 Keywords in tile-compressed files	32
4.4 Hierarchical keywords	32
4.4.1 The domain name structure	32
4.4.1.1 Categories	33
4.4.1.2 Subsystems	34
4.4.1.3 Parameters	35
4.4.2 Hierarchical keyword categories	37
4.4.2.1 Category Data Product (DPR)	37

ESPRESSO RAW Data Query

ESO Science Archive - ESPRESSO Data Products — Mozilla Firefox

File Edit View History Bookmarks Tools Help

archive.eso.org/wdb/wdb/eso/espesso/form

Echelle SPectrograph for Rocky Exoplanets and Stable Spectroscopic Observations

ESPRESSO Raw Data Query Form

How to use? Other Instruments Archive FAQ Archive Facility HOME ESO HOME

Description

This form provides access to observations (raw data) performed with ESPRESSO since September 2018 that are stored on-line in the Science Archive Facility in Garching. Find more information about ESPRESSO data on the [Quality Control web pages](#). Paranal ambient conditions can be queried separately from [here](#).

Search [] Reset [] Output preferences: html table [] Return max 1000 rows. All Fields [] Syntax Help []

Target Information

Target name: eps Ind SIMBAD name []
Coordinate System: Equatorial (FK5) RA: [] DEC: [] RA: sexagesimal/hours, decimal/degrees
Search Box: 00 10 00 Equatorial Output Format: Sexagesimal []
 Input Target List: Browse... No file selected.

Observation and proposal parameters

DATE OBS: [] (YYYY MM(M) DD of night begin [12:00 UT], DD MM(M) YYYY also acceptable)
OR give a query range using the following two fields (start/end dates)
Start: [] 12 hrs [UT] [] End: [] 12 hrs [UT] []
 Program ID: [] TP.C-NNNN (e.g. 080.A-0123*) or PPP.AAAA (as of ESO period 105 e.g. 105.20G)**
 Program Type: Any [] SV Mode: All modes []
 PI/CoI: [] as PI only []
 Proposal Title: []

Generic File Information

DP.ID: [] archive filename of FITS file (e.g. ESPRE.2018-01-28T01:41:40.428)
 EXPTIME: [] Exposure time (seconds)
 DPR.CATG: Any [] Data category (e.g. SCIENCE)
 DPR.TYPE: Any [] Observation type User defined input: [] (e.g. OBJECT or P2VM)
 DPR.TECH: Any [] Observation technique
 OB_CONTAINER_ID: [] Scheduling container ID OB_CONTAINER_TYPE: Any [] Scheduling container type
 OB_CONTAINER_PARENT_ID: [] Scheduling parent container ID OB_CONTAINER_PARENT_TYPE: Any [] Scheduling container parent type
 OB.ID: [] identification number of OB within ESO system
 OBS.TARG.NAME: [] Target name specified in Observation Block (OB)
 OBS.START: [] Observation Block (OB) start of execution
 TPL.NAME: [] ESPRESSO template name
 TPL.START: [] starting time of template (UT)
 TPL.EXPNO: [] Number of the particular exposure within the template
 TPL.NEXP: [] total number of exposures within the template

Instrument Specific Information

TNS.MODE: Any [] Instrument mode
 DET.BINX: Any [] Setup binning factor along X
 DET.BINY: Any [] Setup binning factor along Y
 DET.READ.CURNAME: Any [] readout mode name
 TELESCOPE: Any [] Telescope Information OCS_ENABLED_FE: Unit Telescope(s)

ESPRESSO RAW Data Results

ESO Science Archive - ESPRESSO Data Products — Mozilla Firefox

File Edit View History Bookmarks Tools Help

archive.eso.org/wdb/wdb/eso/esspresso/query



Echelle S
P
R
O

Echelle S
P
R
O

SCIENCE ARCHIVE FACILITY

ESPRESSO Raw Data
Query Results

[How to use?](#)
[Other Instruments](#)
[Archive FAQ](#)
[Archive Facility HOME](#)
[ESO HOME](#)

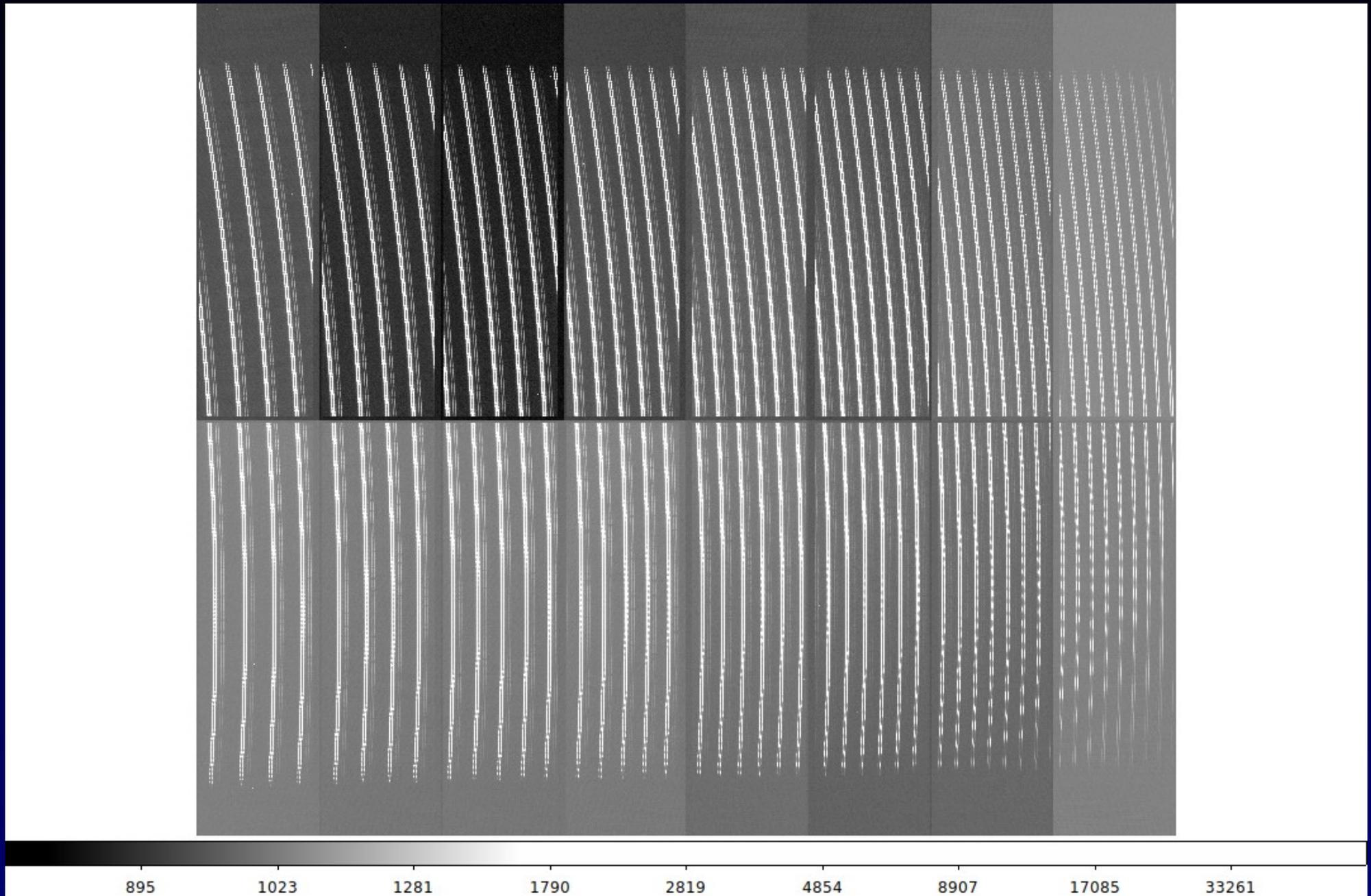
To request data please mark the checkbox in the left-most column (or click anywhere in the row), then press the **Request marked datasets** button.
 Datasets for which the proprietary period is over are highlighted in **green** and are publicly available.
 Datasets that are still under the proprietary period are highlighted in **red** and can only be downloaded by the corresponding PI.
 Datasets that are not yet available in the Archive are marked with a "N/A".
 Follow the link on the ob_id field to see all the datasets of that Observing Block (OB), logically sorted.
 Follow the link on the ob_container_id field to see all the datasets of all related OBs, logically sorted.
 Follow the link on the ob_container_parent id field to see all the datasets of all related containers, logically sorted.
 Any comments or suggestions for improvement of this form can be sent to the [ESO Operations Helpdesk](#).

Define new query

SIMBAD coordinates for eps Ind : 22 03 21.6, -56 47 09.5.

Mark	More	HDR	Release Date	Object	Target Ra, Dec	Target l, b	Program ID	DP.ID	EXPTIME	DPR.CATG	DPR.TYPE	DPR.TECH	OB CONTAINER ID	OB CONTAINER PARENT ID	OB ID	OBS TARG NAME
<input checked="" type="checkbox"/>		Header	2021-11-25	eps Ind	22:03:30.73 -56:47:57.0	336.161118 -48.057369	1102.C-0744(B)	ESPRE.2018-10-29T00:05:47.355	150.000	SCIENCE	OBJECT,FP	EHELLE	2205897		2206493	eps Ind
<input checked="" type="checkbox"/>		Header	2021-11-25	eps Ind	22:03:30.52 -56:47:58.2	336.160994 -48.056805	1102.C-0744(B)	ESPRE.2018-10-29T00:09:04.116	150.000	SCIENCE	OBJECT,FP	EHELLE	2205897		2206493	eps Ind
<input checked="" type="checkbox"/>		Header	2021-11-25	eps Ind	22:03:30.35 -56:47:59.7	336.160713 -48.056272	1102.C-0744(B)	ESPRE.2018-10-29T00:12:23.719	150.000	SCIENCE	OBJECT,FP	EHELLE	2205897		2206493	eps Ind
<input checked="" type="checkbox"/>		Header	2021-11-25	eps Ind	22:03:30.35 -56:47:59.7	336.160713 -48.056272	1102.C-0744(B)	ESPRE.2018-10-29T00:15:43.313	150.000	SCIENCE	OBJECT,FP	EHELLE	2205897		2206493	eps Ind
<input checked="" type="checkbox"/>		Header	2021-11-25	eps Ind	22:03:30.35 -56:47:59.7	336.160713 -48.056272	1102.C-0744(B)	ESPRE.2018-10-29T00:19:02.939	150.000	SCIENCE	OBJECT,FP	EHELLE	2205897		2206493	eps Ind
<input checked="" type="checkbox"/>		Header	2021-11-25	eps Ind	22:03:30.35 -56:47:59.7	336.160713 -48.056272	1102.C-0744(B)	ESPRE.2018-10-29T00:22:18.907	150.000	SCIENCE	OBJECT,FP	EHELLE	2205897		2206493	eps Ind
<input checked="" type="checkbox"/>		Header	2021-11-25	eps Ind	22:03:30.80 -56:47:55.8	336.161451 -48.057680	1102.C-0744(B)	ESPRE.2018-10-29T23:55:43.700	100.000	SCIENCE	OBJECT,FP	EHELLE	2205897		2206493	eps Ind
<input checked="" type="checkbox"/>		Header	2021-11-25	eps Ind	22:03:30.80 -56:47:55.8	336.161451 -48.057680	1102.C-0744(B)	ESPRE.2018-10-29T23:58:10.747	100.000	SCIENCE	OBJECT,FP	EHELLE	2205897		2206493	eps Ind
<input checked="" type="checkbox"/>		Header	2021-11-25	eps Ind	22:03:30.80 -56:47:55.8	336.161451 -48.057680	1102.C-0744(B)	ESPRE.2018-10-30T00:00:37.377	100.000	SCIENCE	OBJECT,FP	EHELLE	2205897		2206493	eps Ind
<input checked="" type="checkbox"/>		Header	2021-11-25	eps Ind	22:03:30.80 -56:47:55.8	336.161451 -48.057680	1102.C-0744(B)	ESPRE.2018-10-30T00:03:01.877	100.000	SCIENCE	OBJECT,FP	EHELLE	2205897		2206493	eps Ind
<input checked="" type="checkbox"/>		Header	2021-11-25	eps Ind	22:03:30.80 -56:47:55.8	336.161451 -48.057680	1102.C-0744(B)	ESPRE.2018-10-30T00:05:31.574	100.000	SCIENCE	OBJECT,FP	EHELLE	2205897		2206493	eps Ind
<input checked="" type="checkbox"/>		Header	2021-11-25	eps Ind	22:03:30.80 -56:47:55.8	336.161451 -48.057680	1102.C-0744(B)	ESPRE.2018-10-30T00:08:01.111	100.000	SCIENCE	OBJECT,FP	EHELLE	2205897		2206493	eps Ind

ESPRESSO RAW Spectrum (in ds9)



Reduced Spectra – ESO Phase 3

ESO Requirements

- Transfer Iftp, FileZilla - submission by account
- Data format – 1D merged + ancilliary S2D



European Organisation for Astronomical Research in the Southern Hemisphere

Programme: Directorate of Operations (DOO)

Project/WP: Archive Science Group

ESO Science Data Products Standard

Document Number: ESO-044286

Document Version: 8

Document Type: Specification (SPE)

