ANALYSIS OF 6-FREQUENCY SIMULTANEOUS OBSERVATIONS OF 170 COMPACT EXTRAGALACTIC OBJECTS IN 1995–1996: A STATISTICS OF MAIN SPECTRA PARAMETERS

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ABSTRACT. Results of instantaneous spectra observations, carred out at the RATAN–600 during six sets in 1995–1996, are used. We analyse a behaviour of an effective width of spectra, turnover frequency and maximal flux density.

Key words: radio continuum: galaxies — galaxies: compact — quasars: general — BL Lacertae objects: general

Introduction

The question on the common and differencies in the nature of quasars an BL Lacs is studied by many authors during many years. In some papers the authors find such differencies (Valtaoja et al., 1988), in the others — not. It is important that analysed multifrequency spectra was not simultaneous, as a rule. As a result, some main conclusions may be not correct, because the sources are *variable.*

On this reason, it is interesting to do analysis, using do simultaneous observations on many frequencies for many sources. First such analysis in Kovalev (1996) had been done for instantaneous 7-frequency observations in a set of 1989 for 113 objects.

Observations

The preliminary results of instantaneous multifrequency spectra observations at the wavelengths of 31, 13, 7.6, 3.9, 2.7 and 1.4 cm, carried out at the RATAN–600 during six sets in Juli, August, October, December of 1995 and March, Juni of 1996, are used (spectra have been presented in Kovalev et al., 1997).

It is studied a sample of about 170 sources with declination $-30° \div +43°$, 146 of which are the full sample with correlated flux density more than 0.5 Jy at the frequency 2.3 GHz in the VLBI–servey by Preston et al. (1985).

Procedure of Calculations

Using Landau et al. (1996), all spectra before calculations had been transformed to the rest frame of the sources, and then they had been approximated by

$$\log F_\nu = C + (\log \nu - B)^2/2A\,,$$

where F_ν is the flux density, ν — frequency, recalculated to the rest frame of a source. Details on the parameters A, B, C see on the figure 1. There are not used the parameters with great errors, for calibration sources and if $A > 0$, because they have not a sence in the last case. For the each source, the parameters are calculated for the each set and then are averaged with their weights.

Results and Discussion

The strong differences in distribution of parameters A, B, C are absent for 3 studied subgroups of objects (see figure 1). Subgroups for quasars, BL Lacs and other sources have one approximately common peak in the each distribution. Average values of A, B, C are nearly the same for different types of objects. Kolmogorov–Smirnov test on the 5% significance level supports a hypothesis on the identical distribution of different types of objects on the parameters A, B, C.

A comparizon of figures 1 here with the figure 2 from the paper by Landau et al. (1986) gives, that the peak values of parameters B and C are similar. I'd like to emphasize, that similarity of peaks for parameter B has a principial importance. It can be made a conclusion, that high frequency limiting at 22 GHz in presented work did not influence on true deriving a turnover frequency, because the highest frequency, used in Landau et al. (1986) paper, is much higher than 22 GHz.

A tendence for quasars and BL Lac's to be located in different regions of $C - B$ space, as in Valtaoja et al. (1988), is absent.

