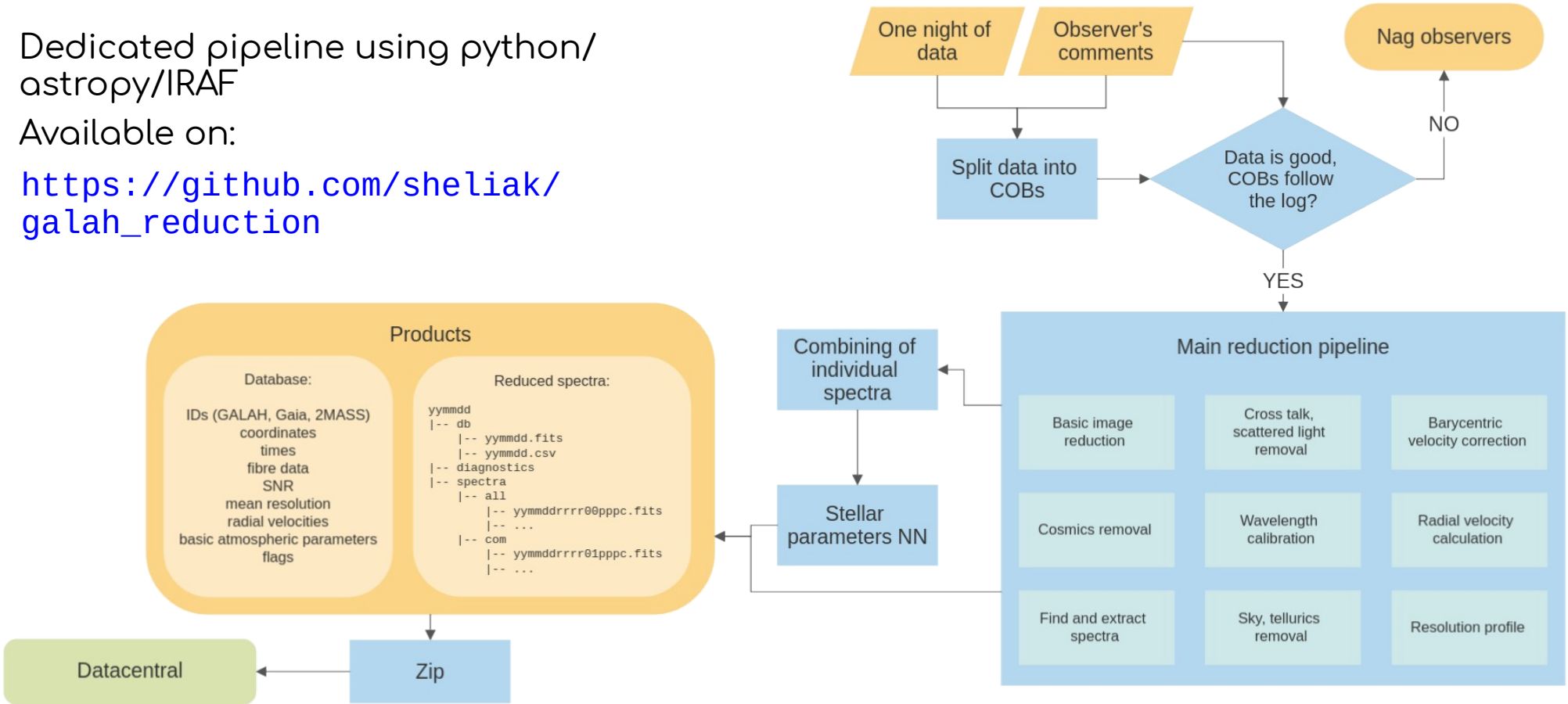
GALAH reduction pipeline

How it works

- Dedicated pipeline using python/ astropy/IRAF
- Available on:

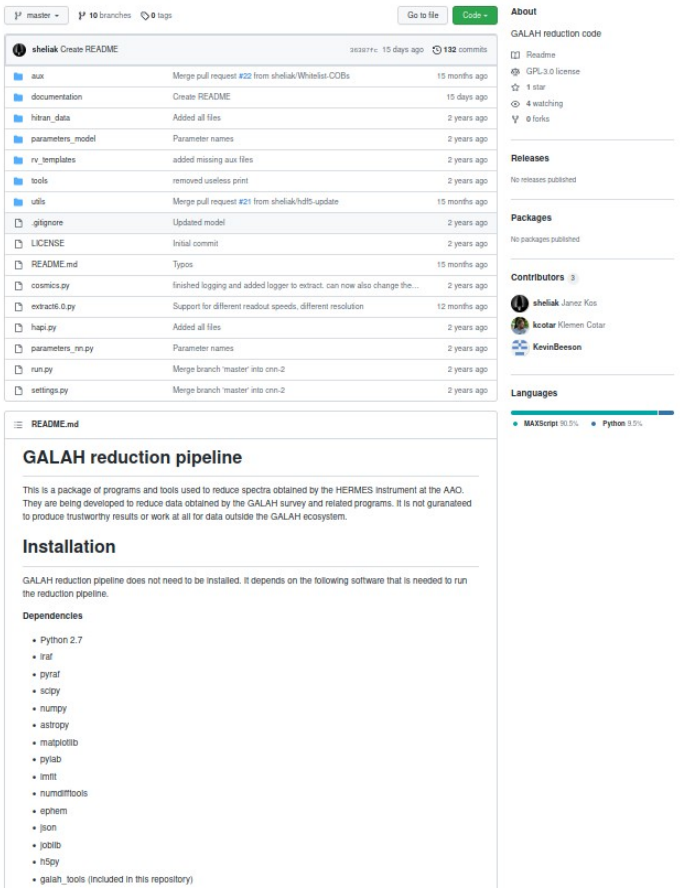
  https://github.com/sheliak/galah_reduction



GALAH reduction pipeline

What is new

- Data and COBs are inspected manually to match the observer's log.
- Bookkeeping improved for benchmark/standard stars
- Improved cross-talk (after better spectral trace modeling)
- Revised arc lamp linelist (following picewise v_r from Tomaž)
- More control and simplification of sky and telluric models
- Resolution profile measured for individual spectra
- Non-parametric spectrum normalisation
- Radial velocity measured for (almost) all stars, including hot and cold
- Neural network estimation of basic atmospheric parameters
- New format of fits files and databases (consistent, always includes the same header keywords and extensions, compatible with Datacentral)