Released On: 2022-03-15

Document Classification: Public

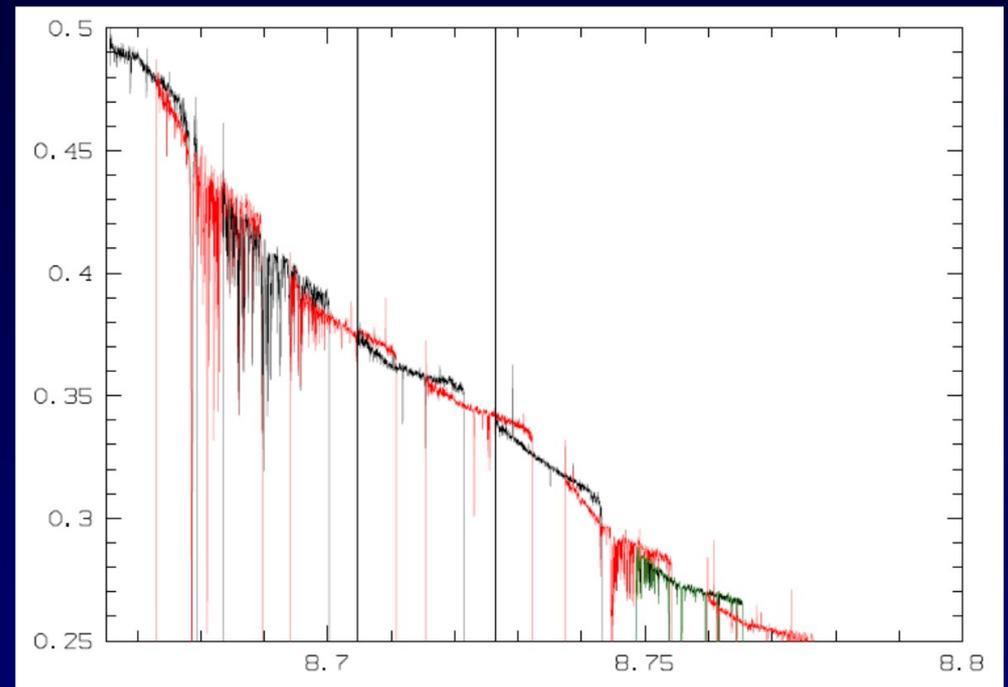
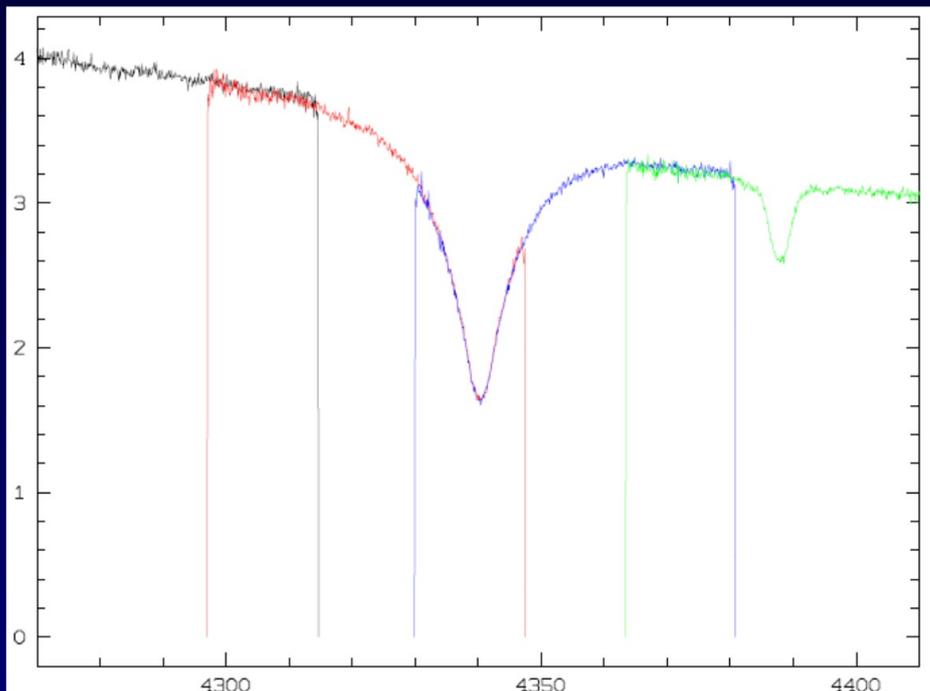
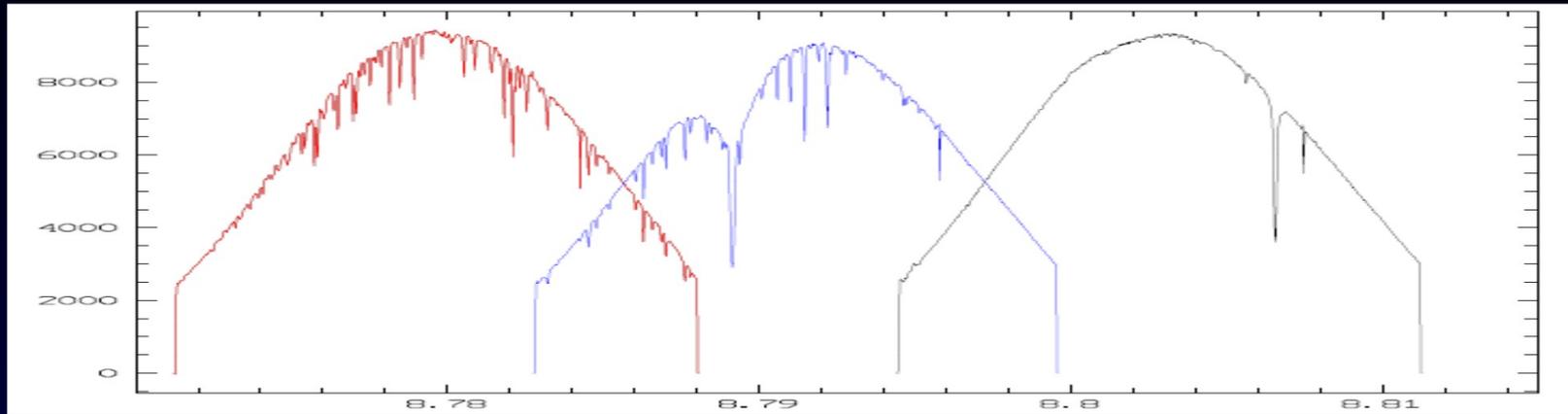
<https://www.eso.org/sci/observing/phase3/p3sdpstd.pdf>

8.2 Data format

The spectrum **binary table format is VO-compliant** in the sense that it complies to the basic requirements of the VO format [RD3], both in terms of structure and header keyword names and values.

The 1D spectrum is serialised in a binary table as a single record, with as many cells as needed (e.g. one for the wavelength, one for the flux, etc.), each cell containing one array of data points, and with arrays across all cells of equal size. Despite being supported by FITS, the usage of variable length arrays is not allowed in Phase 3, as such format is not well supported by the existing spectral tools. Only standard BINTABLE extensions are allowed; this implies PCOUNT=0 and GCOUNT=1.

Problems with 1D Order Merging



IVOA Spectral Data Model



International
Virtual
Observatory
Alliance

IVOA Spectral Data Model

Version 1.03

IVOA Recommendation 2007-10-29

This version (Recommendation Rev 1)

<http://www.ivoa.net/Documents/REC/DM/SpectrumDM-20071029.pdf>

Latest version:

<http://www.ivoa.net/Documents/latest/SpectrumDM.html>

Previous versions:

<http://www.ivoa.net/Documents/PR/DM/SpectrumDM-20070913.html>

Editors:

Jonathan McDowell, Doug Tody

Contributors:

Jonathan McDowell, Doug Tody, Tamas Budavari, Markus Dolensky, Inga Kamp, Kelly McCusker, Pavlos Protopapas, Arnold Rots, Randy Thompson, Frank Valdes, Petr Skoda, and the IVOA Data Access Layer and Data Model Working Groups.

Simple Spectral Access Protocol V1.04



International
Virtual
Observatory
Alliance

Simple Spectral Access Protocol

Version 1.04

IVOA Recommendation Feb 01, 2008

This version:

<http://www.ivoa.net/Documents/REC/DAL/SSA-20080201.html>

Latest version:

<http://www.ivoa.net/Documents/latest/SSA.html>

Previous version(s):

Version 1.03, December 2007
Version 1.02, September 2007
Version 1.01, June 2007
Version 1.00, May 2007
Version 0.97, November 2006
Version 0.96, September 2006
Version 0.95, May 2006
Version 0.91, October 2005
Version 0.90, May 2005

Editors:

D.Tody, M. Dolensky

Authors:

D.Tody, M. Dolensky, J. McDowell, F. Bonnarel, T. Budavari, I. Busko, A. Micol, P. Osuna, J. Salgado, P. Skoda, R. Thompson, F. Valdes, and the data access layer working group.

VO Binary Table FITS

Another common case is the case of a data submitter decides to publish as main flux, the spectrum normalised to the continuum, but wants also to store the flux not normalised. In this case, the primary header must contain the header keyword:

```
CONTNORM = T
```

and the header in the first extension looks like this:

```
VOCLASS = 'SPECTRUM v2.0' / VO Data Model
TTYPE1 = 'WAVE ' / Label for field 1
TTYPE2 = 'FLUX_NORM' / Label for field 2
TTYPE3 = 'ERR_NORM' / Label for field 3
TTYPE4 = 'FLUX ' / Label for field 4
TTYPE5 = 'ERR ' / Label for field 5
TUTYP1 = 'spec:Data.SpectralAxis.Value'
TUTYP2 = 'spec:Data.FluxAxis.Value'
TUTYP3 = 'spec:Data.FluxAxis.Accuracy.StatError'
TUTYP4 = 'eso:Data.FluxAxis.Value'
TUTYP5 = 'eso:Data.FluxAxis.Accuracy.StatError'
TUCD1 = 'em.wl;obs.atmos' / em.wl: vacuum, em.wl;obs.atmos: air
TUCD2 = 'phot.flux.density;em.wl;arith.ratio;meta.main'
TUCD3 = 'stat.error;phot.flux.density;em.q1;arith.ratio;meta.main'
TUCD4 = 'phot.flux.density;em.wl'
TUCD5 = 'stat.error;phot.flux.density;em.q1'
```

ESO P3 Science Archive – Query Form

ESO Science Archive - Data Products — Mozilla Firefox

File Edit View History Bookmarks Tools Help

archive.eso.org/wdb/wdb/adp/phase3_spectral/form

ES O PHASE3 ARCHIVE INTERFACES

GENERIC SPECTRAL IMAGING VISTA

HELP DATA TYPES FAQ DATA RELEASES DATA STREAMS

Spectral Data Products Query Form

This form provides access to **reduced spectra** and **data cubes** that were contributed by PIs of ESO programmes or produced by ESO (using ESO calibration pipelines with the best available calibration data). These data were then integrated into the ESO [Science Archive Facility](#) through the [Phase 3 process](#). Each available data set is fully described; please see the [list of contributed data releases](#) and [pipeline-processed data streams](#) including their corresponding descriptions. To search for other ESO phase 3 data products, please use the [generic data](#) [Read more...](#)

Search Reset Output preferences: html table Return max 200 rows. All Fields Syntax Help

Target/Position Information

Target name: eps ind SIMBAD name: Query by Target List: Browse... No file selected.

Input Coord. Sys.: Equatorial (FK5)

Position RA: 00 02 00 DEC: RA: sexagesimal hours, decimal degrees

Search Box: 00 02 00 Output Display: RA DEC Gal long Gal lat

Spectra & Cubes Characteristics

Wavelength coverage: Any [nm] Examples: 656, 393 AND 656, 393..656.
 R ($\lambda/\Delta\lambda$): e.g. > 10000 or < 3000 or 3000..10000
 Flux Calibration: Any
 Product category: Any cube spectrum

Parameters specific to 1d spectra		Parameters specific to data cubes	
<input checked="" type="checkbox"/> SNR (spectra)		<input checked="" type="checkbox"/> ABMAGLIM (cubes)	
<input checked="" type="checkbox"/> Aperture	[arcsec]	<input checked="" type="checkbox"/> Spatial Resolution	[arcsec]
<input checked="" type="checkbox"/> Spectral bin	[nm]	<input checked="" type="checkbox"/> Strehl Ratio	a constraint on a number between 0 and 1
<input checked="" type="checkbox"/> Dispersive element			
<input checked="" type="checkbox"/> Extended object	Any		
<input checked="" type="checkbox"/> Normalised	Any		
<input checked="" type="checkbox"/> Total flux	Any		

Observation/Temporal Parameters

Telescope: Any, APEX-12m, ESO-3.6, ESO-NTT, ESO-VLT-U1

Instrument: SOFI, UVES, VIMOS, XSHOOTER, NO INSTR

OBSTECH: MOS, MOS,NODDING, MXU, NODDING, SPECTRUM

Date Obs: UT time (Place the mouse here to see examples)

MJD Obs: Modified Julian Date

Exptime: Total integration time per pixel [s]

Multi OB: Any

Collections and Observing Programmes

Collection: Select options

Collection Title

Run/Program ID: eg 179.B-2003(B) PI Name Certified by: Any

Collection's DOI

ESO P3 Science Archive - Results

Dynamic filter: (# 2103/2103) MarkFiltered UnmarkFiltered Filter only marked records

Request marked datasets Reset MarkAll MarkPublic MarkProprietary New query Programmatic

Data products for object eps Ind within collection ESPRESSO

(catalogs excluded)

Mark	More	HDR	provenance	Object	RA	DEC	Filter	ABMAGLIM	Wavelength	SNR	R (λ/δλ)	Product category	Instrument	Date Obs	Exptime	Collection	Release	Product version	Release Description
		Header	Display provenance	eps Ind	330.877179	-56.799500			377.200..789.997	731.5	140000	SCIENCE.SPECTRUM	ESPRESSO	2018-10-29T00:09:04.116	750.00	ESPRESSO		1	[doc_id:1.76]
		Header	Display provenance	eps Ind	330.878349	-56.798830			377.200..789.997	996.3	140000	SCIENCE.SPECTRUM	ESPRESSO	2018-10-29T23:55:43.700	700.00	ESPRESSO		1	[doc_id:1.76]
		Header	Display provenance	eps Ind	330.877994	-56.798930			377.200..789.997	721.9	140000	SCIENCE.SPECTRUM	ESPRESSO	2018-10-30T23:43:01.380	700.00	ESPRESSO		1	[doc_id:1.76]
		Header	Display provenance	eps Ind	330.877966	-56.799010			377.200..789.997	494.6	140000	SCIENCE.SPECTRUM	ESPRESSO	2018-10-31T00:24:29.176	100.00	ESPRESSO		1	[doc_id:1.76]
		Header	Display provenance	eps Ind	330.879309	-56.799270			377.200..789.997	793.0	140000	SCIENCE.SPECTRUM	ESPRESSO	2019-04-26T08:05:26.963	700.00	ESPRESSO		1	[doc_id:1.76]
		Header	Display provenance	eps Ind	330.878916	-56.799390			377.200..789.997	1199.9	140000	SCIENCE.SPECTRUM	ESPRESSO	2019-04-30T09:24:32.290	700.00	ESPRESSO		1	[doc_id:1.76]
		Header	Display provenance	eps Ind	330.879858	-56.799240			377.200..789.997	1189.5	140000	SCIENCE.SPECTRUM	ESPRESSO	2019-05-21T10:15:50.436	700.00	ESPRESSO		1	[doc_id:1.76]
		Header	Display provenance	eps Ind	330.879252	-56.799640			377.200..789.997	943.9	140000	SCIENCE.SPECTRUM	ESPRESSO	2019-05-22T09:48:42.196	420.00	ESPRESSO		1	[doc_id:1.76]
		Header	Display provenance	eps Ind	330.879954	-56.799580			377.200..789.997	1340.3	140000	SCIENCE.SPECTRUM	ESPRESSO	2019-09-15T02:08:38.336	560.00	ESPRESSO		1	[doc_id:1.76]
		Header	Display provenance	eps Ind	330.880451	-56.799460			377.200..789.997	1181.7	140000	SCIENCE.SPECTRUM	ESPRESSO	2019-09-26T02:36:47.446	1400.00	ESPRESSO		1	[doc_id:1.76]
		Header	Display provenance	eps Ind	330.880469	-56.799660			377.200..789.997	1135.5	140000	SCIENCE.SPECTRUM	ESPRESSO	2019-10-20T02:17:30.640	700.00	ESPRESSO		1	[doc_id:1.76]
		Header	Display provenance	eps Ind	330.882410	-56.802010			377.200..789.997	1069.5	140000	SCIENCE.SPECTRUM	ESPRESSO	2021-04-30T08:43:44.576	700.00	ESPRESSO		1	[doc_id:1.76]
		Header	Display provenance	eps Ind	330.884999	-56.802600			377.200..789.997	656.0	140000	SCIENCE.SPECTRUM	ESPRESSO	2021-08-01T02:03:47.486	700.00	ESPRESSO		1	[doc_id:1.76]

ESO P3 Science Archive – Spectrum

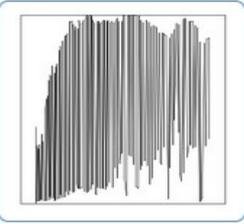
ESO Science Archive - Data Products — Mozilla Firefox

File Edit View History Bookmarks Tools Help

archive.eso.org/wdb/wdb/adp/phase3_main/query/...:ADP.2021-04-13T13:28:15.797?product_status=all 80%

provenance status: up-to-date

eps Ind (ADP.2021-04-13T13:28:15.797)

Preview	
HDR	Display FITS Header
provenance	Display provenance chain
Object	eps Ind
RA	330.877179
DEC	-56.799500
Gal long	336.160994
Gal lat	-48.056804
Filter	
ABMAGLIM	
Wavelength	377.200..789.997
SNR	731.5
R (Å/Å)	140000
Product category	SCIENCE.SPECTRUM
Telescope	ESO-VLT-U3
Instrument	ESPRESSO
OBSTECH	EHELLE
Date Obs	2018-10-29T00:09:04.116
Stop Time	2018-10-29T00:24:48.906
MJD Obs	58420.00630
MJD End	58420.01723
Exptime	750.00

Eps Ind 1D Spectrum - Zoom

ESO Dataset — Mozilla Firefox

File Edit View History Bookmarks Tools Help

archive.eso.org/dataset/ADP.2021-04-13T13:28:15.797 80%

Dataset:
ADP.2021-04-13T13:28:15.797

- FITS Header
- File Download
- Dataset Download
- Printable Preview
- Data Documentation

Position

Object	eps Ind
RA (J2000)	22:03:30.52
Dec (J2000)	-56:47:58.2
Galactic longitude	336.16099
Galactic latitude	-48.0568

