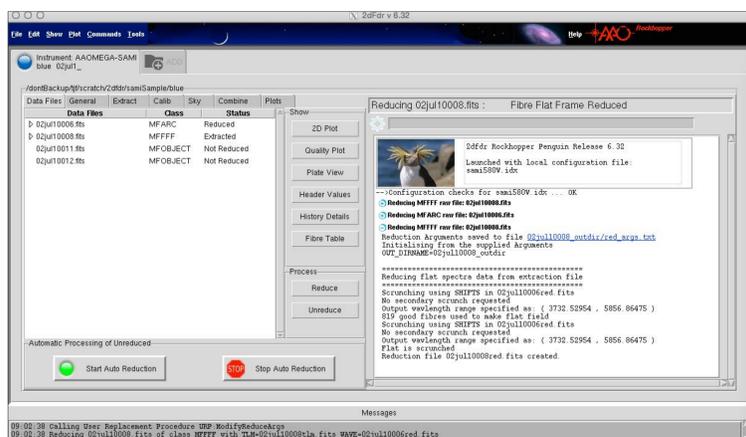


# AAO 2dFdr - 1 million spectra and counting

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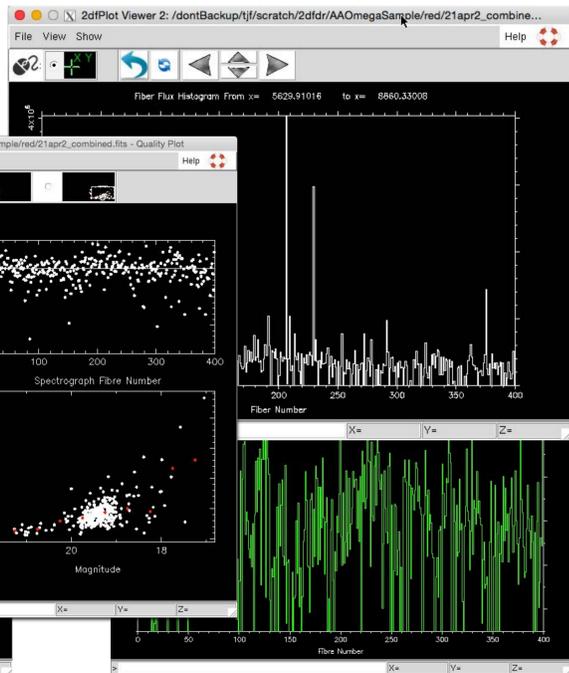
2dFdr processing SAMI (Multi Object IFU with AAOmega) data in batch mode

**2dFdr (2dF - DR) is the AAO's fibre spectrograph data reduction package.**

**2dFdr originated in the early 90s as the pipeline reduction package for the AAO's 2dF Instrument<sup>6</sup>. The early target was spectral extraction for large scale redshift surveys.**

2dFdr is flexible enough to enable adaption to support different fibre spectrographs, instruments and surveys. Algorithms can be selected based on the instrument or user options and if not explicitly specified, the software selects the configuration based on the data in the current directory.

Currently supports the AAOmega spectrograph in each of its modes (2dF (MOS), SAMI (Multi-object IFU) and KOALA (large IFU), and the HERMES Spectrograph. Historical support at various levels exists for various older instruments (6dF, AAOmega Spiral IFU, FMOS)

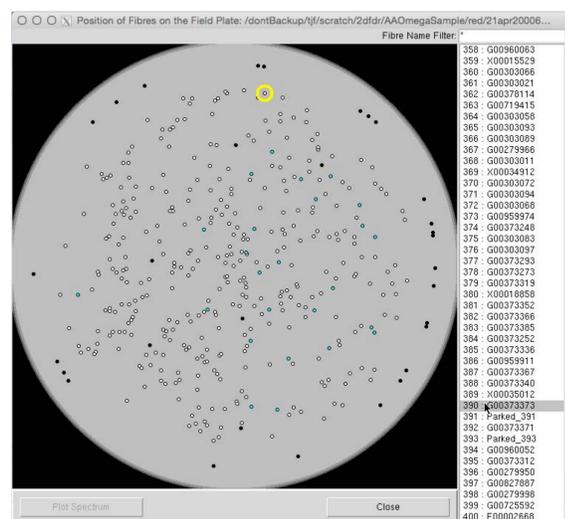


2dFdr provides an assortment of plots to assist in the assessment of the data

Left - sky flux, middle - a collection of common quality plots, right fibre throughput, upper right: fibre flux histogram