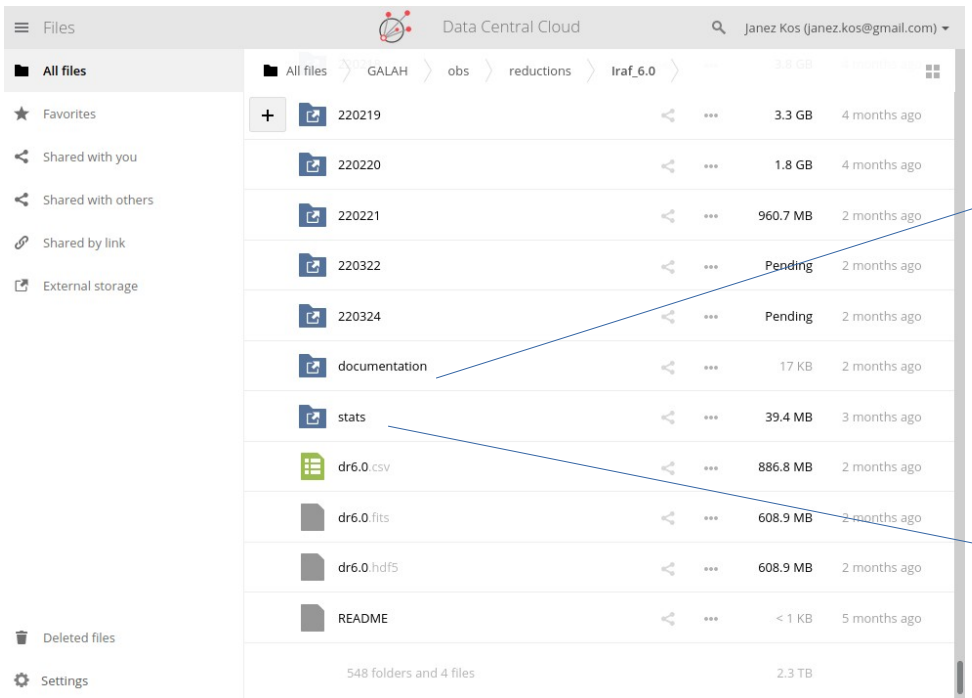


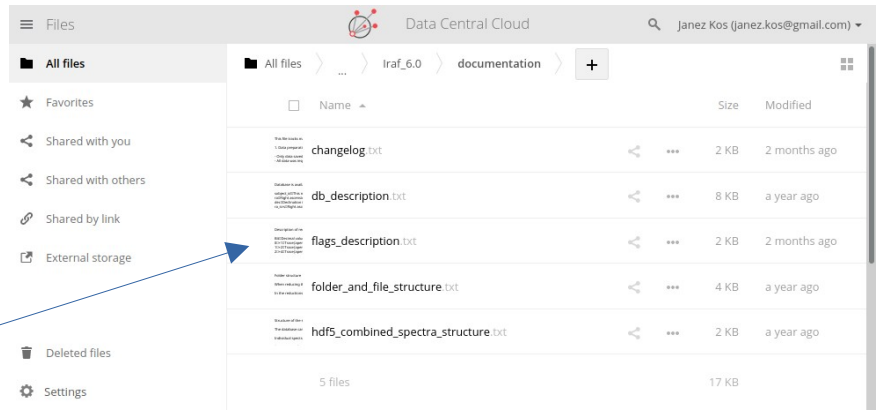
Using reduced GALAH data

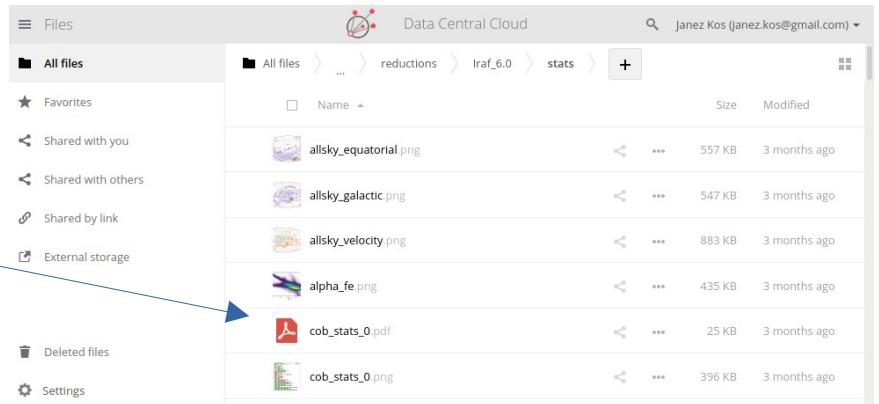
Where to find it

- Datacentral

https://cloud.datacentral.org.au/apps/files?dir=/GALAH/obs/reductions/Iraf_6.0&fileid=15489397



