DO LUMINOUS QSOS HAVE SOFTER UV SPECTRA ?

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We present a comparison of well defined continuum slope distributions for QSOs found in the LBQS (Chaffee, F.H. et al. 1991, Astron. J., 102, 461 and references therein) and in the Hamburg–ESO–survey (hereafter HES) (Reimers, D. 1990, The messenger 60, 13).

The method for the determination of power–law indices of the LBQS QSO sample is described by Francis (Francis, P.J. 1993, ApJ 407, 519): transformation of all spectra in the quasar rest–frame; defining three pairs of continuum windows in the quasar rest–frame avoiding emission lines: 1430–1480 Å and 2150–2230 Å , 2150–2230 Å and 3020–3100 Å , 3020–3100 Å and 4150–4250 Å; fitting power–laws ($f_\nu \propto \nu^\alpha$) to all QSO–spectra containing one of these pairs.

For a direct comparison we applied the same method to the HES long slit QSO spectra. The measured mean continuum slopes are :

$$z = 0.2 \text{ to } 0.5 : <\alpha_{LBQS}> = +0.3 \, , <\alpha_{HES}> = -0.18$$
$$z = 0.7 \text{ to } 1.1 : <\alpha_{LBQS}> = -0.8 \, , <\alpha_{HES}> = -0.95$$
$$z = 1.6 \text{ to } 1.9 : <\alpha_{LBQS}> = -0.5 \, , <\alpha_{HES}> = -1.03$$

Since blue objects are easier to find we conclude that the dominance of softer spectra in the HES sample is real and not effected by selection effects.

Francis (1993, see above) has pointed out in principal that it is not possible to obtain the true mean continuum slope of the QSO population in a given redshift range without taking into account the survey brightness limits, a dispersion in the continuum slopes and individual K–correction. For this reason we simulated a survey on a virtual QSO population: Each QSO gets an absolute magnitude by the LF (Hewett, P.C., Foltz, C.B., Chaffee, F.H. 1993, ApJ 406, L43), a random z in an initial z–range and an individual α scattered randomly around α_0 (with a gaussian distribution of half width $\Delta\alpha = 0.5$). At last an apparent brightness for each QSO is calculated using its individual α for the K–correction. Adopting the survey limits of HES (B = 14 to 17.5) and LBQS (B = 16.5 to 18.85) together with the redshift ranges given above we can obtain virtual QSO subsamples with mean continuum slopes now comparable to the measured values (see above).

We can show that a linear correlation between α_0 and M_{abs} ($\alpha_0 = b + a \cdot M_{abs}$, $a = 0.4 \pm 0.1$, $b = 9.4 \pm 0.05$) is valid over a z range from 0.2 to 1.9 covering a dynamic range of nearly 5 magnitudes in each bin (see above). Our result is in strong contrast to Zheng & Malkan (Zheng, W.,Malkan ,M. 1993,ApJ 415, 517). Since their QSO sample is not separated in redshift bins evolution effects are very likely. Francis (1993, see above) has shown that high–redshift QSOs have intrinsically harder slopes than low redshift QSOs.

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