Data

Data Type	SPECTRUM (FLUX CALIBRATED)
Signal-to-Noise Ratio	731.5
Data Level	2

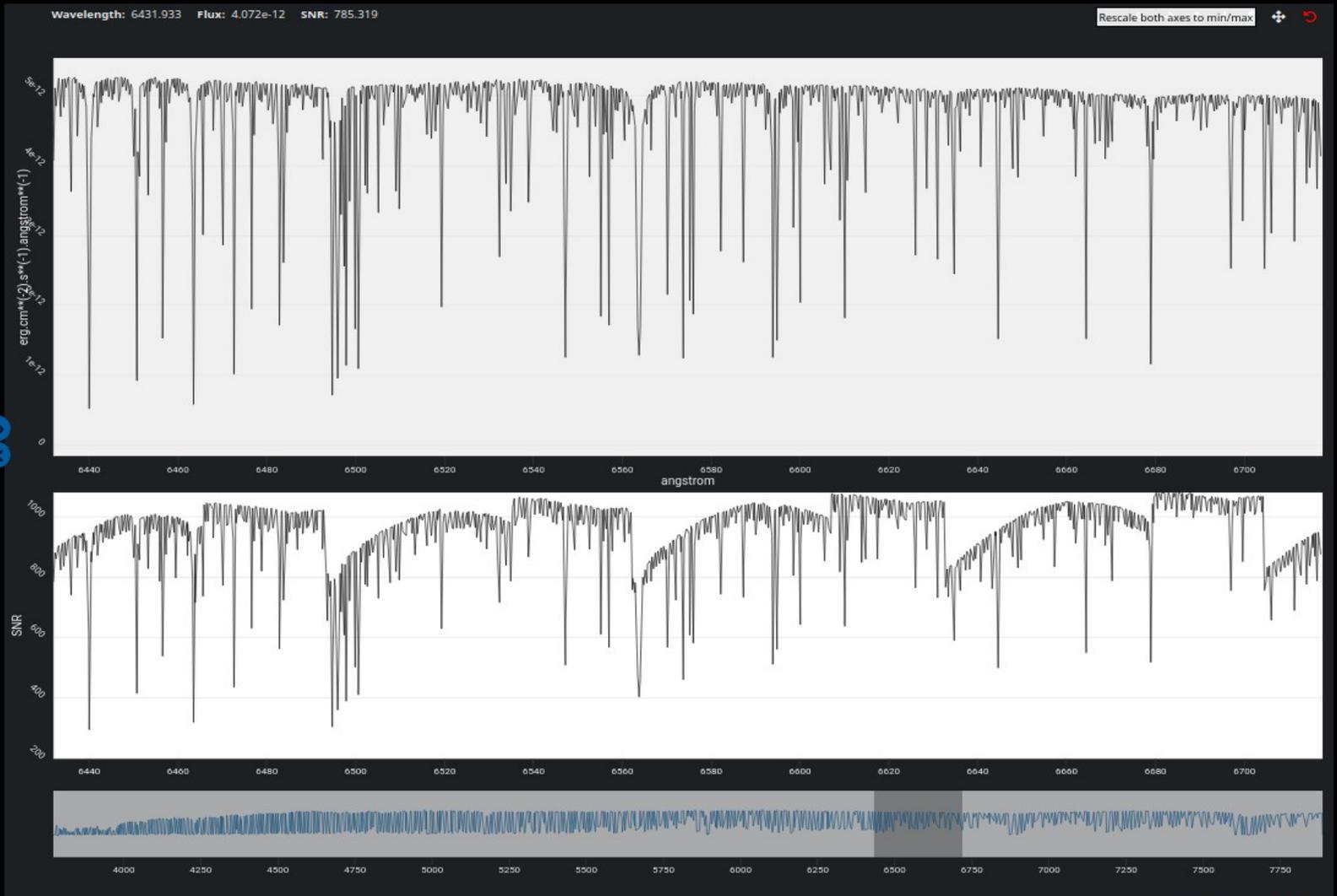
Energy

Spectral Range	377.2-790 nm
Spectral Resolution (R)	140000

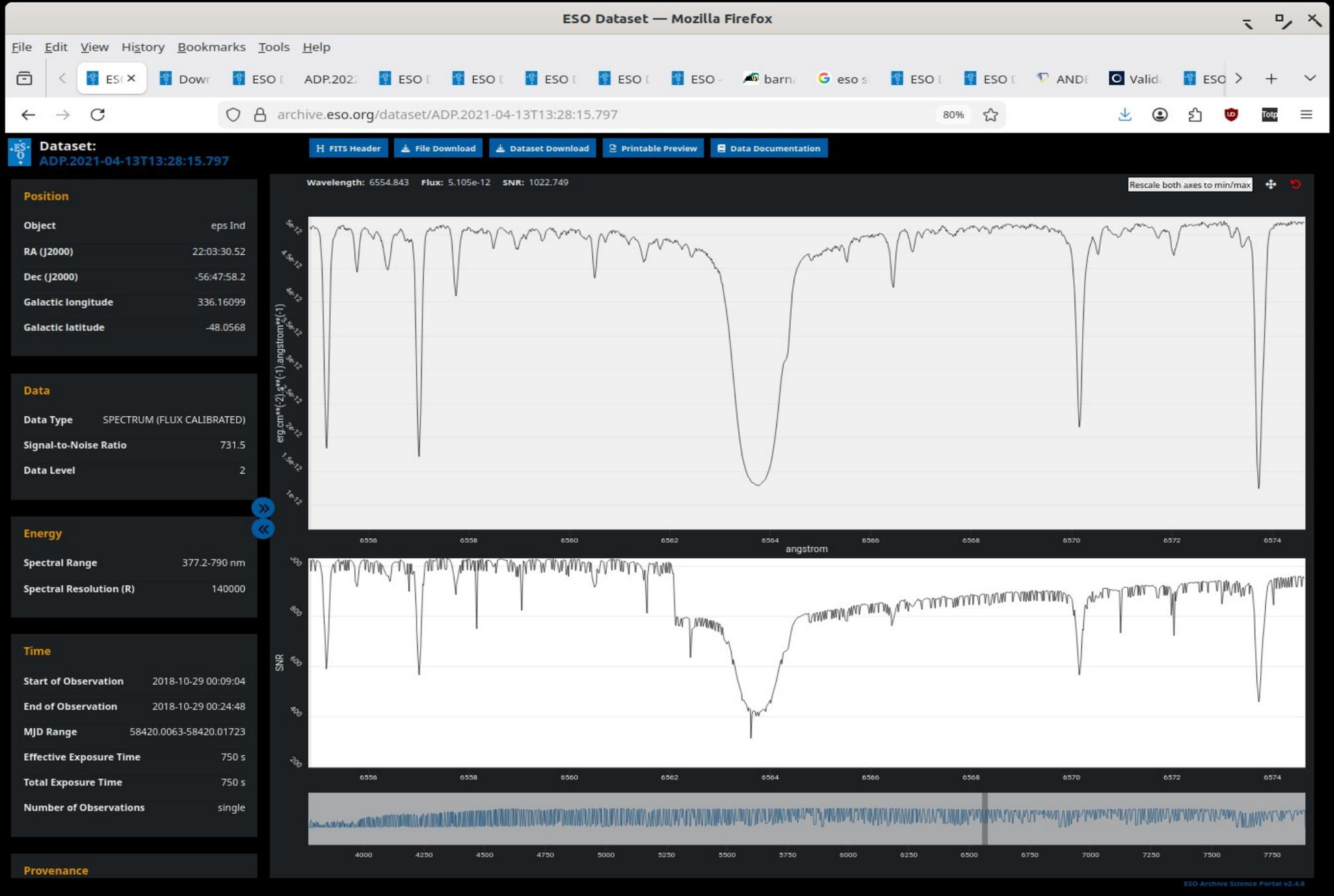
Time

Start of Observation	2018-10-29 00:09:04
End of Observation	2018-10-29 00:24:48
MJD Range	58420.0063-58420.01723
Effective Exposure Time	750 s
Total Exposure Time	750 s
Number of Observations	single

Provenance



Eps Ind – 1D Spectrum - Halpha

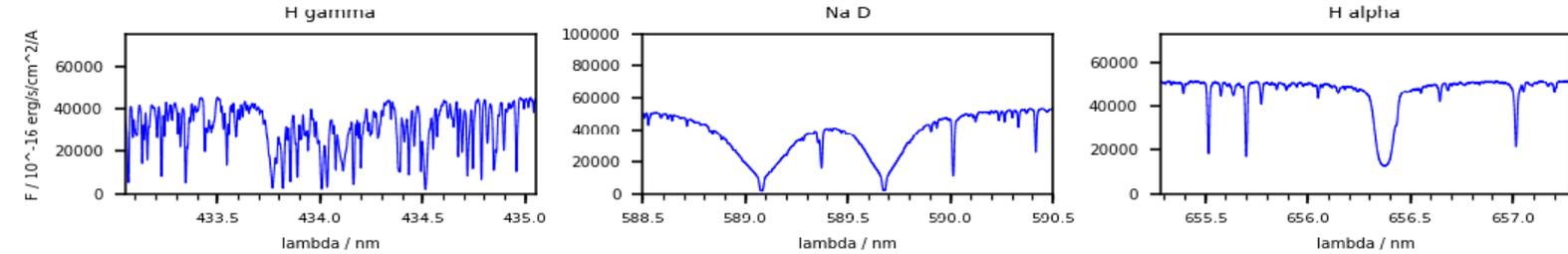
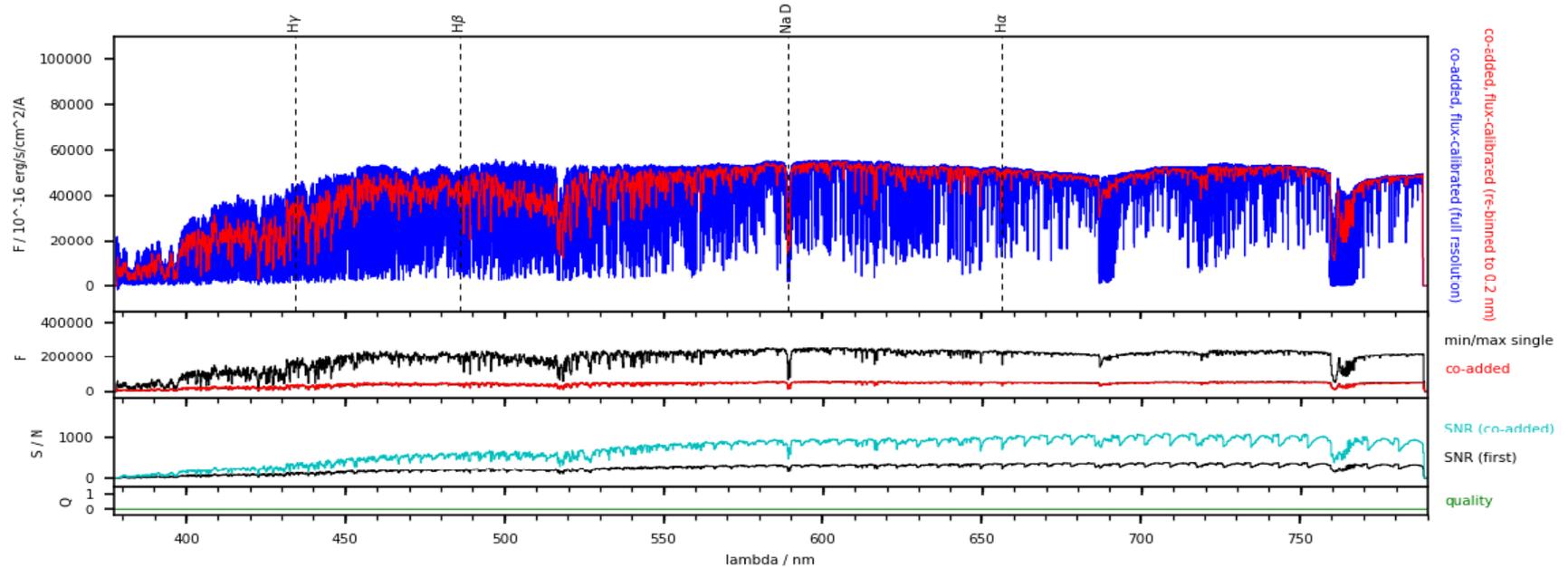


1D Spectrum – Preview (png)



ESPRESSO data product preview r.ESPRE.2018-10-29T00:05:47.355_com_0000.fits Date: 2018-10-28

Product: S1D_STACK_A	RUN_ID: 1102.C-0744(B)	INS MODE: SINGLEHR
ORS_ID: 2206493	Target: eps Ind	Binning: 1x1
TPL_ID: ESPRESSO_singleHR_obs	Spec type: K5	Telescope: UT3
MJD_OBS: 58420.00629764		Fibre B: FP



Texptime [s]: 750.0	avg S/N stack: 665	seeing (first): 0.45	avg CCF RV [km/s]: -39.913954	score bits: 0000100
N exposures (sqrt N): 5 (2.24)	avg S/N all single: 309	Npix sat (first): 2	avg CCF RV err [km/s]: 0.000142	
avg contribution: 4.94	avg S/N improvement: 2.15	delta t wave A [d]: 0.41	CCF mask: K6	

created by espre_stack.py v1.0 on 2021-02-16T09:01:49

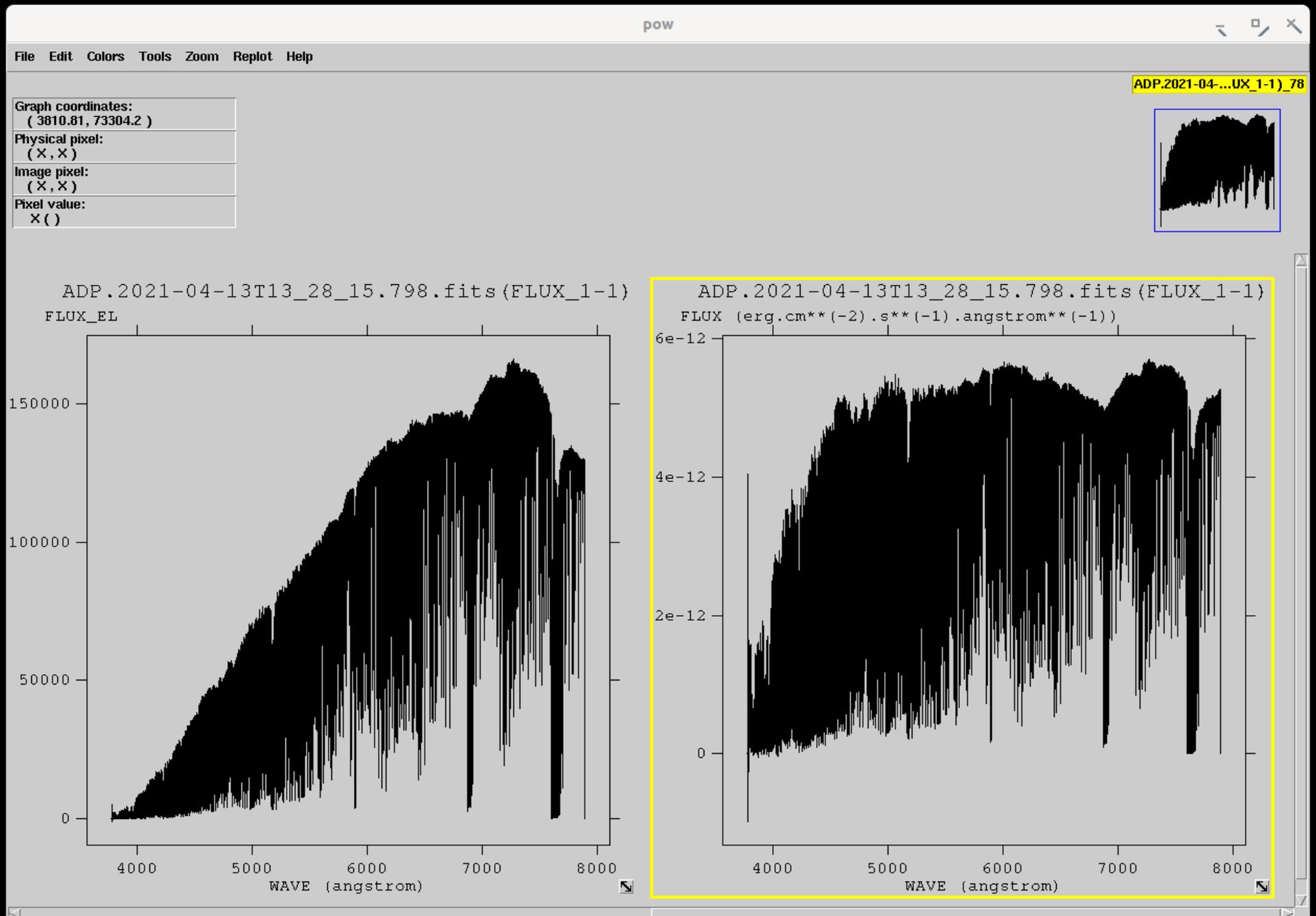
What Is in the P3 FITS Files ?