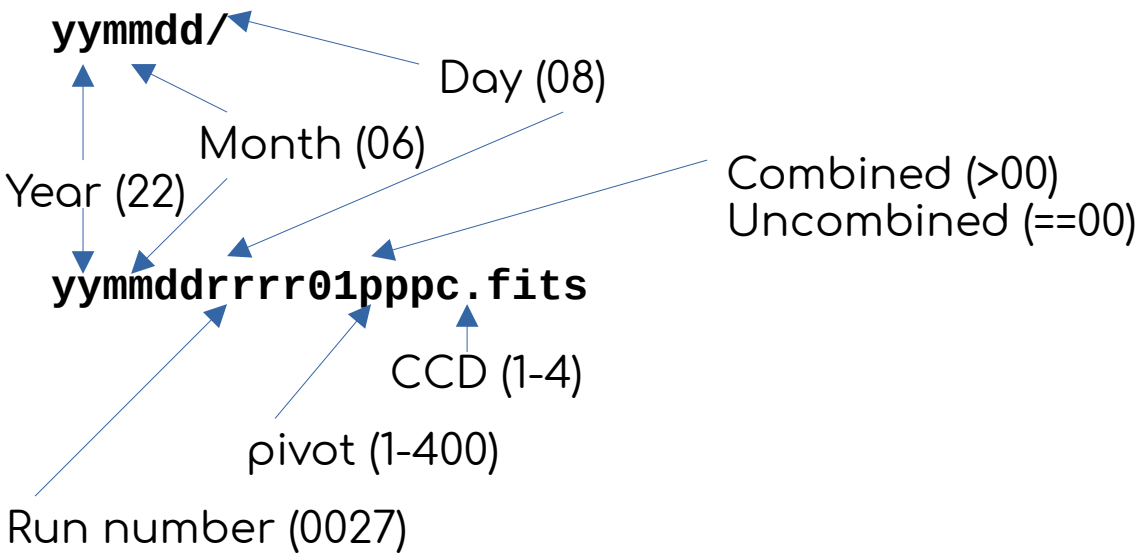




Using reduced GALAH data

Folder structure

- `spectra/com` and `spectra/all` are zipped because Datacentral and Owncloud do not support millions of files.
- Naming conventions:



Name	Size	Type
210115	3 items	Folder
db	3 items	Folder
210115.fits	25.9 kB	Image
210115.hdf5	8.9 kB	Document
210115.txt	7.1 kB	Text
diagnostics	0 items	Folder
spectra	2 items	Folder
all	0 items	Folder
com	20 items	Folder
2101150001010021.fits	403.2 kB	Image
2101150001010022.fits	403.2 kB	Image
2101150001010023.fits	403.2 kB	Image
2101150001010024.fits	403.2 kB	Image
2101150001010031.fits	403.2 kB	Image
2101150001010032.fits	403.2 kB	Image
2101150001010033.fits	403.2 kB	Image
2101150001010034.fits	403.2 kB	Image
2101150001010041.fits	403.2 kB	Image
2101150001010042.fits	403.2 kB	Image
2101150001010043.fits	403.2 kB	Image
2101150001010044.fits	403.2 kB	Image
2101150001010051.fits	403.2 kB	Image
2101150001010052.fits	403.2 kB	Image
2101150001010053.fits	403.2 kB	Image
2101150001010054.fits	403.2 kB	Image
2101150022012391.fits	299.5 kB	Image
2101150022012392.fits	299.5 kB	Image
2101150022012393.fits	299.5 kB	Image
2101150022012394.fits	299.5 kB	Image
documentation	5 items	Folder
changelog.txt	2.5 kB	Text
db_description.txt	8.0 kB	Text
flags_description.txt	1.6 kB	Text
folder_and_file_structure.txt	4.0 kB	Text
hdf5_combined_spectra_structure.txt	1.8 kB	Text
stats	7 items	Folder
allsky_equatorial.png	570.3 kB	Image
allsky_galactic.png	560.4 kB	Image
README	2.8 kB	Text
repeats.png	1.3 MB	Image
resolution_fibres.png	1.6 MB	Image
snr.png	95.6 kB	Image
snr_per_element.png	98.9 kB	Image
210115.fits	256.3 kB	Image
dr6.0.fits	25.9 kB	Image
dr6.0.hdf5	8.9 kB	Document
dr6.0.txt	7.1 kB	Text
README	520 bytes	Text

