The AF2 reduction pipeline

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Introduction

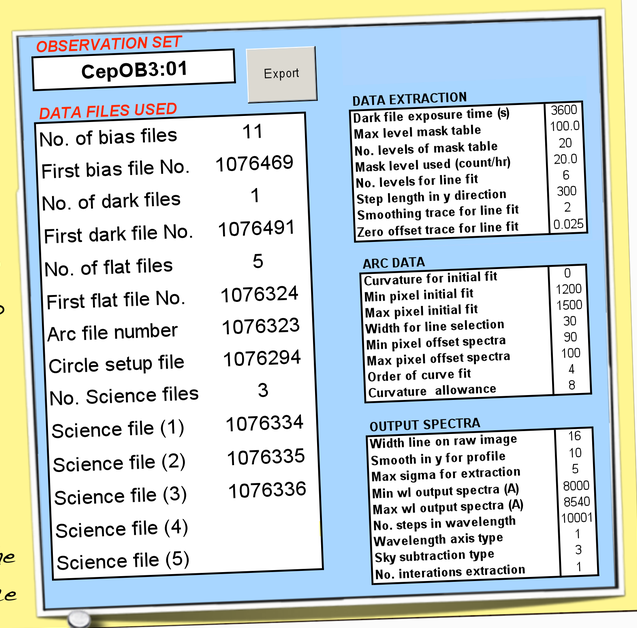
We present a new reduction pipeline for AF2/WYFFOS (AutoFib2/Wide Field Fibre Optical Spectrograph). This software, written in IDL and soon publicly available, is able to perform full data reduction (including fibre to fibre sensitivity corrections and optimal extraction of the individual spectra) for a broad range of observing strategies. A quick-look version of the pipeline will also be available for carrying out real-time, preliminary reductions at the telescope while carrying out observations. This package is designed to be readily extensible to other fibre-fed spectrographs.

1. Graphical User Interface (GUI)

- The user specifies the data files for an observation set including the calibration files via a GUI.

-Data can be easily visualised and inspected with the IDL ATV package.

- Quicklook option: an (even more) user-friendly, on-the-fly quicklook version of the pipeline will be available to observers so observing is all they have to worry about.



Development version of the Graphical User Interface

2. Automated data reduction

- The software automatically subtracts a master bias, traces the fibres, performs flat-field correction and masks bad pixels in the science data.

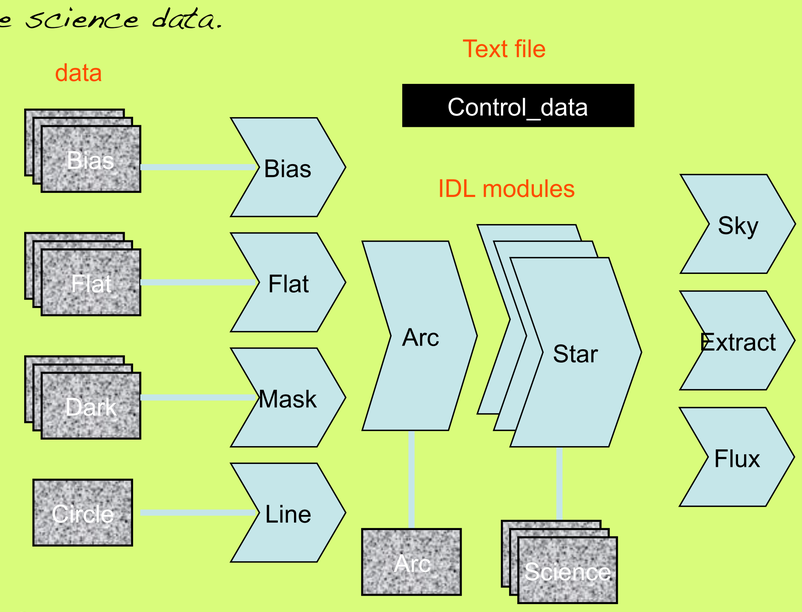
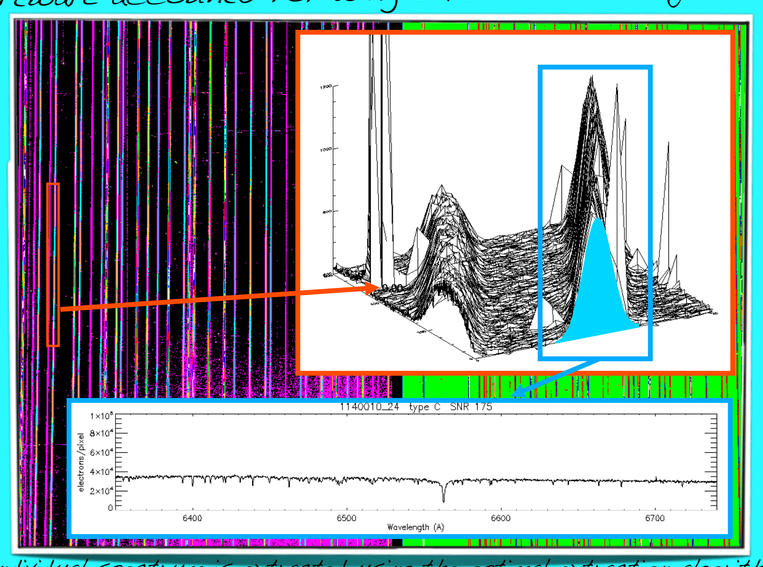