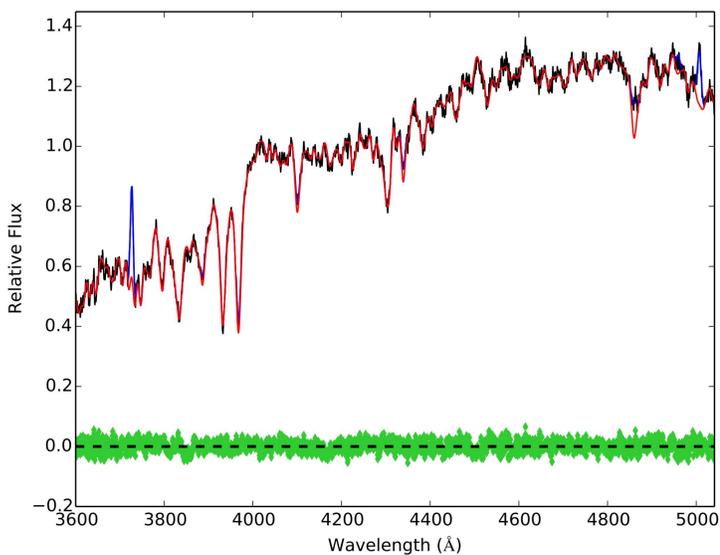
**2dFdr is now much more than redshift survey tool - it extracts high quality spectra, pushing the limits of what can be achieved with the spectrographs**

**2dFdr can now secure redshifts for objects that were many times fainter than what was typically done with 2dF and AAOmega**



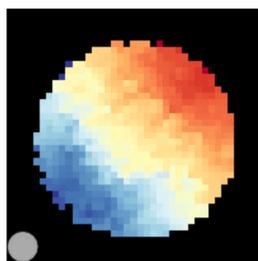
2dF plate view plot

Quickly allows you to associate a plate position with an object and slit position



The co-added spectrum of 300 LRGs (in black), together with a fit (in red and blue). Residuals are in green.

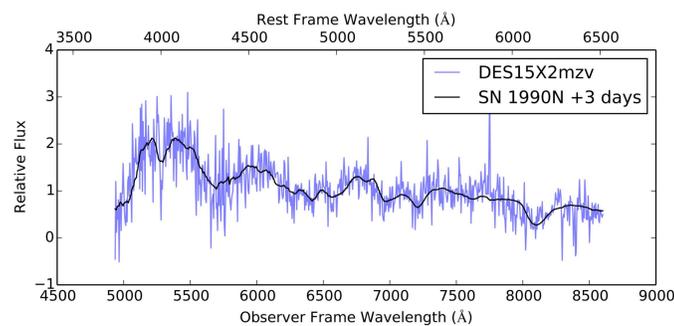
The mean magnitude of the LRGs that went into this spectrum was  $r=22.5$ . Note how all the bumps and wiggles in the data have counterparts in the fitted spectrum. The blue lines are emission lines due to oxygen and hydrogen and are not part of the template. From this spectrum, we can estimate the age of stars in the galaxy and their composition



A Velocity map produced from a SAMI IFU Probe (61 fibres).