Using reduced GALAH data

Database structure

- Fits, csv, and hdf5 formats
- See `db_description.txt` in the documentation folder
- Entries can be arrays (array of four v_r in one column instead of four velocities in four columns)

obj_name	galah_id	2mass	gaia_id	snr
gaiadr2_3335074476514836608	None	05505952+0759226	3335074476514836608	(22.1591, 43.21375, 58.58233, 69.493256)
gaiadr2_3335031144588572416	None	05492441+0800522	3335031144588572416	(24.49571, 47.767635, 70.07752, 76.79426)
gaiadr2_3335042277143687936	None	05481002+0805158	3335042277143687936	(27.617647, 41.06321, 40.64838, 47.30115)
gaiadr2_3335042281439724032	None	05481101+0804342	3335042281439724032	(17.972574, 25.585434, 31.410936, 28.5520...
gaiadr2_3335061866491047040	None	05510181+0755193	3335061866491047040	(16.426517, 29.6932, 39.344868, 44.152897)
gaiadr2_3335039184767237248	None	05480332+0759422	3335039184767237248	(19.744057, 31.98743, 42.36305, 42.803127)
gaiadr2_3335040082416484608	None	05474933+0800392	3335040082416484608	(24.311218, 35.413586, 42.2184, 40.678406)
gaiadr2_3335040662235985408	None	05475376+0802418	3335040662235985408	(20.966766, 30.76269, 41.157455, 36.77188...
gaiadr2_3335023860324040704	None	05491860+0754411	3335023860324040704	(24.349243, 38.31095, 48.748142, 47.14402...
gaiadr2_3334963666358726144	None	05510880+0748577	3334963666358726144	(27.028599, 44.824184, 60.87149, 61.35661)
gaiadr2_3334978441046247040	None	05500435+0752122	3334978441046247040	(16.277863, 27.331093, 33.79147, 38.49702)
gaiadr2_3334977616412276224	None	05500884+0751031	3334977616412276224	(19.527021, 35.74639, 49.356853, 53.89766...
gaiadr2_3335023207489011456	None	05484292+0755099	3335023207489011456	(15.8017845, 33.094986, 49.905827, 56.932...
gaiadr2_3335024513159069312	None	05485980+0755189	3335024513159069312	(20.21906, 32.593475, 42.89588, 43.24447)
gaiadr2_3334975417389045760	None	05492595+0751087	3334975417389045760	(42.79215, 61.87645, 75.0881, 72.14314)
gaiadr2_3334964525352203648	None	05503856+0746121	3334964525352203648	(10.293749, 18.748781, 26.16957, 31.64015...
gaiadr2_3334965139531175424	None	05502429+0746291	3334965139531175424	(15.30748, 30.953445, 46.87235, 53.336273)
gaiadr2_3334964319193779840	None	05503043+0745203	3334964319193779840	(11.172056, 20.073051, 29.005026, 31.0807)
gaiadr2_3334970740168530560	None	05495358+0744576	3334970740168530560	(25.310698, 50.56815, 75.68982, 85.681404)
gaiadr2_3335021803035855488	None	05490319+0751094	3335021803035855488	(36.948368, 56.103943, 72.558754, 68.0876...
gaiadr2_3334971809616520320	None	05494050+0746574	3334971809616520320	(21.59127, 33.02736, 41.819687, 40.304443)
gaiadr2_3322949916980673408	None	05505719+0738270	3322949916980673408	(17.052788, 34.989002, 56.634804, 60.7238...
gaiadr2_3334958924714627840	None	05500006+0744024	3334958924714627840	(14.3349, 24.238453, 34.35803, 33.90839)
gaiadr2_3334957997001927424	None	05502587+0741515	3334957997001927424	(20.63208, 35.009697, 49.1565, 47.572227)
gaiadr2_3335021906115082624	None	05484989+0750394	3335021906115082624	(28.1891, 41.6916, 54.4486, 50.04661)
gaiadr2_3334957683467953792	None	05500557+0740488	3334957683467953792	(44.92377, 65.202324, 82.598656, 75.41166)
gaiadr2_3334969232636158464	None	05493299+0742482	3334969232636158464	(46.600452, 98.9716, 159.38493, 173.39314)
gaiadr2_3335001187192677888	None	05474391+0750260	3335001187192677888	(25.223001, 35.141724, 43.115704, 40.7312...
gaiadr2_3334974936352715136	None	05492860+0748054	3334974936352715136	(10.673324, 20.972378, 32.731934, 35.6898...
gaiadr2_3335002767740637184	None	05474694+0752049	3335002767740637184	(16.26325, 25.494099, 33.89688, 31.780731)
gaiadr2_3334969125260828672	None	05493437+0742010	3334969125260828672	(27.166864, 41.874405, 57.561527, 52.6976...
gaiadr2_3335025754405587968	None	05481739+0753144	3335025754405587968	(48.19157, 102.272125, 167.62067, 186.043...
gaiadr2_3334998678931964544	None	05482940+0749026	3334998678931964544	(15.074157, 26.379925, 38.557827, 38.0975...