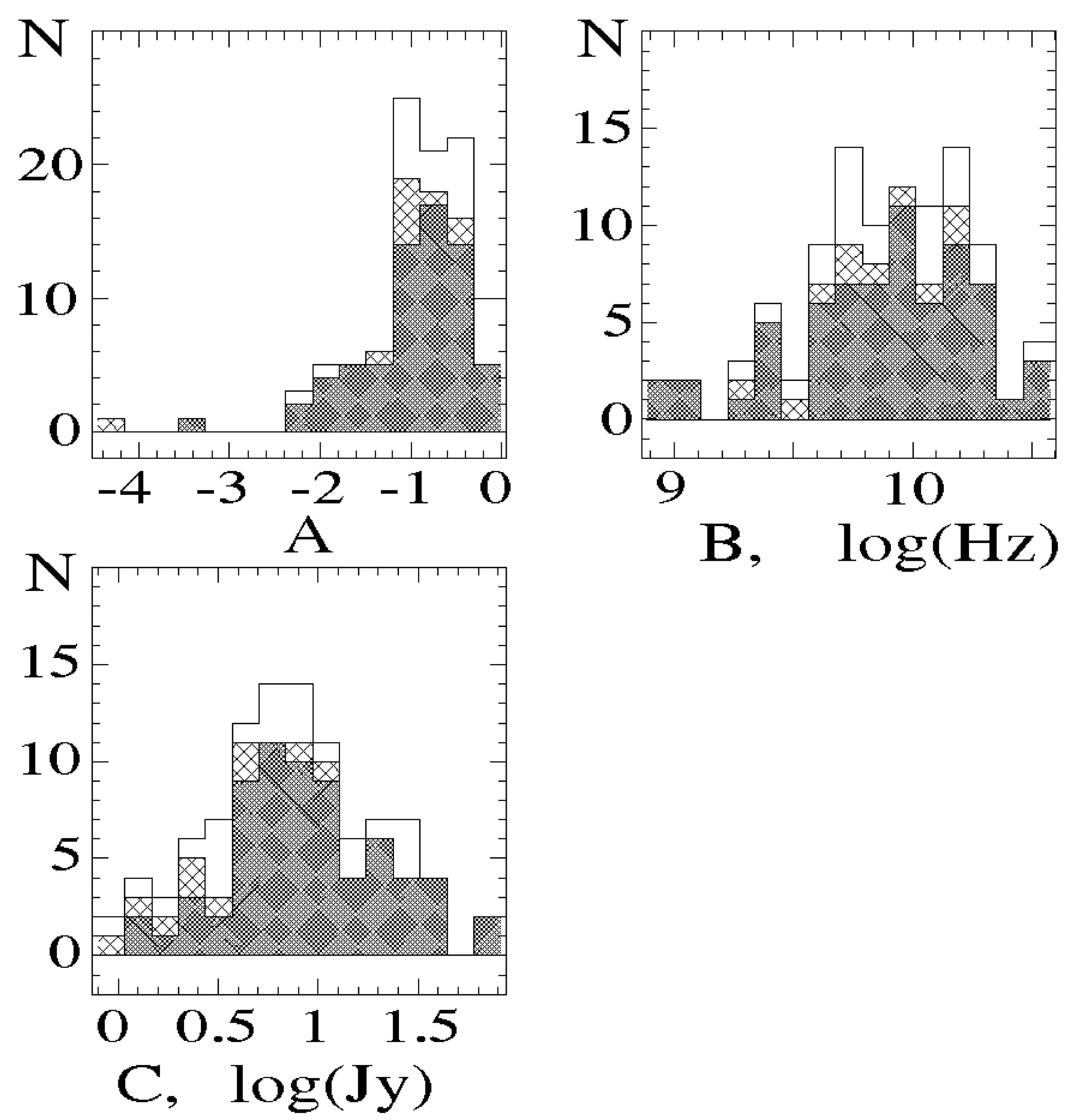

Figure 1. Histogram of the spectral parameters A (a), B (b), C (c) for sources in the sample (A is an effective width of spectra, B is a logarithm of the turnover frequency, C is a logarithm of the maximal flux density). It is blacked for quasars, shaded — for BL Lacs, open — for other sources.