Diagram showing the process of the data reduction pipeline

3. Extraction of spectra

- An optimal extraction algorithm is used for extracting the spectra (a boxcar algorithm can optionally be used, e.g. for emission-line spectra).

- The software accounts for wing emission from adjacent fibres.

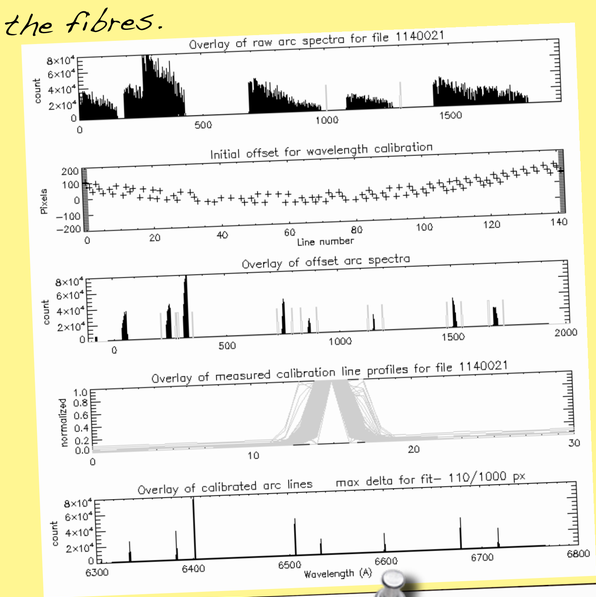


Each individual spectrum is extracted using the optimal extraction algorithm

4. Wavelength calibration

- The software selects an arc lamp spectrum from a fibre near the centre of the chip. The user is then prompted to identify the principle arc lines; other significant lines are automatically identified.

- Upon user's approval, the dispersion solution is propagated to the rest of the fibres.



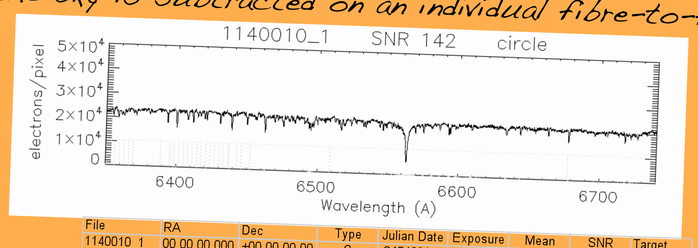
1140021 Line No.	Ne IC4665, Max Delta (Pixels)
0	0.005
1	0.006
2	0.003
3	0.003
4	0.006
5	0.007
6	0.000
7	0.005
8	0.004
9	0.004
10	0.000
11	0.006
12	0.003
13	0.002
14	0.005
15	0.000
16	0.006
17	0.003
18	0.000
19	0.008
20	0.004
21	0.115
22	0.094
23	0.000
24	0.006