	sobject_id	ra	dec	ra_icrs	dec_icrs	mjd	utdate	epoch	mjd_s	utdate_s	epoch_s	mjd_e											
21	210115000101001	87.748	7.98964	87.748	7.98963	59229.4797	2021-01-15 11:30:46.134	2021.03967	59229.44756	2021-01-15 10:44:28.919	2021.03958	59229.51											
22	210115000101002	87.3517	8.0145	87.3517	8.0145	59229.4797	2021-01-15 11:30:46.134	2021.03967	59229.44756	2021-01-15 10:44:28.919	2021.03958	59229.51											
23	210115000101003	87.0417	8.08769	87.0418	8.0877	59229.4797	2021-01-15 11:30:46.134	2021.03967	59229.44756	2021-01-15 10:44:28.919	2021.03958	59229.51											
24	210115000101004	87.0459	8.07617	87.0459	8.07617	59229.4797	2021-01-15 11:30:46.134	2021.03967	59229.44756	2021-01-15 10:44:28.919	2021.03958	59229.51											
25	210115000101005	87.7575	7.92197	87.7575	7.92197	59229.4797	2021-01-15 11:30:46.134	2021.03967	59229.44756	2021-01-15 10:44:28.919	2021.03958	59229.51											
26	210115000101006	87.0138	7.99506	87.0138	7.99506	59229.4797	2021-01-15 11:30:46.134	2021.03967	59229.44756	2021-01-15 10:44:28.919	2021.03958	59229.51											
27	210115000101007	86.9556	8.01094	86.9556	8.01093	59229.4797	2021-01-15 11:30:46.134	2021.03967	59229.44756	2021-01-15 10:44:28.919	2021.03958	59229.51											
28	210115000101009	86.974	8.04497	86.974	8.04497	59229.4797	2021-01-15 11:30:46.134	2021.03967	59229.44756	2021-01-15 10:44:28.919	2021.03958	59229.51											
29	210115000101010	87.3275	7.91131	87.3275	7.91131	59229.4797	2021-01-15 11:30:46.134	2021.03967	59229.44756	2021-01-15 10:44:28.919	2021.03958	59229.51184	2021-01-15 12:17:03.355	2021.03976	1	10	1	-18440.	4092.47	0.135867	0	(34.52282, 23.59067, 22.0833, 7.596154)	86.8455
30	210115000101011	87.7867	7.81597	87.7867	7.81598	59229.4797	2021-01-15 11:30:46.134	2021.03967	59229.44756	2021-01-15 10:44:28.919	2021.03958	59229.51184	2021-01-15 12:17:03.355	2021.03976	20	11	20	-39207.	4092.47	0.156483	0	(204.1067, 193.4087, 191.3122, 178.3522)	86.8455
31	210115000101012	87.5182	7.87008	87.5182	7.87009	59229.4797	2021-01-15 11:30:46.134	2021.03967	59229.44756	2021-01-15 10:44:28.919	2021.03958	59229.51184	2021-01-15 12:17:03.355	2021.03976	19	12	19	-27307.	4092.47	0.203503	0	(195.8891, 185.1442, 183.0979, 170.0175)	86.8455
32	210115000101013	87.5368	7.85086	87.5368	7.85087	59229.4797	2021-01-15 11:30:46.134	2021.03967	59229.44756	2021-01-15 10:44:28.919	2021.03958	59229.51184	2021-01-15 12:17:03.355	2021.03976	18	13	18	-31752.	4092.47	0.20885	0	(187.5483, 176.8169, 174.8352, 161.6874)	86.8455
