

PHOTOELECTRIC OBSERVATIONS OF CONTINUOUS AND EMISSION LINES VARIABILITY IN SPECTRA OF SEYFERT GALAXY NGC 1275 NUCLEUS

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The spectral observations of NGC 1275 nucleus in the range of 3700-7000 AA being carried out since 1971 to 1978 showed the existance of hydrogen and forbidden emission lines variability with the time scale of 5-6 and 1-2 years (Pronik, 1980). Observations on 6-m telescope during 4 nights in January, 1977 permit to reveal the scale variability of these lines 2-3 days, too (Merkulova, Pronik, 1985). These results evidenced the necessary of close photoelectric series of spectral observations of the galaxy nucleus with the filling factor of several days and hours.

The central region of NGC 1275 galaxy is being observed on the 1.25-m telescope of Crimean observatory with the scanning spectrophotometer ASP-38 and offset photoguide using the pulse counting technique. The entrance aperture was 10". During the observations the seeing was 2"-3" and zenith distances of NGC 1275 did not exceed 60°.

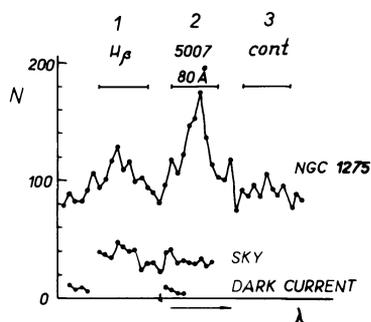


Fig.1. Scan of the NGC 1275 nucleus. Explanations see in the text.

Before the observation each night we made test scans of the galaxy. One of them is given in Fig.1. It is obtained with the scanning step equal to 10 Å and the exit slit equal to 40 Å. While scanning the central region of the galaxy the exit slit was 80 Å. It is centered consecutively at one of the three regions of the spectrum, which with due regard to the redshift corresponded to H_β, 4959+5007 Å [OIII] and continuum located by 100 Å redward from [OIII] doublet: 1, 2, 3 correspondingly in Fig.1.

The thorough analysis showed that the errors of observations did not exceed 10% (Merkulova, 1986; Merkulova, Metik, Pronik, 1987).

The central region of NGC 1275 galaxy was observed from November 12, 1982 till March 5, 1984. During 12 nights 101 series of observations were made in succession: the sky background- the comparison star- the galaxy. The sky background was measured 5' northward from the galaxy nucleus. As a com-

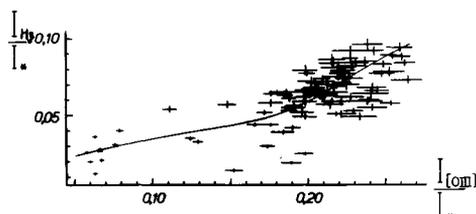


Fig.2. Relation between the intensities of H_{β} and $[OIII]$ lines in the NGC 1275 nucleus. Horizontal and vertical lines—r.m.s. errors of one observation.

parison star we used the star (2' northward from NGC 1275 nucleus) from the list by V. Lyutyi (1972). One series of observation was about half an hour long.

After the sky background had been subtracted the data in whole were used to compute the ratios of nucleus and the comparison star intensities: I_1 / I_* , I_2 / I_* , I_3 / I_* and

then we calculate:
$$\frac{I_1 - I_3}{I_*} = I_{H_{\beta}} / I_* ;$$

$$\frac{I_2 - I_3}{I_*} = I_{[OIII]} / I_* .$$
 The latter were adopted as relative intensities of the nucleus in H_{β} and $[OIII]$ lines and the comparison star and I_3 / I_* —as I_{cont} / I_* —relative intensities of nucleus continuum and the comparison star. The first two ratios are typical for the nucleus and the latter—for the central region within 10" in diameter.

Analysis of obtained values of $I_{H_{\beta}} / I_*$, $I_{[OIII]} / I_*$ and I_{cont} / I_* show that there is synchronous variations of fluxes in H_{β} and $[OIII]$ lines (see Fig.2). Both values vary by more than twice. These data confirm the results of a number of papers, that the equivalent widths of H_{β} and $[OIII]$ lines in the spectrum of NGC 1275 galaxy vary synchronously (Merkulova, Pronik, 1983; Pronik, 1980; Doroshenko, Terebizh, 1983).

According to the cited papers equivalent widths of H_{β} and $[OIII]$ lines and the continuum flux of NGC 1275 nucleus are varying in the inverse dependence. Let us turn to Fig.3. Here the absciss shows the values of I_{cont} / I_* and the ordinate— $I_{[OIII]} / I_{cont}$ which are connected with the equivalent widths synonymously. Evidently, the correlation is complex: the most part of data are located on the straight lines which indicate the inverse correlations of $I_{[OIII]} / I_{cont}$ and I_{cont} / I_* . Parameters characterizing the ratio of these values depend on the time of observations. As a rule they are maintained during the period equal to one night (up to 8 hrs).

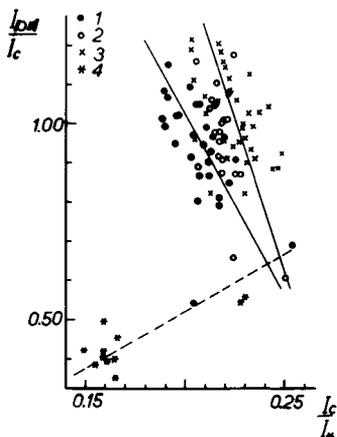


Fig.3. Relation of relative intensities of lines and continuum in the NGC 1275 nucleus. Each symbol (1-4) corresponds to one or several days of observations.

Fig.3 shows, too, that one of 12 nights revealed a direct correlation of $I_{\text{[OIII]}}/I_{\text{cont}}$ and $I_{\text{cont}}/I_{\text{*}}$ (as labeled by asterisks). During this night the least values of fluxes as in H_{β} and [OIII] lines so in continuum were observed. The analogous phenomenon - strong decrease of H_{β} line flux had been noticed by us earlier while analysing the spectra of NGC 1275 nucleus obtained on 6-m telescope (Merkulova, Pronik, 1983). We had 23 series of the nucleus spectra observations and only one of them showed such a phenomenon. Now it has been found in one of 12 nights. Really the phenomenon is very rare. But since we had observed it twice on the spectra obtained by different technique and on different telescopes, we are inclined to suspect that it cannot be explained only in terms of instrumental or other errors. In order to investigate the phenomenon of strong decrease of the emission lines fluxes and continuum, long-term and desirably patrol observations of NGC 1275 galaxy nucleus are needed.

Synchronous variations of H_{β} and [OIII] lines evidence that they originated in the adjacent regions in the gaseous envelope of the galaxy nucleus. But there exist some features of a-synchronous variations. Therefore we may conclude that the regions emitting H_{β} and [OIII] lines coincide only partially.

So our photoelectrical observations confirm our previous data on rapid variations in the NGC 1275 nucleus spectrum.

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