1D Spectrum – 3.7 (1.9) Million Points

```
fv: Header of ADP.2021-04-13T13_28_15.806.fits[1] in /home/skoda/ESO-...
File Edit Tools Help
Search for: Find Case sensitive? No
XTENSION= 'BINTABLE' / binary table extension
BITPIX = 8 / 8-bit bytes
NAXIS = 2 / 2-dimensional binary table
NAXIS1 = 19503528 / width of table in bytes
NAXIS2 = 1 / number of rows in table
PCOUNT = 0 / size of special data area
GCOUNT = 1 / one data group (required keyword)
TFIELDS = 6 / number of fields in each row
TTYPE1 = 'WAVE' / label for field 1
TFORM1 = '443262D' / data format of field: 8-byte DOUBLE
TUNIT1 = 'angstrom' / physical unit of field
TTYPE2 = 'FLUX_EL' / label for field 2
TFORM2 = '443262D' / data format of field: 8-byte DOUBLE
TUNIT2 = 'angstrom' / physical unit of field
TTYPE3 = 'ERR_EL' / label for field 3
TFORM3 = '443262D' / data format of field: 8-byte DOUBLE
TUNIT3 = 'angstrom' / physical unit of field
TTYPE4 = 'QUAL_EL' / label for field 4
TFORM4 = '443262J' / data format of field: 4-byte INTEGER
TUNIT4 = 'angstrom' / physical unit of field
TTYPE5 = 'SNR' / label for field 5
TFORM5 = '443262D' / data format of field: 8-byte DOUBLE
TUNIT5 = 'angstrom' / physical unit of field
TTYPE6 = 'WAVE_AIR' / label for field 6
TFORM6 = '443262D' / data format of field: 8-byte DOUBLE
TUNIT6 = 'angstrom' / physical unit of field
VOCCLASS = 'SPECTRUM V2.0' / VO Data Model
VOPUB = 'ESO/SAF' / VO Publishing Authority
OBJECT = 'eps Ind' / Target designation
RA = 330.876468 / [deg] Spectroscopic target position (J2000)
DEC = -56.79991 / [deg] Spectroscopic target position (J2000)
TELAPSE = 150. / [s] Total elapsed time
TMID = 58420.0140965156 / [d] MJD mid exposure
TDMIN1 = 3772.00274400483 / Start in spectral coordinate
TDMAX1 = 7899.97909940637 / Stop in spectral coordinate
SPEC_VAL = 583.59909217056 / [nm] Mean wavelength
SPEC_BW = 412.797635540154 / [nm] Bandpass width = Wmax - Wmin
EXTNAME = 'SPECTRUM' / Extension name
INHERIT = T / Primary header keywords are inherited
TUTYP1 = 'spec:Data.SpectralAxis.Value' / IVOA data model element for field 1
TUCD1 = 'em.wl;meta.main' / UCD for field 1
TUTYP2 = 'eso:Data.FluxAxis.Value' / IVOA data model element for field 2
TUCD2 = 'em.wl;obs.atmos / air' / UCD for field 2
TUTYP3 = 'eso:Data.FluxAxis.Accuracy.StatError' / IVOA data model element for field 3
TUCD3 = 'stat.snr' / UCD for field 3
TUTYP4 = 'eso:Data.FluxAxis.Accuracy.QualityStatus' / IVOA data model element for field 4
TUCD4 = 'meta.code.qual' / UCD for field 4
TUTYP5 = 'eso:Data.FluxAxis.Accuracy.SNR' / IVOA data model element for field 5
TUCD5 = 'stat.snr' / UCD for field 5
TUTYP6 = 'eso:Data.SpectralAxis.Value' / IVOA data model element for field 6
TUCD6 = 'em.wl;obs.atmos / air' / UCD for field 6
NELEM = 443262 / Length of the data arrays
CHECKSUM = 'e0E8e0D6e0D6e0D6' / HDU checksum updated 2021-04-13T13:27:21
DATASUM = '3784120603' / data unit checksum updated 2021-04-13T13:27:21
```

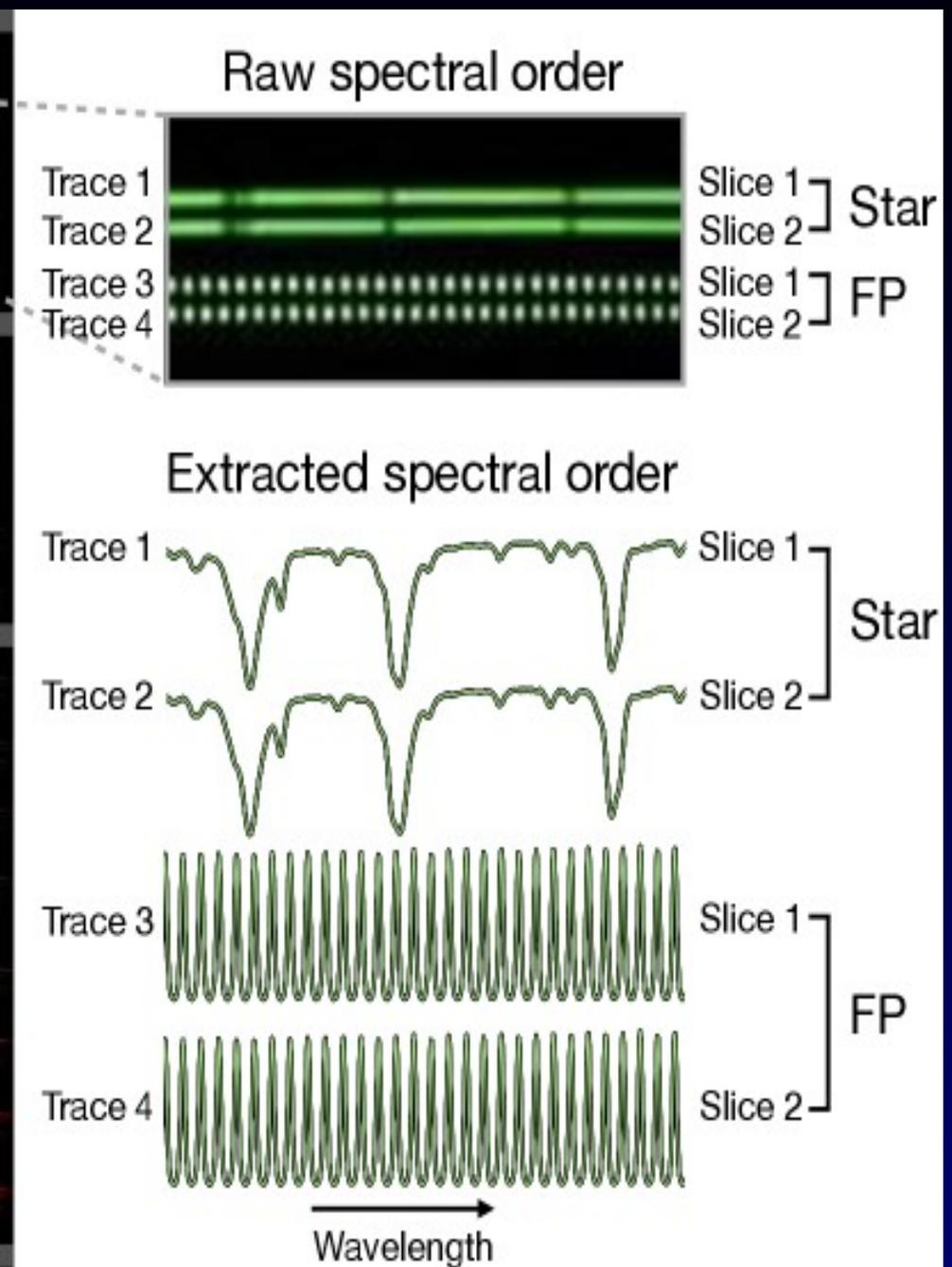
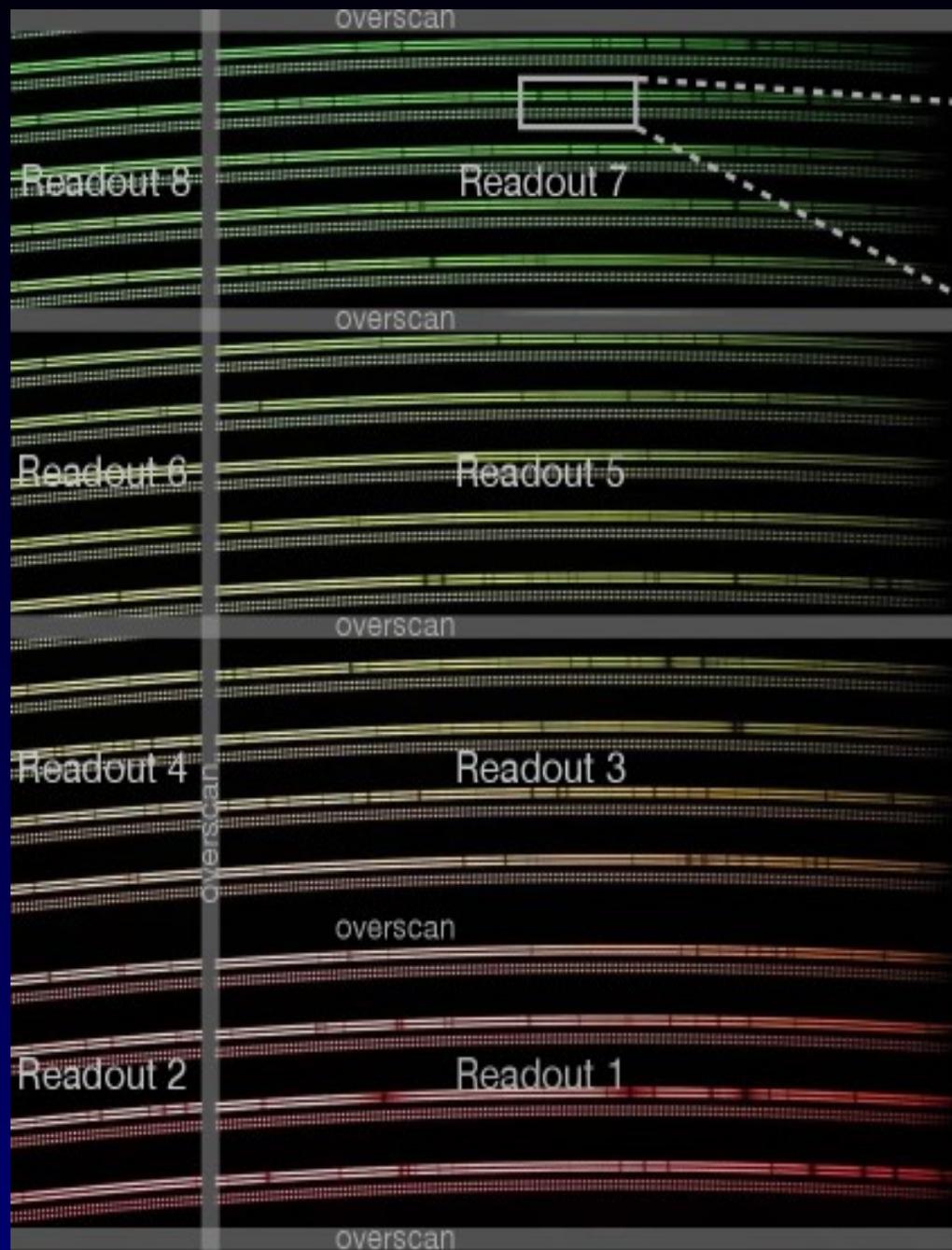
```
fv: Header of ADP.2021-04-13T13_28_15.798.fits[1] in /home/skoda/ESO-F...
File Edit Tools Help
Search for: Find Case sensitive? No
XTENSION= 'DINTADLE' / binary table extension
BITPIX = 8 / 8-bit bytes
NAXIS = 2 / 2-dimensional binary table
NAXIS1 = 37234008 / width of table in bytes
NAXIS2 = 1 / number of rows in table
PCOUNT = 0 / size of special data area
GCOUNT = 1 / one data group (required keyword)
TFIELDS = 12 / number of fields in each row
TTYPE1 = 'WAVE' / label for field 1
TFORM1 = '443262D' / data format of field: 8-byte DOUBLE
TUNIT1 = 'angstrom' / physical unit of field
TTYPE2 = 'FLUX' / label for field 2
TFORM2 = '443262D' / data format of field: 8-byte DOUBLE
TUNIT2 = 'erg.cm**(-2).s**(-1).angstrom**(-1)' / physical unit of field
TTYPE3 = 'ERR' / label for field 3
TFORM3 = '443262D' / data format of field: 8-byte DOUBLE
TUNIT3 = 'erg.cm**(-2).s**(-1).angstrom**(-1)' / physical unit of field
TTYPE4 = 'QUAL' / label for field 4
TFORM4 = '443262J' / data format of field: 4-byte INTEGER
TUNIT4 = 'angstrom' / physical unit of field
TTYPE5 = 'SNR' / label for field 5
TFORM5 = '443262D' / data format of field: 8-byte DOUBLE
TUNIT5 = 'angstrom' / physical unit of field
TTYPE6 = 'WAVE_AIR' / label for field 6
TFORM6 = '443262D' / data format of field: 8-byte DOUBLE
TUNIT6 = 'angstrom' / physical unit of field
TTYPE7 = 'FLUX_EL' / label for field 7
TFORM7 = '443262D' / data format of field: 8-byte DOUBLE
TUNIT7 = 'angstrom' / physical unit of field
TTYPE8 = 'ERR_EL' / label for field 8
TFORM8 = '443262D' / data format of field: 8-byte DOUBLE
TUNIT8 = 'angstrom' / physical unit of field
TTYPE9 = 'QUAL_EL' / label for field 9
TFORM9 = '443262J' / data format of field: 4-byte INTEGER
TUNIT9 = 'angstrom' / physical unit of field
TTYPE10 = 'FLUX_CAL' / label for field 10
TFORM10 = '443262D' / data format of field: 8-byte DOUBLE
TUNIT10 = 'erg.s**(-1).cm**(-2).angstrom**(-1)' / physical unit of field
TTYPE11 = 'ERR_CAL' / label for field 11
TFORM11 = '443262D' / data format of field: 8-byte DOUBLE
TUNIT11 = 'erg.s**(-1).cm**(-2).angstrom**(-1)' / physical unit of field
TTYPE12 = 'QUAL_CAL' / label for field 12
TFORM12 = '443262J' / data format of field: 4-byte INTEGER
TUNIT12 = 'angstrom' / physical unit of field
VOCCLASS = 'SPECTRUM V2.0' / VO Data Model
VOPUB = 'ESO/SAF' / VO Publishing Authority
OBJECT = 'eps Ind' / Target designation
RA = 330.877179 / [deg] Spectroscopic target position (J2000)
DEC = -56.7995 / [deg] Spectroscopic target position (J2000)
TELAPSE = 150. / [s] Total elapsed time
TMID = 58420.0071656956 / [d] MJD mid exposure
TDMIN1 = 3772.00274400483 / Start in spectral coordinate
TDMAX1 = 7899.97909940637 / Stop in spectral coordinate
SPEC_VAL = 583.59909217056 / [nm] Mean wavelength
SPEC_BW = 412.797635540154 / [nm] Bandpass width = Wmax - Wmin
EXTNAME = 'SPECTRUM' / Extension name
INHERIT = T / Primary header keywords are inherited
TUTYP1 = 'spec:Data.SpectralAxis.Value' / IVOA data model element for field 1
TUCD1 = 'em.wl;meta.main' / UCD for field 1
TUTYP2 = 'spec:Data.FluxAxis.Value' / IVOA data model element for field 2
TUCD2 = 'phot.flux.density;em.wl;src.net;meta.main' / UCD for field 2
TUTYP3 = 'spec:Data.FluxAxis.Accuracy.StatError' / IVOA data model element for field 3
TUCD3 = 'stat.error;phot.flux.density;meta.main' / UCD for field 3
TUTYP4 = 'spec:Data.FluxAxis.Accuracy.QualityStatus' / IVOA data model element for field 4
TUCD4 = 'meta.code.qual;meta.main' / UCD for field 4
TUTYP5 = 'eso:Data.FluxAxis.Accuracy.SNR' / IVOA data model element for field 5
TUCD5 = 'stat.snr' / UCD for field 5
TUTYP6 = 'eso:Data.SpectralAxis.Value' / IVOA data model element for field 6
TUCD6 = 'em.wl;obs.atmos / air' / UCD for field 6
TUTYP7 = 'eso:Data.FluxAxis.Value' / IVOA data model element for field 7
```