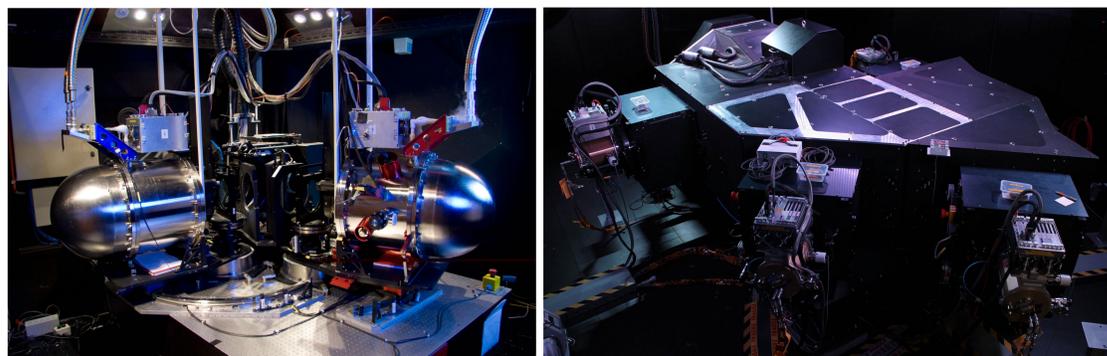
Each pixel corresponds to a spectra reduced with 2dFdr.

**The Improvements allow the OzDES survey (currently underway) to reach targets that are about 50 times fainter than was achieved with the GAMA survey completed in 2014**



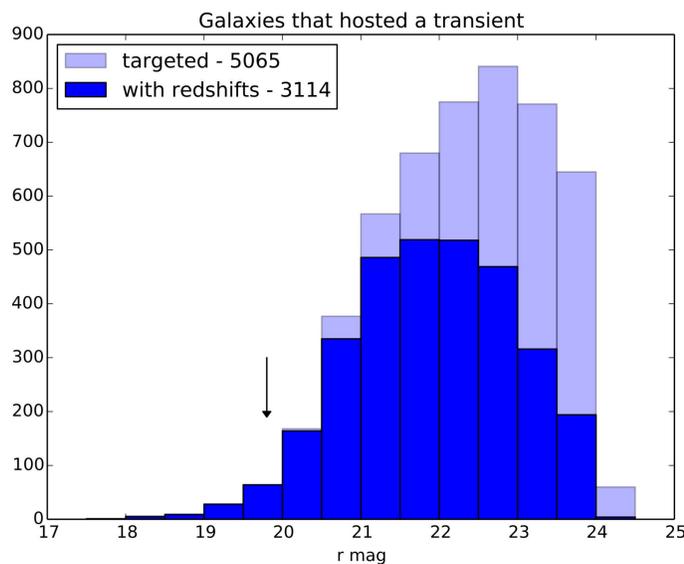
A Type Ia SN at  $z=0.32$  a few days past maximum light, showing the characteristic 'W' feature' due to sulfur at 5400 Angstroms (rest wavelength) and a broad dip at 6100 Angstroms that is due to silicon.

Classifying the SNe before the recent changes to 2dFdr would not have been possible. In Blue is the spectrum of the SN, in black is a local SN plotted for comparison.



Examples of the spectrographs supported by 2dFdr - Left the 2 channel AAOmega Low/Medium resolution spectrograph, right the 4 channel HERMES high resolution spectrograph.

Both of these spectrographs can be fed with 396 fibres from the AAT's 2dF instrument. AAOmega also has two IFU feeds (SAMI and KOALA) which are supported by 2dFdr.



The magnitude distribution of galaxies targeted by OzDES. Galaxies with with redshifts are in dark blue. Galaxies that have been targeted are in light blue.

The difference between the two represents galaxies that do not yet have a redshift. As the OzDES survey proceeds and the integration builds up, the number of galaxies without redshift will decrease. The magnitude limit of the GAMA survey, which was completed in 2014, is represented by the vertical arrow. The faintest objects in OzDES are about 50 times fainter. Without the improvements that have been made to 2dFdr, OzDES would not have been able to get as many redshifts at these faint limits as it has.

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