Development version of the wavelength calibration procedure

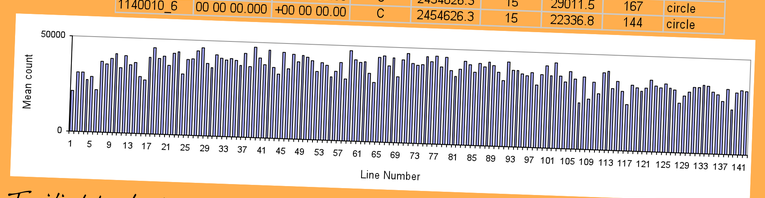
5. Sky subtraction

- If some fibres were assigned to sky, a median sky spectrum is generated, scaled to the target fibre sensitivity, and subtracted from each science spectrum.

- If, on the contrary, sky frames were taken by applying an offset to the telescope, the sky is subtracted on an individual fibre-to-fibre basis.



File	RA	Dec	Type	Julian Date	Exposure	Mean	SNR	Target
1140010_1	00 00 00.000	+00 00 00.00	C	2454626.3	15	21155.0	143	circle
1140010_2	00 00 00.000	+00 00 00.00	C	2454626.3	15	31021.2	174	circle
1140010_3	00 00 00.000	+00 00 00.00	C	2454626.3	15	30996.3	173	circle
1140010_4	00 00 00.000	+00 00 00.00	C	2454626.3	15	27402.1	162	circle
1140010_5	00 00 00.000	+00 00 00.00	C	2454626.3	15	29011.5	167	circle
1140010_6	00 00 00.000	+00 00 00.00	C	2454626.3	15	22336.8	144	circle

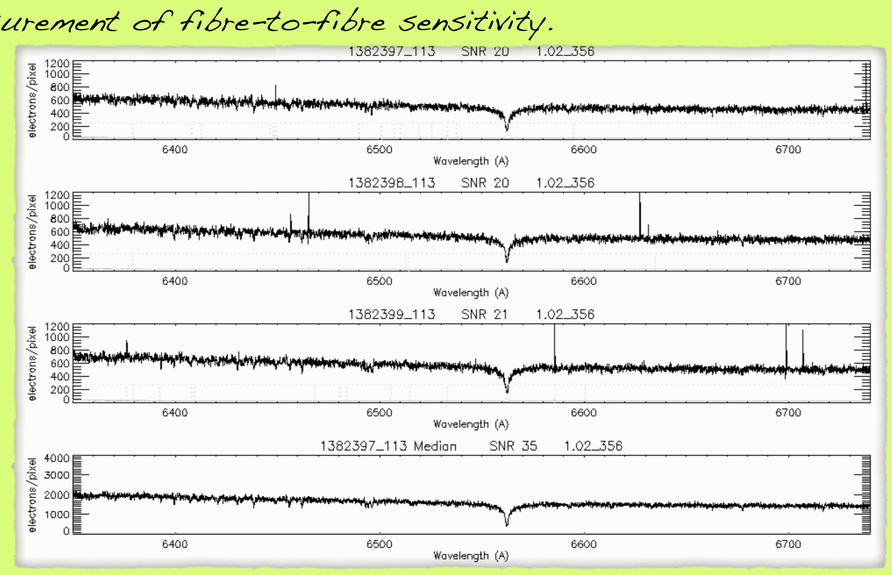


Twilight sky image giving the relative fibre-to-fibre sensitivity

6. Output files

- The pipeline generates fits files containing the base and sky subtracted spectra (with their associated uncertainties) transformed onto a common wavelength base.

- The intensity is normalised according to the most recent measurement of fibre-to-fibre sensitivity.



An example of the combined final spectrum (bottom) of a F star in the χ Per open cluster