1D Spectra (Electrons + Flux Calib)

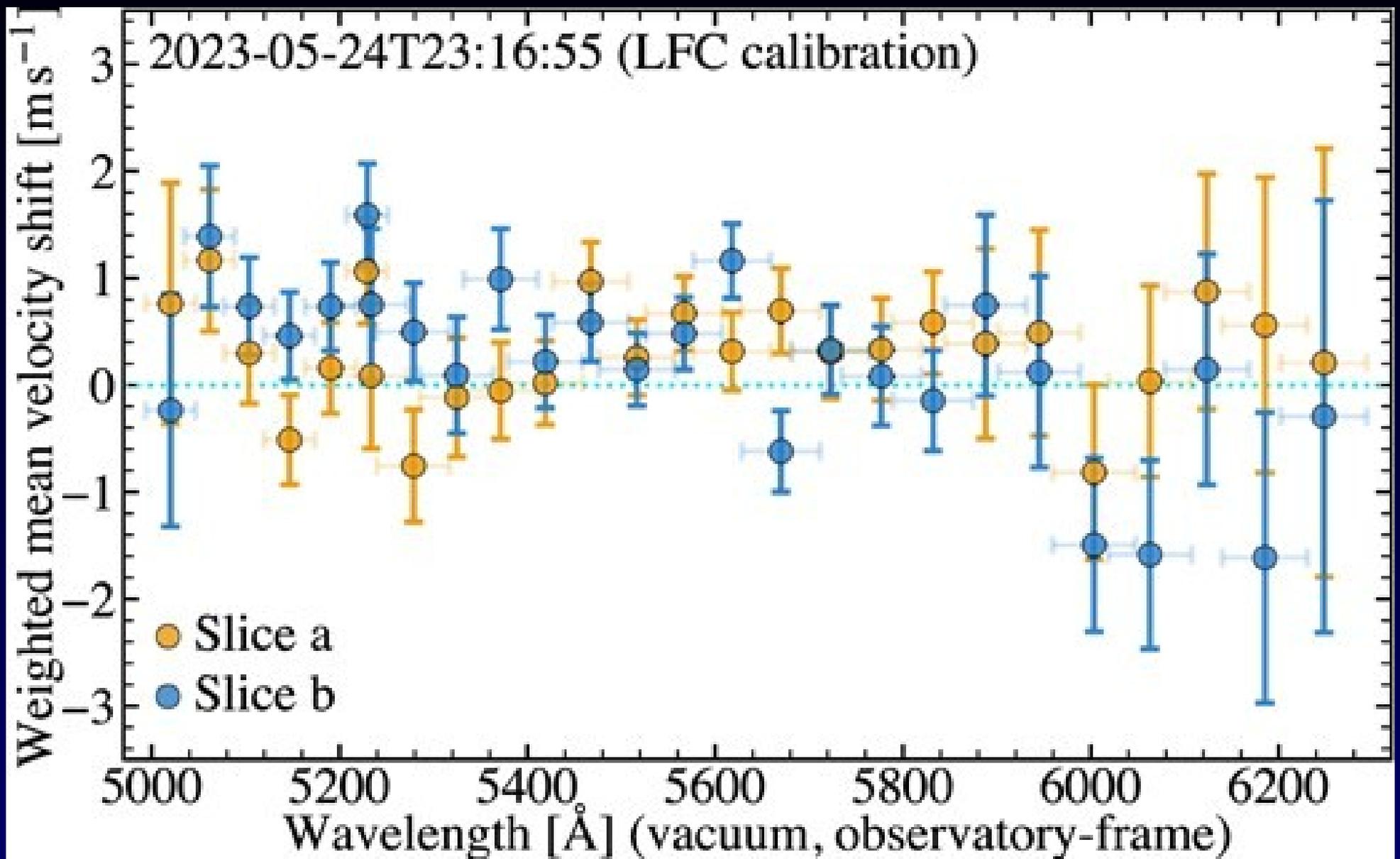


Ancillary Files (S2D et al.)

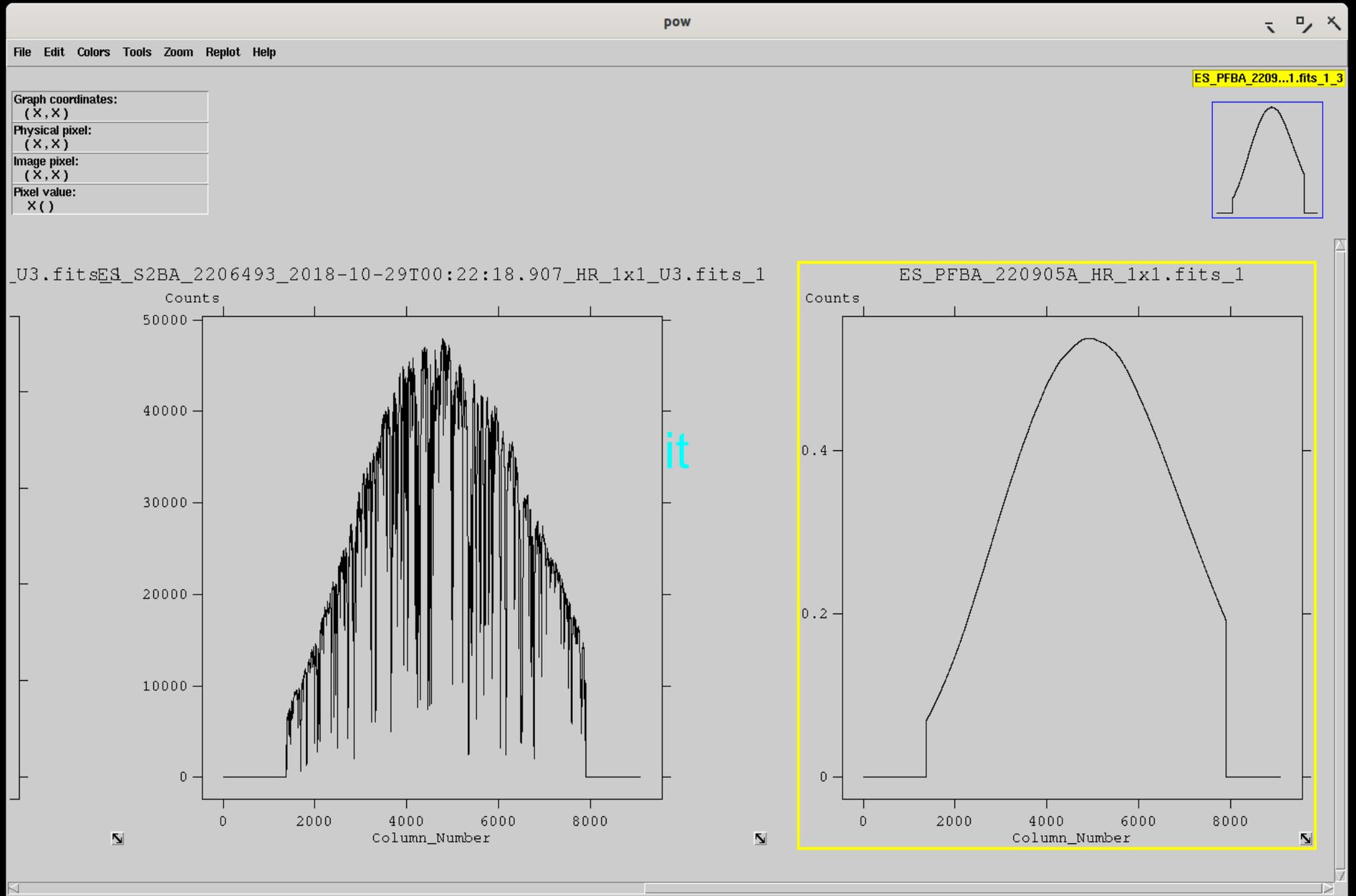
ESPRESSO Dual Slices



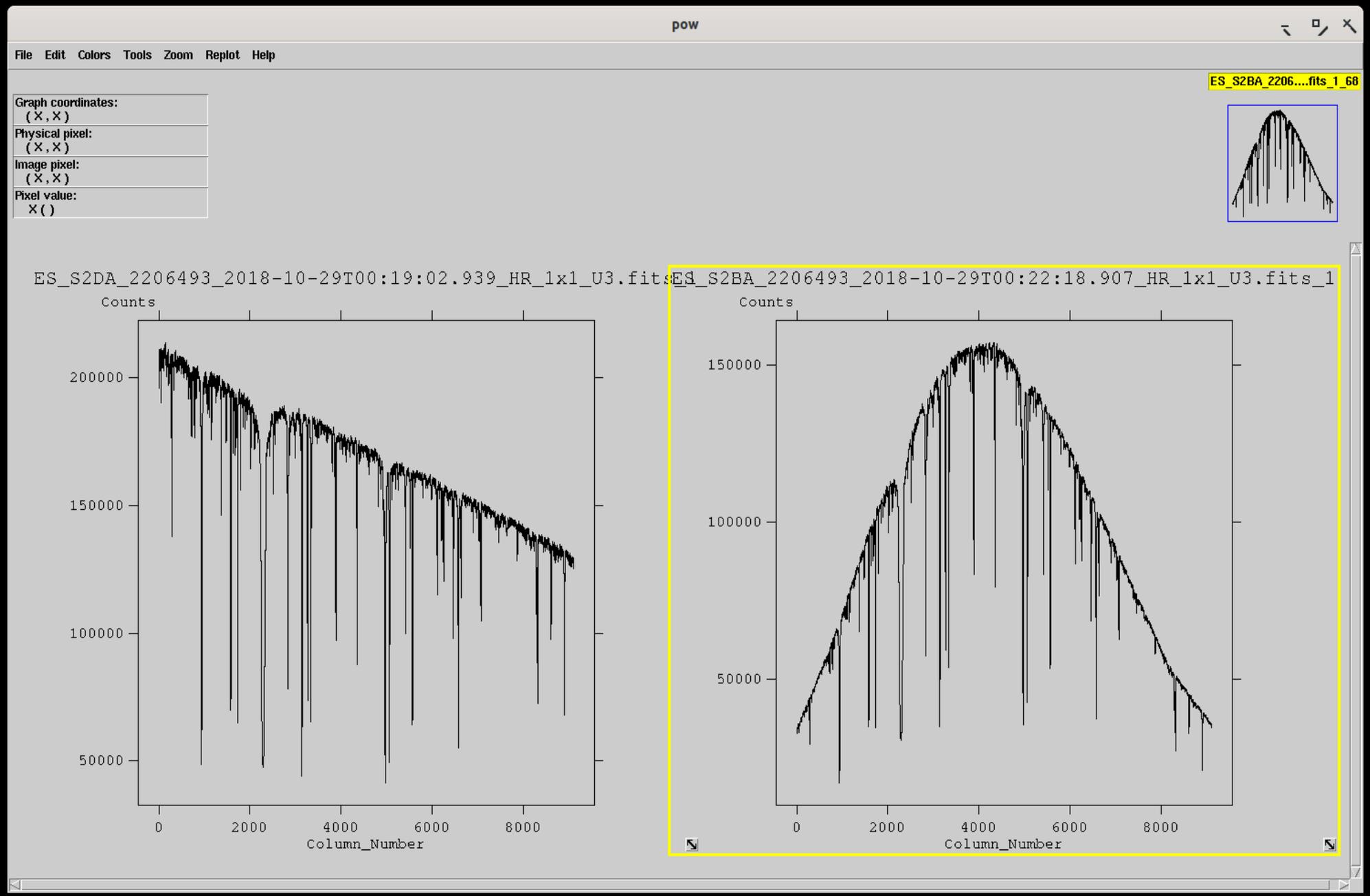
ESPRESSO Slices RV Difference



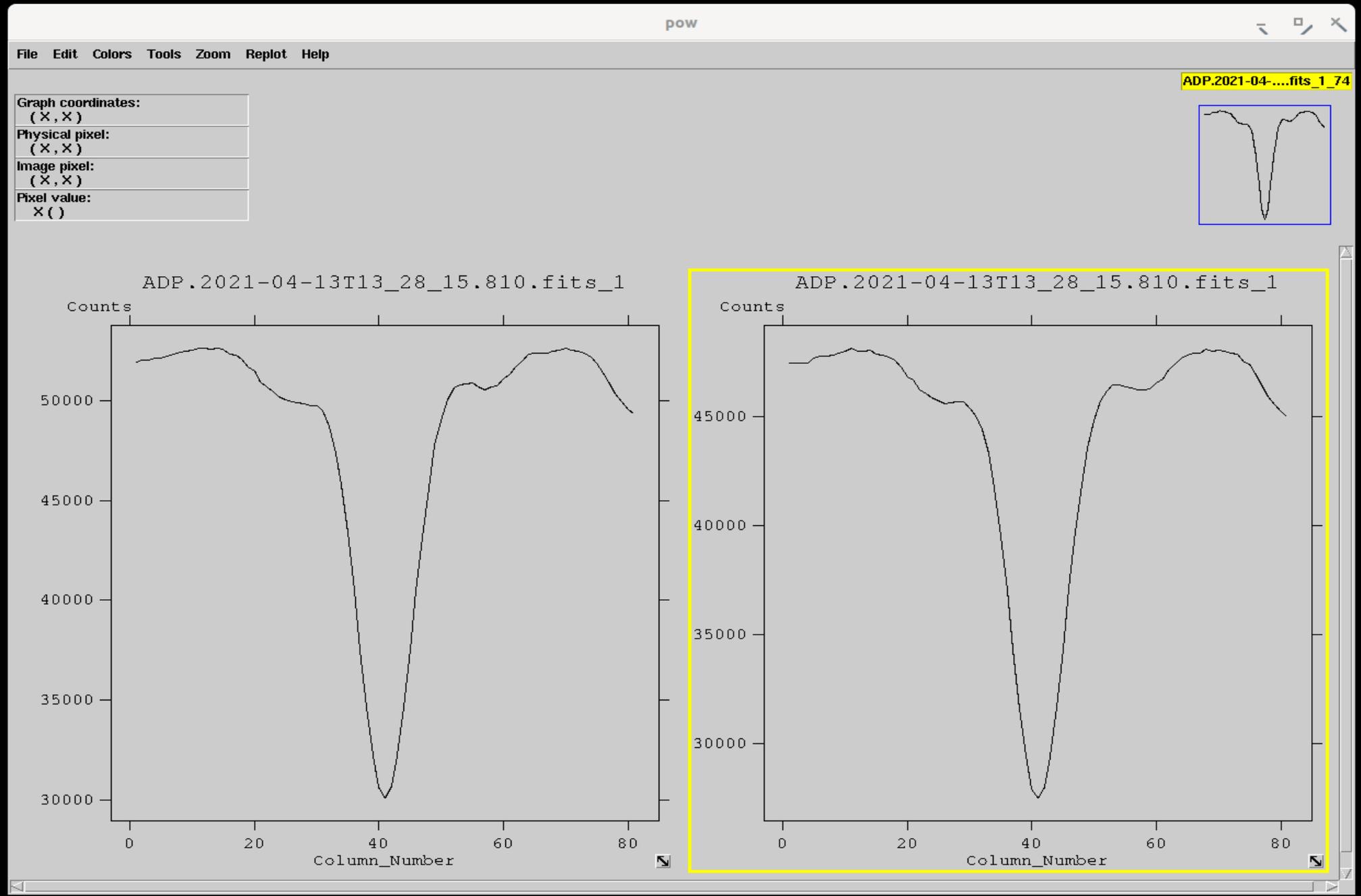
Hgamma Order (Extracted + Blaze Fit)



