

Chapter 11 : Spectra - Combining Individual Spectra and Fitting Continua

After reducing the data to flux calibrated spectra per observation, several more steps are necessary before optimal (lowest possible systematic and random errors) physical measurements can be derived from the data.

11.1 : Wavelength Corrections and Alignments

Since the wavelength calibrations described in chapter 10 used air wavelengths, it was necessary to apply an air-to-vacuum correction ($\sim +1\text{\AA}$) before averaging the spectra. Also, for accurate comparison of spectra between epochs, a correction to the heliocentric rest frame (between -0.5\AA and $+0.5\text{\AA}$) was applied.

Given that we want to compare spectra for each QSO over all epochs, we wish to place all the spectra on a standard wavelength scale. We have chosen to divide the observations into four resolution/aperture categories: (1) high resolution, $\sim 3\text{\AA}$ ($\sim 180\text{ km s}^{-1}$ at 5000\AA), (2) moderate resolution, $\sim 7\text{\AA}$ ($\sim 420\text{ km s}^{-1}$), (3) low resolution, $\sim 12\text{\AA}$ ($\sim 720\text{ km s}^{-1}$), and (4) large aperture (LA) observations (slit size in the dispersion direction $\gtrsim 4$ arcseconds). We use these four terms (high, medium, low, and LA) to refer to the resolution/aperture of spectra throughout this thesis. Note that these terms tend to have different meanings in the literature; in particular, “high resolution” usually means $\lesssim 1\text{\AA}$ resolution.

Each of the original non-flux-calibrated, polynomial wavelength-scale spectra were divided into one of these four categories and re-aligned (*i.e.* re-binned using Vista Lagrangian interpolation) to linear scales with dispersions (\AA per pixel) of 1.2, 2.5, 4.0, and 4.0, respectively, and a fixed wavelength/pixel coordinate (3000\AA at pixel number 1). At the same time, the vacuum and heliocentric corrections were applied. This ensures that in all future analysis the pixels within each spectra will match and no further re-binning will be necessary.