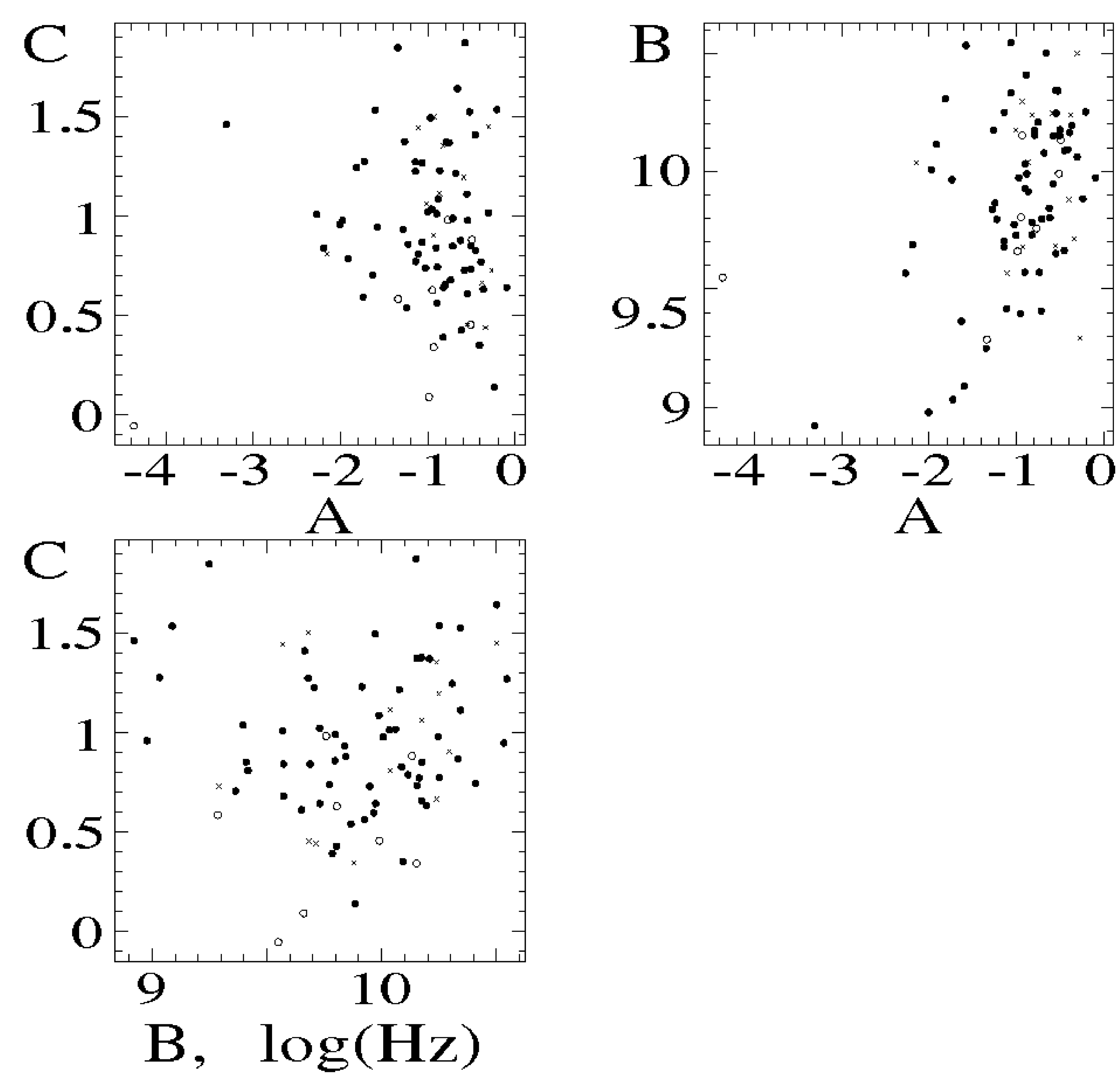

Figure 2. Dependences for C versus B (a), C versus A (b) and B versus A (c): filled circles — for quasars, open circles — for BL Lac's, cross – for the other sources. The ordinate is marked in log(Jy).

Table 1. Correlation of the spectral parameters.

Optical ID	Number of objects	Correlation Coefficients (Probabilities)		
		(A,B)	(A,C)	(B,C)
Quasars	67	0.448 (> 99.9%)	0.204 (90.1%)	0.002 (< 10.%)
BL Lac objects	10	0.479 (83.8%)	0.588 (92.9%)	0.206 (43.4%)
Other	22	0.125 (42.0%)	0.323 (85.2%)	0.266 (76.7%)
All sample	99	0.378 (> 99.9%)	0.070 (50.5%)	0.088 (61.4%)

Unfortunately (or fortunately) we did not obtain *again any* correlation between maximal flux and its turn over frequency (see figure 2 and table 1). Correlation between (A,B) parameters has been found (see table 1). This result may shown a decreasing a number of independent parameters, by which the spectra are characterized. This conclusion is in agreement with the results by Landau et al. (1986), Valtaoja et al. (1988). General results are in agreement with Kovalev (1996).

Summary

1. Obtained distribution testify in the favour to common physical nature of quasars and BL Lacs.
2. Correlation between the peak flux density and its frequency is absent.
3. The peak histogram value of the turnover frequency is about 10 GHz in the local frame of the source.

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