Halpaha Order (Unblazed + Extracted)



ESPRESSO CCF in Halpha (2 slices)



ESO Science Portal – VO based

archive.eso.org/scienceportal/home

Datasets: 7253 Selected: 0

SIN | 2000 | eps Ind | 5' | intersects

22 03 21.65 -56 47 09.5
14.56' × 10.92'

Observatory
La Silla Paranal APEX 7253

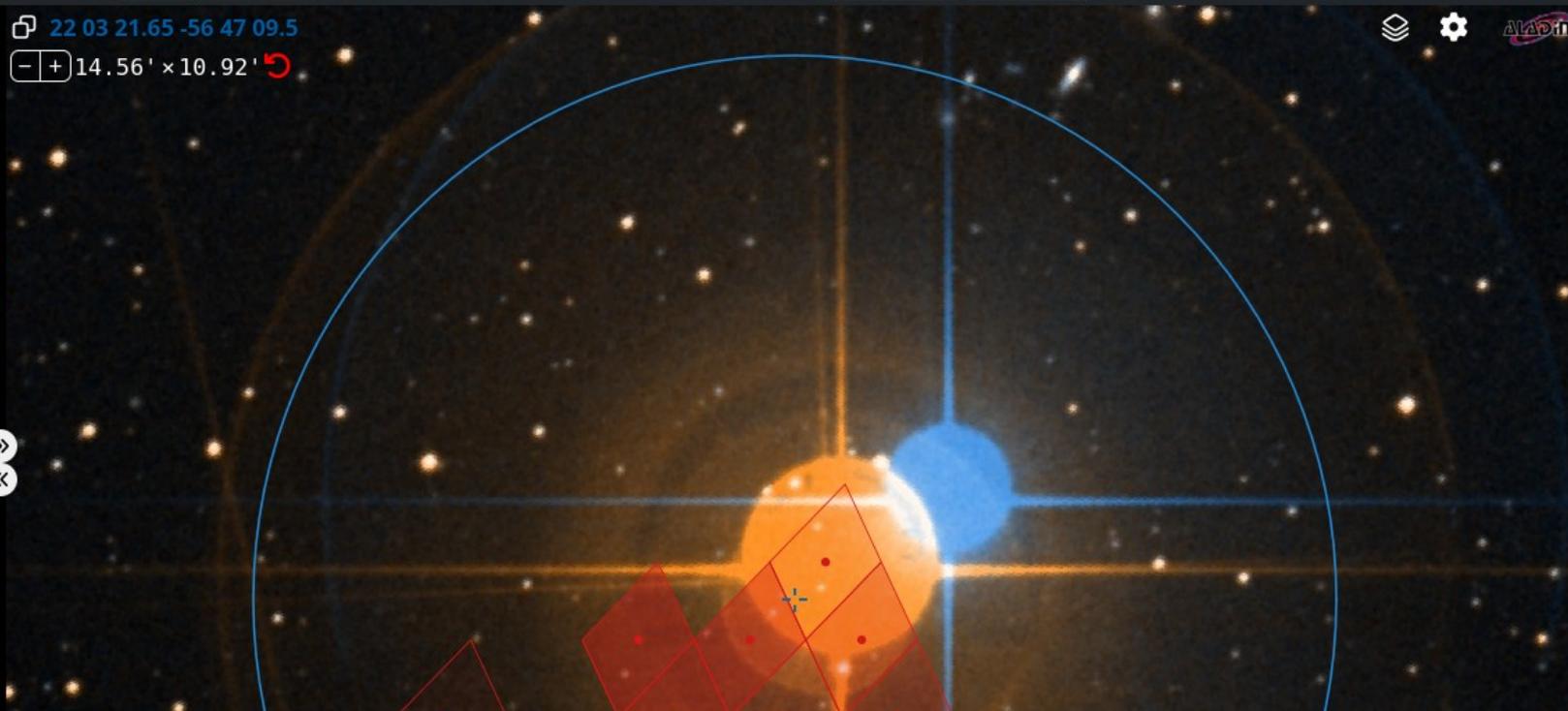
Data Type
SPECTRUM 7253
CATALOG 26
IMAGE 24
VISIBILITY 11

Spectral Range
UV
opt
NIR

Filter/Band
No data to display

Spectral Resolution
100k-+
10k-100k

Signal-to-Noise Ratio

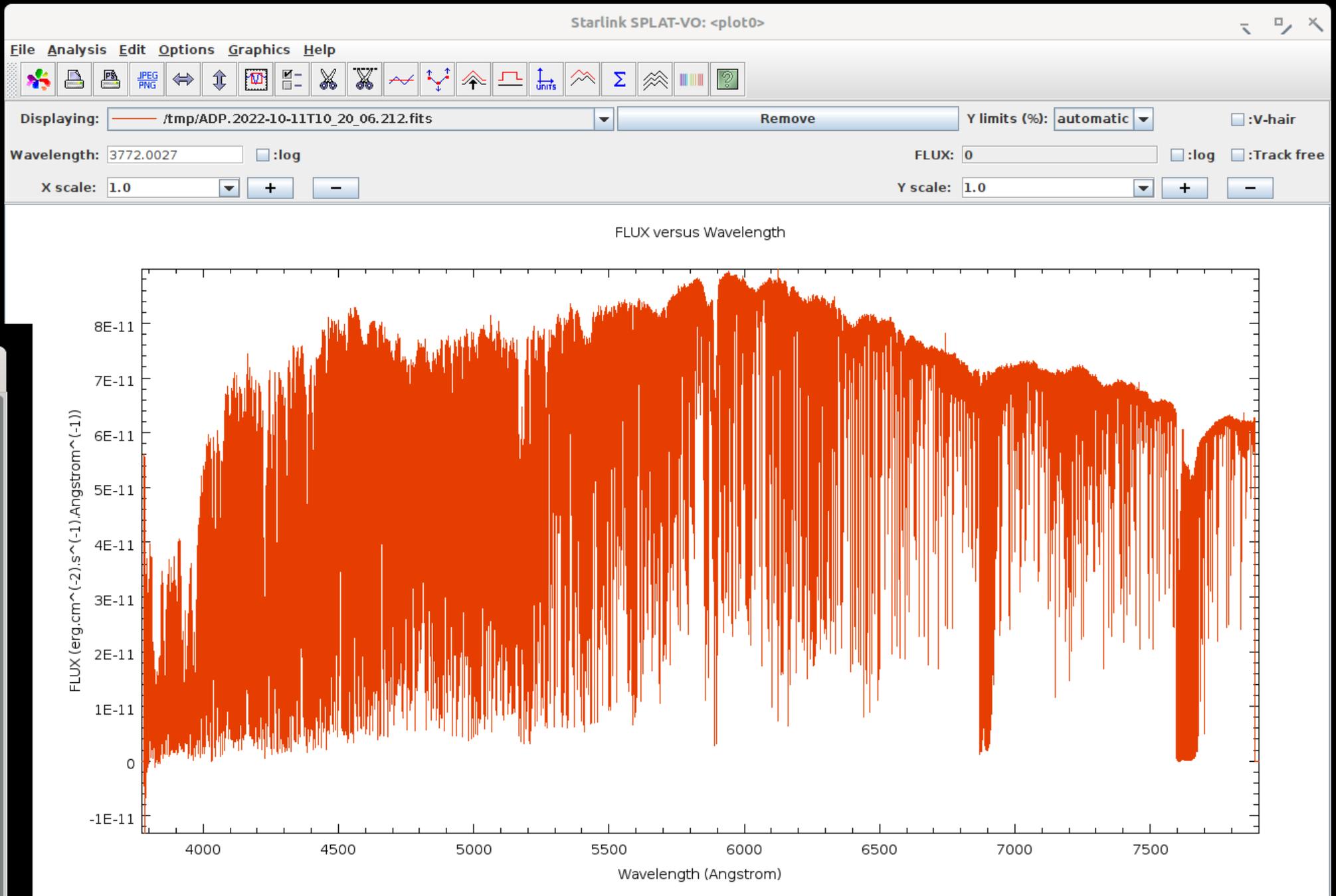


Actions	Dist.	Data Type	Spec.Range	Spec.Res.	SNR	Obs.Date	Collection	Instrum.	T.Exp.T.	#Obs	P.I.	Program Id	Object
<input type="checkbox"/>	1.75'	SPECTRUM	1972-2452 nm	86000	378.9	2022-10-09 04:35:26	CRICESplus	CRIRES	90 s	single	JOFRE PFEIL, PAULA	110.23Y6	eps Ind
<input type="checkbox"/>	1.75'	SPECTRUM	1946-2486 nm	86000	385	2022-10-09 04:32:02	CRICESplus	CRIRES	90 s	single	JOFRE PFEIL, PAULA	110.23Y6	eps Ind
<input type="checkbox"/>	1.75'	SPECTRUM	1461-1771 nm	86000	383.5	2022-10-09 04:29:01	CRICESplus	CRIRES	60 s	single	JOFRE PFEIL, PAULA	110.23Y6	eps Ind
<input type="checkbox"/>	1.75'	SPECTRUM	1446-1796 nm	86000	344.4	2022-10-09 04:26:13	CRICESplus	CRIRES	60 s	single	JOFRE PFEIL, PAULA	110.23Y6	eps Ind
<input type="checkbox"/>	1.75'	SPECTRUM	1122-1331 nm	86000	338.2	2022-10-09 04:23:11	CRICESplus	CRIRES	90 s	single	JOFRE PFEIL, PAULA	110.23Y6	eps Ind
<input type="checkbox"/>	1.75'	SPECTRUM	949.6-1121 nm	86000	282.4	2022-10-09 04:19:39	CRICESplus	CRIRES	90 s	single	JOFRE PFEIL, PAULA	110.23Y6	eps Ind

VO Tools

- SPLAT-VO (GAVO – Ondrejov)
- CASSIS (OMP)
- IPAC Firefly (IRSAViewer)
 - All NASA data, LSST (Rubin)
 - Spectra in echelle – started
 - <https://github.com/Caltech-IPAC/firefly>
- Not Supported:
 - SpecView (HST)
 - VOSpec (ESA)

VO Tool – SPLAT-VO - Eps Ind



CASSIS

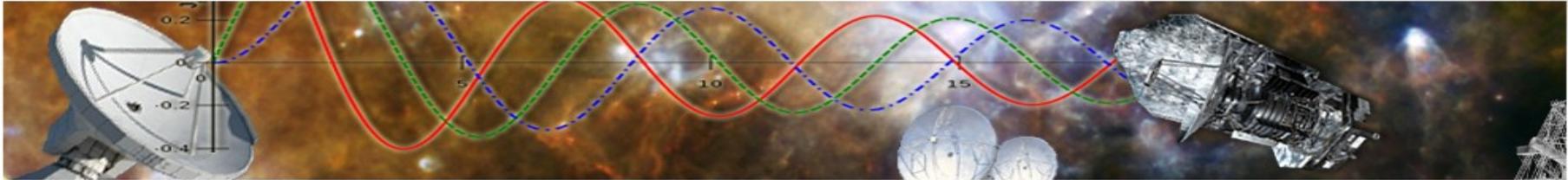
 **CASSIS**
A free interactive spectrum analyser

 **GSO**
OBSERVATOIRE VIRTUEL GRAND SUD OUEST

 **OIRAP**
OBSERVATOIRE INFRAROUGE

 **UNIVERSITÉ TOULOUSE III PAUL SABATIER**
Université de Toulouse

 **CNRS**



The current version of CASSIS is 6.4, released July 16, 2024

CASSIS

Presentation

Download & Installation

Documentation & Data

What's new?

FAQ

Caveats and tricks

Bugs report

Publications and Talks

Credits

Authors

Catalogs

License

Links

Help Online

• Project Scientists

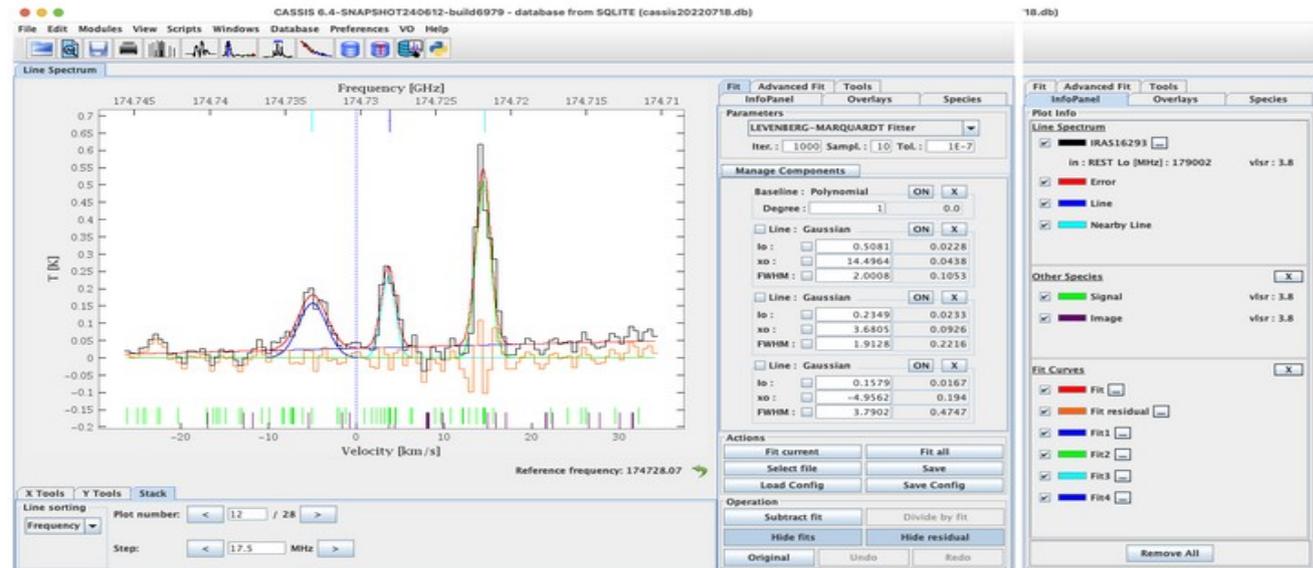
- Sandrine Bottinelli (PI): Sandrine.Bottinelli@irap.omp.eu
- Emmanuel Caux: Emmanuel.Caux@irap.omp.eu
- Audrey Coutens (co-PI): Audrey.Coutens@irap.omp.eu
- Charlotte Vastel: Charlotte.Vastel@irap.omp.eu