33	210115000101014	87.1789	7.91939	87.1789	7.9194	59229.4797	2021-01-15 11:30:46.134	2021.03967	59229.44756	2021-01-15 10:44:28.919	2021.03958	59229.51184	2021-01-15 12:17:03.355	2021.03976	17	14	17	-17221.	4092.47	0.213798	0	(179.2911, 168.5764, 166.5653, 153.3334)	86.8455
34	210115000101015	87.2492	7.92186	87.2492	7.92187	59229.4797	2021-01-15 11:30:46.134	2021.03967	59229.44756	2021-01-15 10:44:28.919	2021.03958	59229.51184	2021-01-15 12:17:03.355	2021.03976	16	15	16	-16322.	4092.47	0.259792	0	(171.1121, 160.4082, 158.4732, 145.1003)	86.8455
35	210115000101016	87.3581	7.85242	87.3581	7.85243	59229.4797	2021-01-15 11:30:46.134	2021.03967	59229.44756	2021-01-15 10:44:28.919	2021.03958	59229.51184	2021-01-15 12:17:03.355	2021.03976	15	16	15	-32100.	4092.47	0.225648	0	(162.8284, 152.0455, 150.1638, 136.774)	86.8455
36	210115000101017	87.6607	7.77003	87.6607	7.77002	59229.4797	2021-01-15 11:30:46.134	2021.03967	59229.44756	2021-01-15 10:44:28.919	2021.03958	59229.51184	2021-01-15 12:17:03.355	2021.03976	14	17	14	-50543.	4092.47	0.269974	0	(154.6183, 143.8646, 142.0207, 128.5542)	86.8455
37	210115000101018	87.6013	7.77475	87.6013	7.77476	59229.4797	2021-01-15 11:30:46.134	2021.03967	59229.44756	2021-01-15 10:44:28.919	2021.03958	59229.51184	2021-01-15 12:17:03.355	2021.03976	13	18	13	-49579.	4092.47	0.281283	0	(146.3476, 135.5692, 133.7916, 120.2175)	86.8455
38	210115000101019	87.6268	7.75564	87.6268	7.75563	59229.4797	2021-01-15 11:30:46.134	2021.03967	59229.44756	2021-01-15 10:44:28.919	2021.03958	59229.51184	2021-01-15 12:17:03.355	2021.03976	12	19	12	-54062.	4092.47	0.301015	0	(138.0437, 127.2692, 125.3964, 111.8438)	86.8455
39	210115000101020	87.4732	7.74931	87.4732	7.74931	59229.4797	2021-01-15 11:30:46.134	2021.03967	59229.44756	2021-01-15 10:44:28.919	2021.03958	59229.51184	2021-01-15 12:17:03.355	2021.03976	11	20	11	-55982.	4092.47	0.23018	0	(129.8894, 119.1043, 117.393, 103.6821)	86.8455
40	210115000101021	87.2633	7.85258	87.2633	7.85258	59229.4797	2021-01-15 11:30:46.134	2021.03967	59229.44756	2021-01-15 10:44:28.919	2021.03958	59229.51184	2021-01-15 12:17:03.355	2021.03976	30	21	30	-32462.	4092.47	0.331603	0	(299.5032, 288.8869, 286.736, 274.1927)	86.8455
41	210115000101022	87.4187	7.78258	87.4187	7.78258	59229.4797	2021-01-15 11:30:46.134	2021.03967	59229.44756	2021-01-15 10:44:28.919	2021.03958	59229.51184	2021-01-15 12:17:03.355	2021.03976	29	22	29	-48327.	4092.47	0.340947	0	(291.1199, 280.4191, 278.411, 265.7315)	86.8455
42	210115000101023	87.7383	7.64083	87.7383	7.64084	59229.4797	2021-01-15 11:30:46.134	2021.03967	59229.44756	2021-01-15 10:44:28.919	2021.03958	59229.51184	2021-01-15 12:17:03.355	2021.03976	28	23	28	-81381.	4092.47	0.328772	0	(282.8669, 272.1612, 270.1795, 257.4044)	86.8455
