Adaptive Filtering of Echelle Spectra of distant Quasars

A. Priebe. D.-E. Liebscher H. Lorenz, G.-M. Richter

Astrophysical Institute Potsdam. Germany

The study of the $Ly \alpha$ – forest of distant ($z > 3$) Quasars is an important tool in obtaining a more detailed picture of the distribution of matter along the line of sight and thus of the general distribution of matter in the Universe and is therefore of important cosmological significance. Obviously this is one of the tasks, where spectral resolution plays an important role.

The spectra we used. were obtained with the EFOSC at the ESO 3.6m telescope. Applying for the data reduction the standard Echelle procedure. as it is implemented for instance in the MIDAS-package, one uses stationary filters (e.g. median) for noise and cosmic particle event reduction in the 2-dimensional Echelle image. These filters are useful if the spatial spectrum of the noise reaches essentially higher frequencies then the highest resolution features in the image. Otherwise the resolution in the data will be degraded and the spectral lines smoothed. However, in the Echelle spectra the highest resolution is already in the range of one or a few pixels and therefore stationary filtering means always a loss of resolution.

We developed an Echelle reduction procedure on the basis of a space variable filter described by Richter [1] (see also [2]) which recognizes the local resolution in the presence of noise and adapts to it. It will be shown that this technique leads to an improvement in resolution by a factor of 2 with respect to standard procedures.

References

[1] Richter G. M.: 1978, Astron. Nachr.. **299**, 282.

[2] Richter, G. M., P. Böhm, H. Lorenz and A. Priebe: 1991, Astron. Nachr., **312**, 346.