• Project Manager

- Jean-Michel Glorian : Jean-Michel.Glorian@irap.omp.eu

• Developer

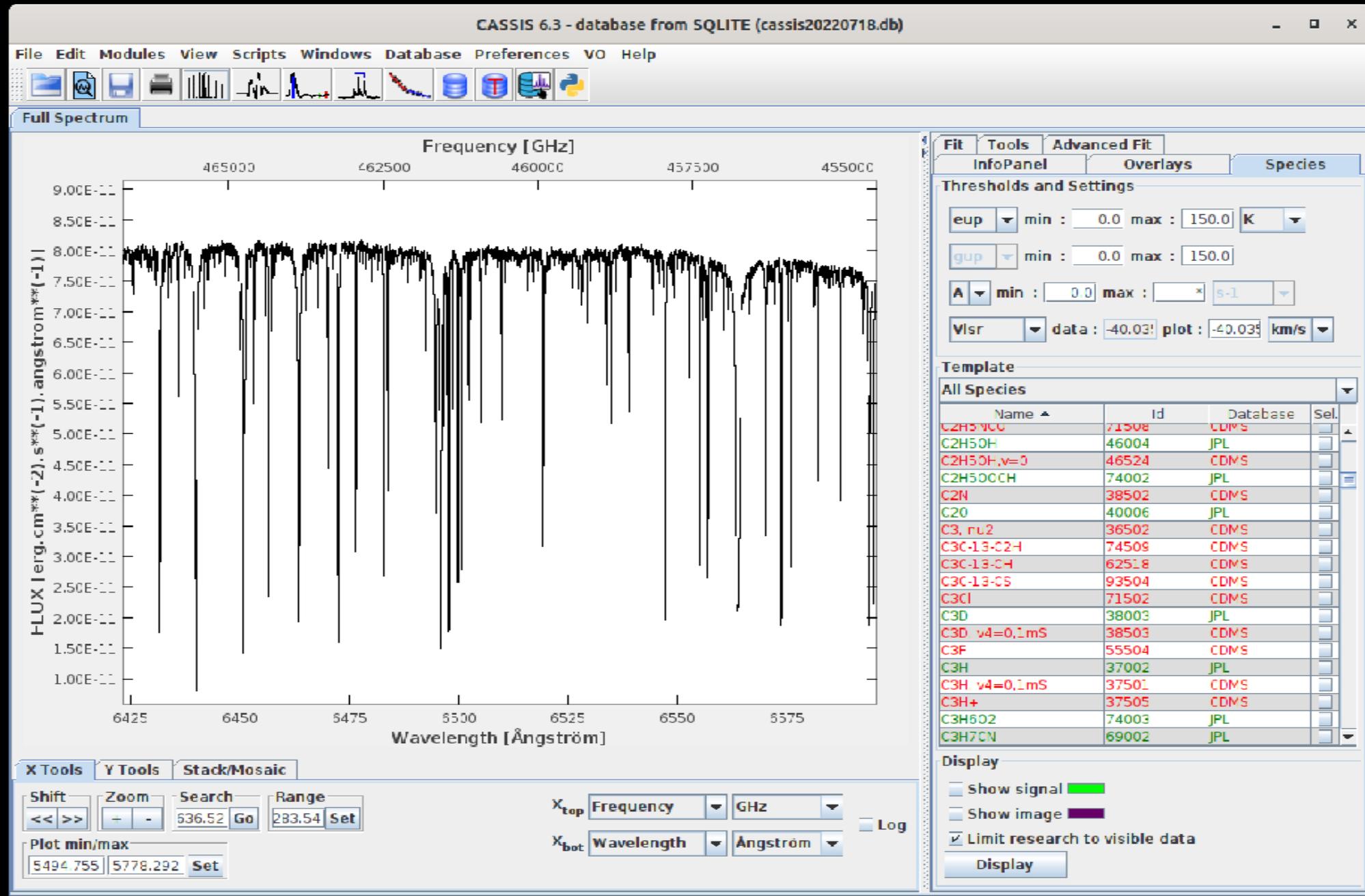
- Mickaël Boiziot : Mickael.Boiziot@irap.omp.eu



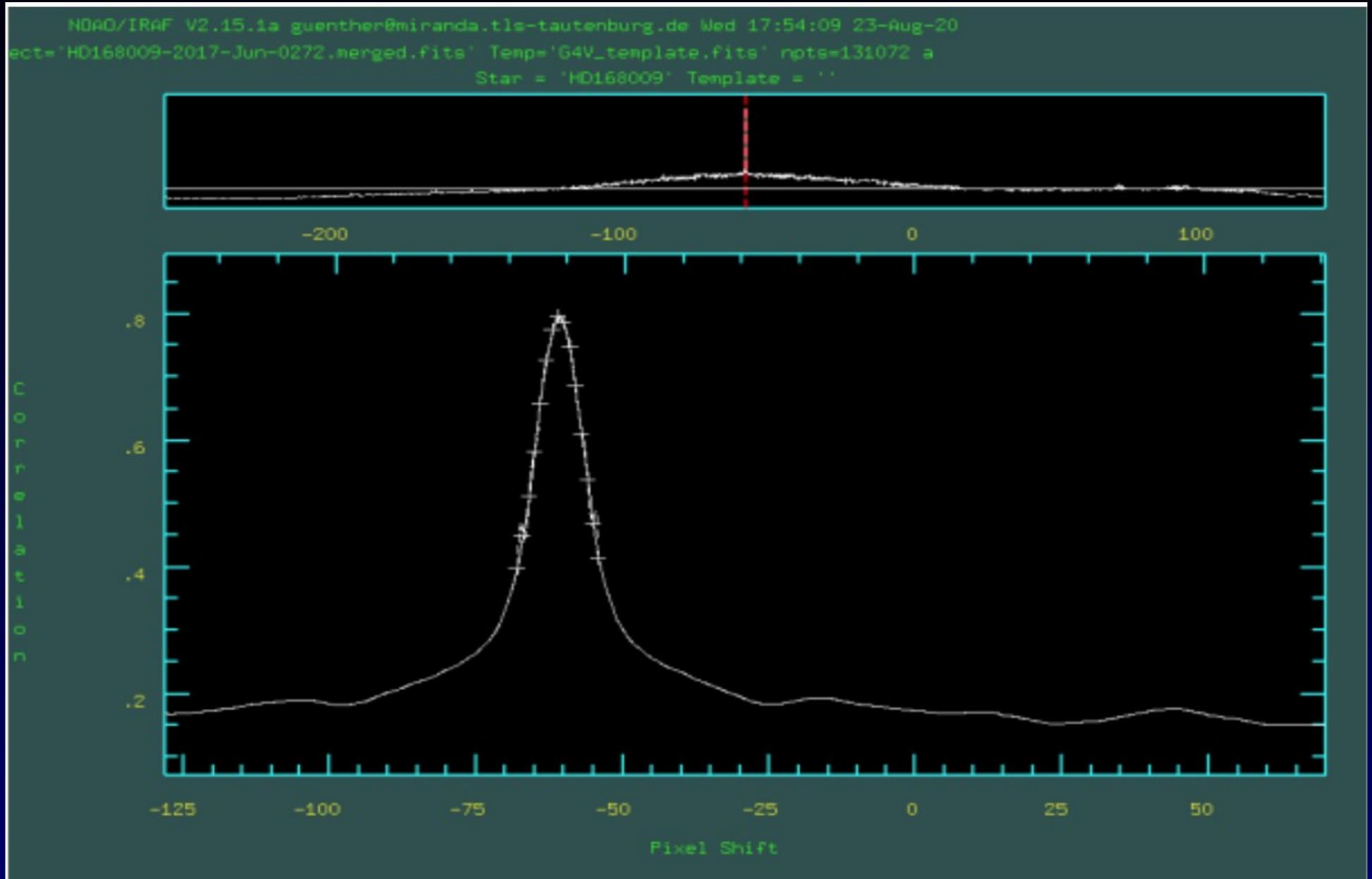
If you used CASSIS for any publication please cite CASSIS as follow : cite CASSIS

(CASSIS is regularly updated, please visit the [What's new section](#))

VO Tool – CASSIS Eps Ind

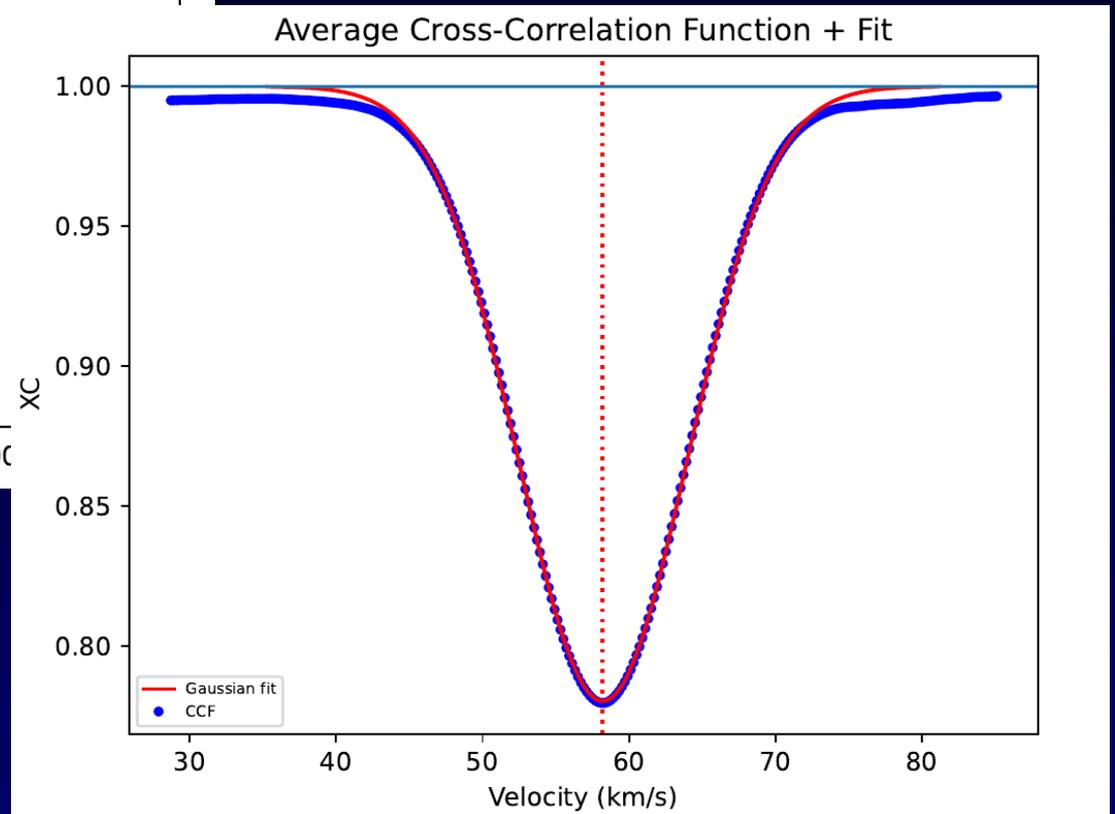
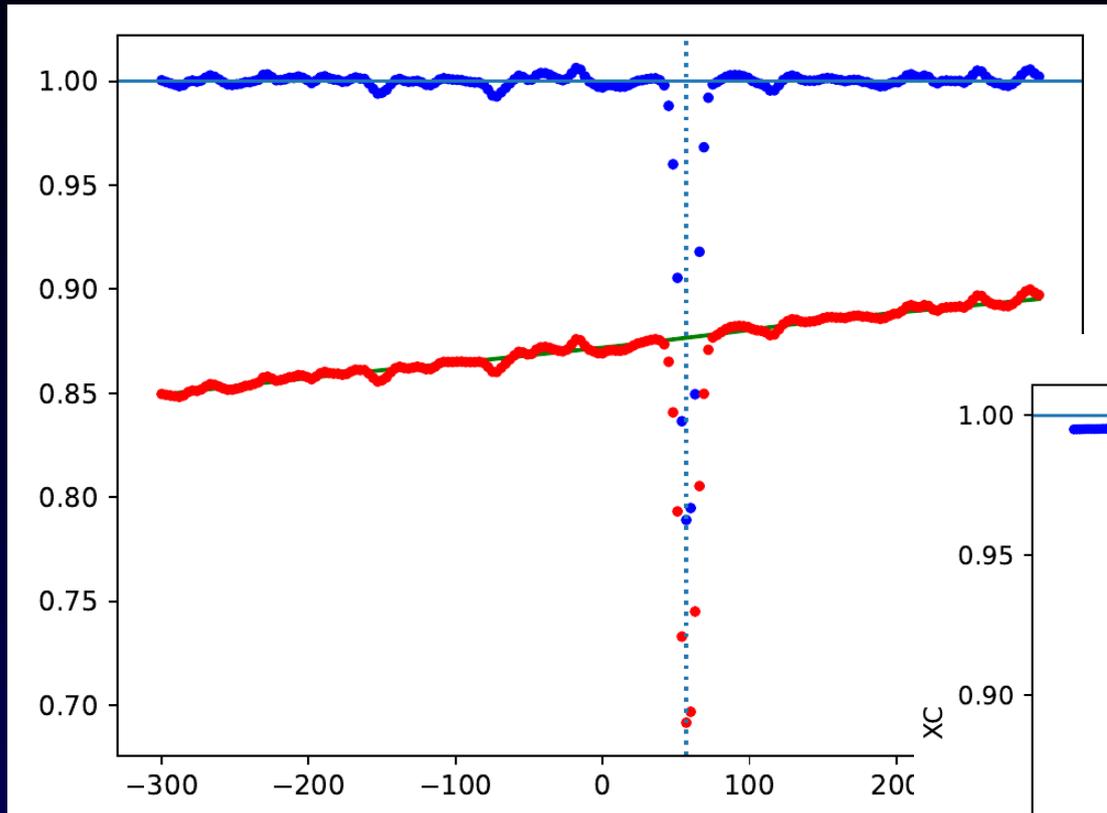


Cross Correlation Function



IRAF fxcor task

Cross Correlation Function - CCF



EPRV Format Standard

EPRV Standard

- About 15 spectrographs (~ 5 passively following)
e.g. CARMENES
- Translators from native format
- Started 2024
- NASA JPL (EPRV project - WG)

<https://github.com/EPRV-RCN/RVData>

<https://eprv-data-standard.readthedocs.io/en/latest>

EPRV L2 – Order by Order Unblazed

HDU	Name	Data Type	MinBetDepth	Multiplicity	Required	Description
0	PRIMARY	PrimaryHDU		False	True	EPRV Standard FITS HEADER (no data)
1	INSTRUMENT_HEADER	ImageHDU		False	True	Inherited instrument header (no data)
2	RECEIPT	BinTableHDU		False	True	Table of operations that have been performed on this file
3	DRP_CONFIG	BinTableHDU		False	True	Pipeline details (settings etc) to go from native data to L2
4	EXT_DESCRIPTOR	BinTableHDU		False	True	Table describing contents of each extension
5	ORDER_TABLE	BinTableHDU		TRUE	TRUE	Table capturing the wavelength extent of each order
6	TRACE1_FLUX	ImageHDU		True	True	Flux in trace 1
7	TRACE1_WAVE	ImageHDU	64	True	True	wavelength solution for trace 1
8	TRACE1_VAR	ImageHDU		True	True	variance for trace 1
9	TRACE1_BLAZE	ImageHDU		True	True	blaze for trace 1
10	BARYCORR_KMS	ImageHDU		False	True	barycentric correction in km/s
11	BARYCORR_Z	ImageHDU		False	True	barycentric correction in redshift
12	BJD_TDB	ImageHDU	64	False	True	Photon weighted midpoint
13	DRIFT	ImageHDU		False	False	Drift measurement map in delta lambda
14	TRACE1_QUALITY	ImageHDU	UINT8	True	False	Quality of each pixel in trace 1
15	EXPMETER	BinTableHDU		False	False	Table of exposure meter counts timeseries over the exposure
16	TELEMETRY	BinTableHDU		False	False	Table of telemetry collected during the exposure
17	TRACE1_TELLURIC	ImageHDU		True	False	Telluric model for trace 1
18	TRACE1_SKYMODEL	ImageHDU		True	False	Sky model for trace 1
19	ANCILLARY_SPECTRUM	ImageHDU		True	False	Extension(s) that store ancillary spectra
20	IMAGE	ImageHDU		True	False	Extension(s) that store useful support images
21	CUSTOM1_TRACE1_FLUX	ImageHDU		True	False	Additionally corrected flux in trace 1
22	CUSTOM1_TRACE1_WAVE	ImageHDU		True	False	Additionally corrected wavelength solution for trace 1
23	CUSTOM1_TRACE1_VAR	ImageHDU		True	False	Additionally corrected variance for the flux in trace 1