43	210115000101024	87.5003	7.734	87.5003	7.734	59229.4797	2021-01-15 11:30:46.134	2021.03967	59229.44756	2021-01-15 10:44:28.919	2021.03958	59229.51184	2021-01-15 12:17:03.355	2021.03976	27	24	27	-59526.	4092.47	0.37882	0	(274.3164, 263.6655, 261.6589, 248.8743)	86.8455
44	210115000101025	87.6078	7.69764	87.6078	7.69764	59229.4797	2021-01-15 11:30:46.134	2021.03967	59229.44756	2021-01-15 10:44:28.919	2021.03958	59229.51184	2021-01-15 12:17:03.355	2021.03976	26	25	26	-67927.	4092.47	0.448679	0	(266.0833, 255.383, 253.4619, 240.5405)	86.8455
45	210115000101026	87.2079	7.84428	87.2079	7.84427	59229.4797	2021-01-15 11:30:46.134	2021.03967	59229.44756	2021-01-15 10:44:28.919	2021.03958	59229.51184	2021-01-15 12:17:03.355	2021.03976	25	26	25	-34655.	4092.47	0.408503	0	(257.665, 246.964, 245.0635, 232.0986)	86.8455
46	210115000101027	87.5232	7.68019	87.5232	7.6802	59229.4797	2021-01-15 11:30:46.134	2021.03967	59229.44756	2021-01-15 10:44:28.919	2021.03958	59229.51184	2021-01-15 12:17:03.355	2021.03976	24	27	24	-72269.	4092.47	0.406687	0	(249.2254, 238.5229, 236.6067, 223.6278)	86.8455
47	210115000101028	87.3875	7.71344	87.3875	7.71343	59229.4797	2021-01-15 11:30:46.134	2021.03967	59229.44756	2021-01-15 10:44:28.919	2021.03958	59229.51184	2021-01-15 12:17:03.355	2021.03976	23	28	23	-64724.	4092.47	0.393176	0	(240.9167, 230.1882, 228.353, 215.2637)	86.8455
48	210115000101029	86.933	7.84056	86.933	7.84056	59229.4797	2021-01-15 11:30:46.134	2021.03967	59229.44756	2021-01-15 10:44:28.919	2021.03958	59229.51184	2021-01-15 12:17:03.355	2021.03976	22	29	22	-36737.	4092.47	0.349474	0	(232.479, 221.8021, 219.9245, 206.8222)	86.8455
49	210115000101030	87.3692	7.80142	87.3692	7.80141	59229.4797	2021-01-15 11:30:46.134	2021.03967	59229.44756	2021-01-15 10:44:28.919	2021.03958	59229.51184	2021-01-15 12:17:03.355	2021.03976	21	30	21	-44045.	4092.47	0.560785	0	(224.0921, 213.3823, 211.564, 198.3933)	86.8455
50	210115000101032	86.9456	7.86803	86.9456	7.86803	59229.4797	2021-01-15 11:30:46.134	2021.03967	59229.44756	2021-01-15 10:44:28.919	2021.03958	59229.51184	2021-01-15 12:17:03.355	2021.03976	39	32	39	-30275.	4092.47	0.438346	0	(389.9877, 379.4101, 377.2635, 365.2936)	86.8455

Using reduced GALAH data

Fits files structure

- Always 8 extensions
- The same wavelength solution in all extensions
- Linear wavelength solution
- Info, parameters from the database are also in the headers
- Which spectra were combined is given in the **headers only**!