EPRV L3 – Merged orders normalized

This is what we already know – SSAP, “distorted data low precision”

HDU	Name	DataType	Multiplicity	Required	Description
0	PRIMARY	PrimaryHDU	False	True	EPRV Standard FITS HEADER (no data)
1	INSTRUMENT_HEADER	ImageHDU	False	True	Inherited instrument header (no data)
2	RECEIPT	BinTableHDU	False	True	Table of operations that have been performed on this file
3	DRP_CONFIG	BinTableHDU	False	True	Pipeline details (settings etc) to go from native data to L2
4	ORDER_TABLE	BinTableHDU	TRUE	TRUE	Table capturing the wavelength extent of each order
5	STITCHED_CORR_TRACE1_FLUX	ImageHDU	True	True	Order stitched blaze-corrected flux in trace 1
6	STITCHED_CORR_TRACE1_WAVE	ImageHDU	True	True	Order stitched BC- and drift-corrected wavelength solution for trace 1
7	STITCHED_CORR_TRACE1_VAR	ImageHDU	True	True	Order stitched variance for the flux in STITCHED_CORR_TRACE1_FLUX
8	COMBINED_STITCHED_CORR_FLUX	ImageHDU	True	True	Order stitched and blaze-corrected flux co-added across all traces
9	COMBINED_STITCHED_CORR_WAVE	ImageHDU	True	True	Order stitched BC- and drift-corrected wavelength solution
10	COMBINED_STITCHED_CORR_VAR	ImageHDU	True	True	Order stitched variance for the combined flux in COMBINED_STITCHED_CORR_FLUX
11	STITCHED_CUSTOMCORR1_TRACE1_FLUX	ImageHDU	True	False	Additional corrections made to STITCHED_CORR_TRACE1_FLUX
12	STITCHED_CUSTOMCORR1_TRACE1_WAVE	ImageHDU	True	False	Wavelength solution corresponding to STITCHED_CUSTOMCORR1_TRACE1_FLUX
13	STITCHED_CUSTOMCORR1_TRACE1_VAR	ImageHDU	True	False	Variance corresponding to STITCHED_CUSTOMCORR1_TRACE1_FLUX
14	COMBINED_STITCHED_CUSTOMCORR1_FLUX	ImageHDU	True	False	Additional corrections made to COMBINED_STITCHED_CORR_FLUX
15	COMBINED_STITCHED_CUSTOMCORR1_WAVE	ImageHDU	True	False	Wavelength solution corresponding to COMBINED_STITCHED_CORR_WAVE
16	COMBINED_STITCHED_CUSTOMCORR1_VAR	ImageHDU	True	False	Variance corresponding to COMBINED_STITCHED_CORR_VAR

EPRV L4 – Derived core exo science

Radial Velocity and Cross Correlation Function (various masks)

It is the most important output of pipeline

HDU	Name	DataType	Multiplicity	Required	Description
0	PRIMARY	PrimaryHDU	FALSE	TRUE	EPRV Standard FITS HEADER (no data)
1	INSTRUMENT_HEADER	ImageHDU	FALSE	TRUE	Inherited instrument header (no data)
2	RECEIPT	BinTableHDU	FALSE	TRUE	Table of operations that have been performed on this file
3	DRP_CONFIG	BinTableHDU	FALSE	TRUE	Pipeline details (settings etc) to go from native data to L2
4	RV1...N	BinTableHDU	TRUE	TRUE	Derived Radial Velocity Measurement
5	CCF1...N	ImageHDU	TRUE	FALSE	Array with same dimensionality of RV1...N, that contains the CCF that produced each RV1...N
6	DIAGNOSTICS1...J	BinTableHDU	TRUE	FALSE	Activity indicators, CCF metrics, etc
7	CUSTOM_CCF1...N	ImageHDU	TRUE	FALSE	Additional CCFs from (e.g.) different masks
8	CUSTOM_RV1...N	BinTableHDU	TRUE	FALSE	Derived Radial Velocity Measurement from CUSTOM_CCF1...N

EPRV L4 – ESPRESSO Tau Cet

Fv: Summary of ESPRE.2021-10-03T06:24:23.449_L4.fits in /home/skoda/EPRV/ESSPRESO/data_standard/

Index	Extension	Type	Dimension	View		
0	Primary	Image	0	Header	Image	Table
1	INSTRUMENT_HFADFR	Image	n	Header	Image	Table
2	RECEIPT	Binary	0 cols X 0 rows	Header	Hist	Plot
3	DRP_CONFIG	Binary	0 cols X 0 rows	Header	Hist	Plot
4	RV1	Binary	6 cols X 1 rows	Header	Hist	Plot
5	EXT_DESCRIPTOR	Binary	6 cols X 6 rows	Header	Hist	Plot
6	CCF1	Image	81 X 171	Header	Image	Table
7	DIAGNOSTICS1	Binary	4 cols X 3 rows	Header	Hist	Plot
8	RV_TEL_CORR	Binary	6 cols X 1 rows	Header	Hist	Plot
9	CCF_TEL_CORR	Image	81 X 171	Header	Image	Table

Fv: Image of ESPRE.2021-10-03T06:24:23.449_L4.fits[6] in /home/skoda/EPRV/ESSPRESO/data_standard/

Select All

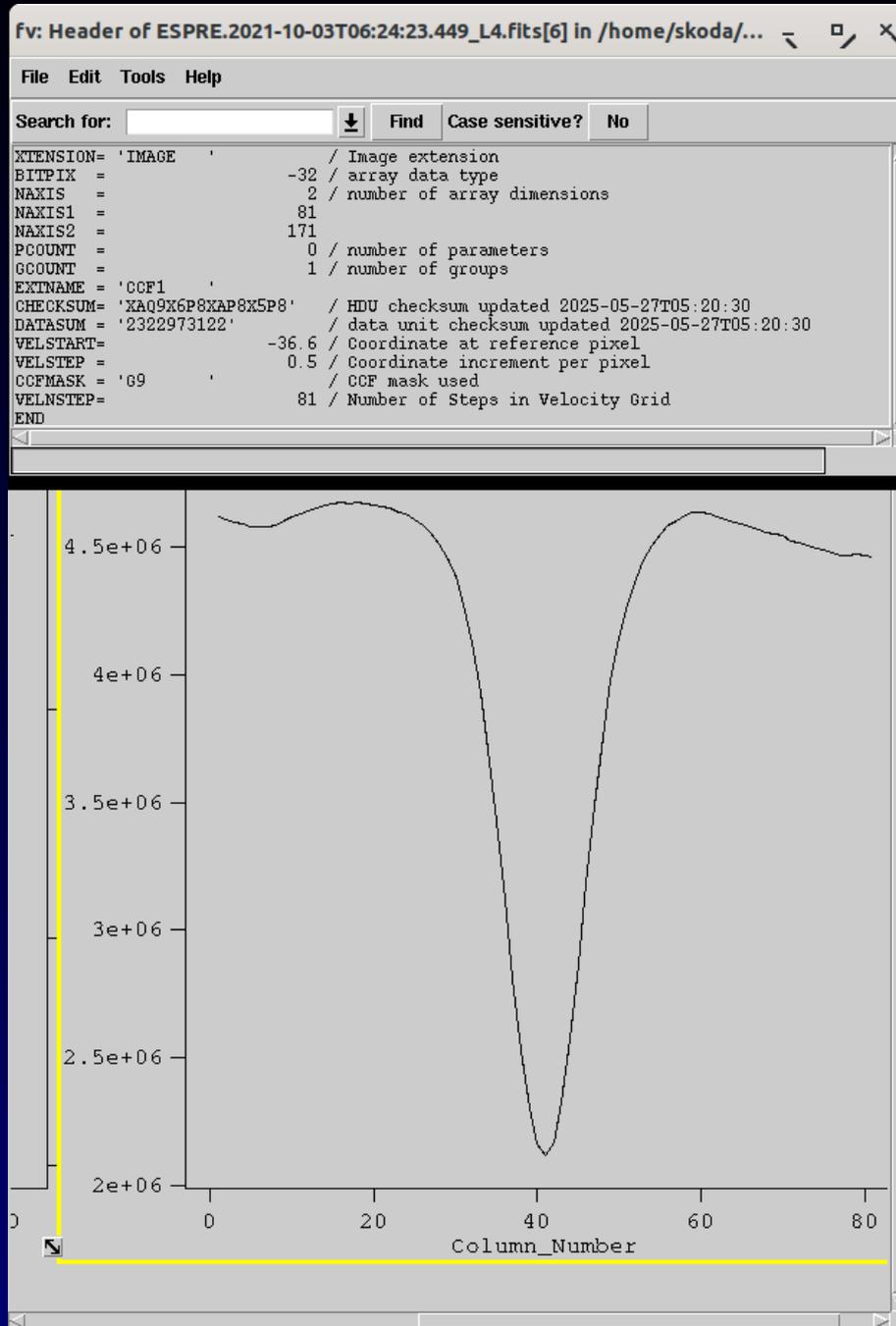
Invert

	1	2	3	4	5	6
98	5.26381e+06	5.26814e+06	5.26253e+06	5.26152e+06	5.25577e+06	5.25909e+06
97	4.93282e+06	4.9213e+06	4.92542e+06	4.92336e+06	4.92463e+06	4.92166e+06
96	5.64695e+06	5.63776e+06	5.63015e+06	5.61536e+06	5.58759e+06	5.55647e+06
95	5.27117e+06	5.259e+06	5.24219e+06	5.2263e+06	5.2046e+06	5.1804e+06
94	5.50534e+06	5.47118e+06	5.43957e+06	5.39959e+06	5.35634e+06	5.30384e+06
93	5.02342e+06	4.99754e+06	4.9695e+06	4.93366e+06	4.89204e+06	4.84796e+06
92	2.18587e+06	2.19189e+06	2.18693e+06	2.18391e+06	2.18239e+06	2.18064e+06
91	1.86196e+06	1.86149e+06	1.8596e+06	1.85738e+06	1.85636e+06	1.85244e+06
90	4.54433e+06	4.53008e+06	4.52264e+06	4.51101e+06	4.50543e+06	4.50644e+06
89	4.61856e+06	4.61068e+06	4.59623e+06	4.58902e+06	4.58102e+06	4.57993e+06
88	5.21423e+06	5.23318e+06	5.24848e+06	5.26762e+06	5.27702e+06	5.29468e+06
87	4.90491e+06	4.91717e+06	4.93551e+06	4.95675e+06	4.97213e+06	4.98265e+06
86	6.9235e+06	6.91467e+06	6.9163e+06	6.90327e+06	6.87164e+06	6.83962e+06
85	6.53055e+06	6.53232e+06	6.52367e+06	6.50842e+06	6.48675e+06	6.45614e+06
84	3.60443e+06	3.60589e+06	3.60856e+06	3.60729e+06	3.60377e+06	3.59144e+06
83	3.36668e+06	3.3637e+06	3.36409e+06	3.36489e+06	3.36121e+06	3.35394e+06
82	125850	127562	130461	129012	129511	130110
81	119783	121979	123595	124569	124390	123490
80	4.75847e+06	4.7726e+06	4.78419e+06	4.78505e+06	4.79347e+06	4.79598e+06
79	4.52354e+06	4.53738e+06	4.54066e+06	4.54695e+06	4.55432e+06	4.56287e+06

Go to: Edit cell: Lock to Parent

Thanks:
E.Fontanet
2025 priv.com.

EPRV L4 CCF in fv



VLSTART=-36.6 km/s
VELSTEP=0.5 km/s

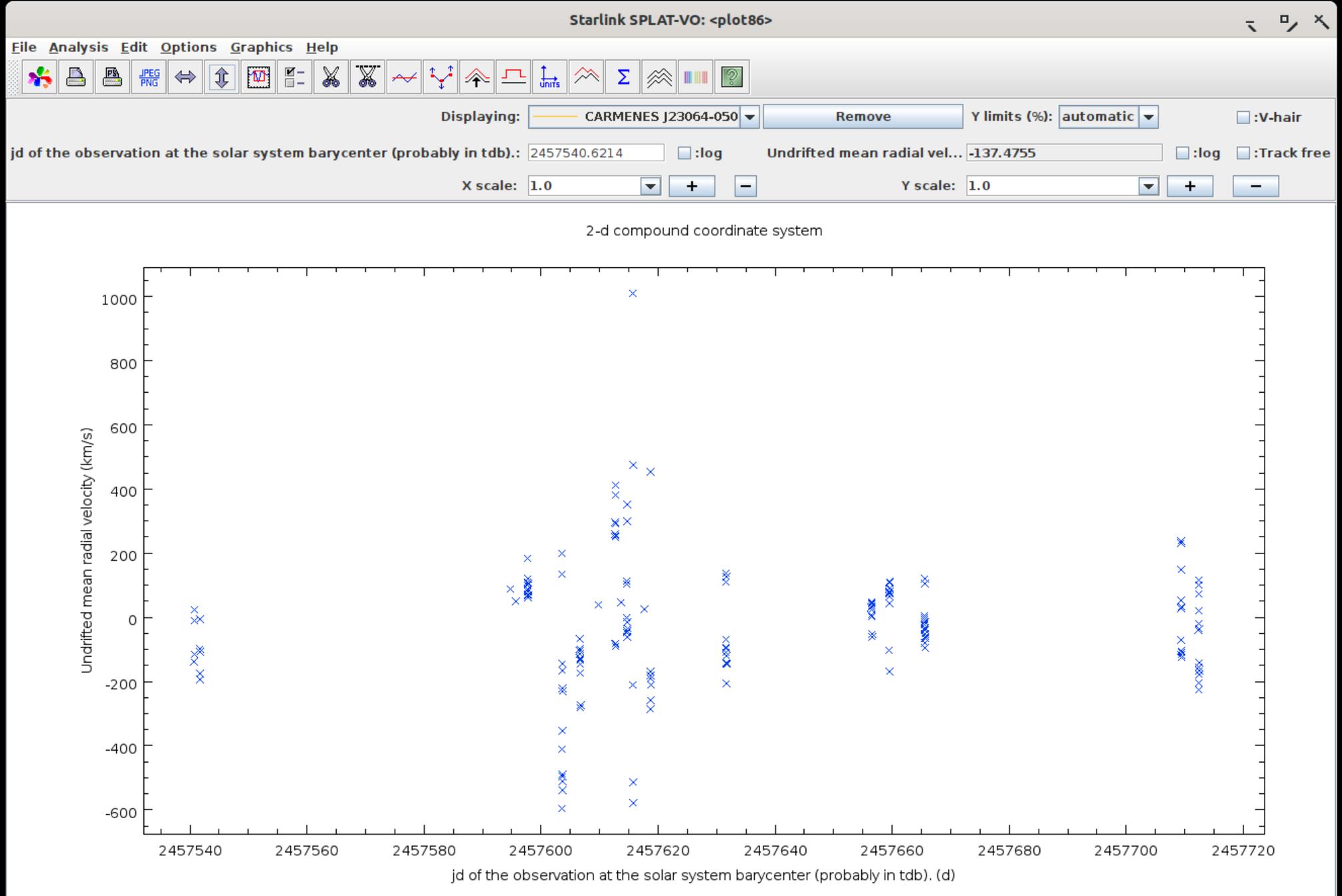
Center~41

$$-36.6 + 40 * 0.5 = -16.6$$

Astrometry	
Radial velocity (R_v)	$-16.68 \pm 0.05^{[5]}$ km/s
Proper motion (μ)	RA: -1721.728 mas/yr ^[1] Dec.: $+854.963$ mas/yr ^[1]
Parallax (π)	273.8097 ± 0.1701 mas ^[1]

Thanks:
E.Fontanet
2025 priv.com.

Trappist-1 RV Curve – Carmenes



Thank you