# KINEMATICAL AND SPECTRAL EVIDENCES OF COMPLEX STRUCTURE OF NGC 1275 NUCLEUS

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ABSTRACT. The analysis of the available data about spectral observations of nucleus and gas velocity field in NGC 1275 leads to a conclusion on the presence in the nucleus of several spatially separated variable sources responsible for a complex variable emission in $H_\beta$ and [OIII] lines profiles.

The asymmetry of the [OIII] line profile in the spectra of NGC 1275 nucleus was noticed by Seyfert [1] . In 1967 Dibaj and Esipov [2] showed, that the asymmetry is due to the presence of a blue component separated from the maximum by 13 Å. In 1970 Anderson [3] published the [OIII] line profile as absolutely symmetrical. Numerous observations of NGC 1275 nucleus spectra on 2.6 meter telescope of the Crimean Astrophysical observatory allowed I. Pronik [4,5] to conclude, that the profile and the intensity variations of the [OIII] lines arise due to variations of the blue wing of the line. In 1976 Kingham and O'Connell [6] obtained $H_\beta$ and [OIII] lines profile during intensive nuclear bursts. They have pointed out, that the observed flux in respect to that obtained by Shields and Oke (1975) [7] is by 60% lower in $H_\beta$ line and by 18% higher in [OIII] lines. As a result the ratio $N_1 + N_2$ [OIII]/$H_\beta$ became equal to 8.7 instead of 4.7 which had been obtained by Shields and Oke [7] . Kingham and O'Connell [6] also noticed, that the observed width of [OIII] line at zero intensity and at half intensity are twice as large as communicated by Anderson [3].

In 1981 Heckman et al., [8] published the $H_\beta$ and [OIII] lines profiles from which it is clear that the ratio $N_1+N_2$ [OIII]/$H_\beta$ significantly differs for the blue and the main component (see Fig. 1). We attempted to separate two components in the profile that yeiled the following results : the intensities of the main and blue components are as 1:0.18 in $H_\beta$ emission and as 1:0.18 for [OIII] lines. From the profiles obtained by Heckman et al. follows, that i) the ratio of total fluxes $N_1 + N_2$ [OIII]/$H_\beta$ = 4.73 (the same as shown by Shields and Oke (1975) [7] ); ii) for the main component this ratio equals to 4.4, which is lower



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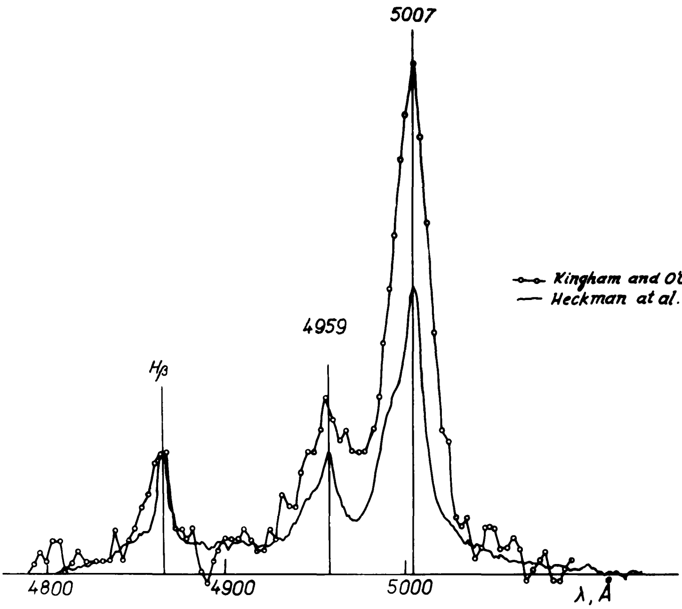


Figure 1. The comparison of Hβ and N1+N2 [OIII] line profiles according to Kingham and O'Connell [6] and Heckman et al., [8]. The vertical axis has an arbitrary scale, the coincidence of Hβ contours height is accidental.

than that obtained by Anderson (1970) : $N_1+N_2$ [OIII] = 5.5 (in the absence of blue component [3] ); iii) for the blue component the ratio $N_1+N_2$ [OIII] /Hβ = 8 (Kingham and O'Connell (1979) [6] obtained the ratio equal to 8.7 for the sum of both components). The value of $N_1+N_2$ [OIII] /Hβ according to douzen-year observations of Chuvaev at 2.6-m telescope of the Crimean observatory varies from 3.3 to 6.9; according to the observational data of I. Pronik [10] it varies from 2.5 to 8. Really the blue component variations cannot lead to such drastic changes of the sum of fluxes $N_1+N_2$ and Hβ , thus the main component of the profiles (especially of Hβ line) should also change its intensity, that had been observed by Kingham and O'Connell and by Merkulova and I. Pronik [11]. All stated above allows a conclusion, which in its turn advances the idea promoted by Shklovskij in 1978 [12] , that like at 1.3 cm radiowave two spatially separated variable radiosources are observed in the nucleus of NGC 1275, so in optical range two variable sources should be observed responsible for time variations of emission in blue and main components of the lines.

The situation with the gas velocity field in NGC 1275 proves to be even more complicated (according to the observations of Burbidge, Burbidge (1965) [13], and Rubin, Ford, Peterson and Lynds

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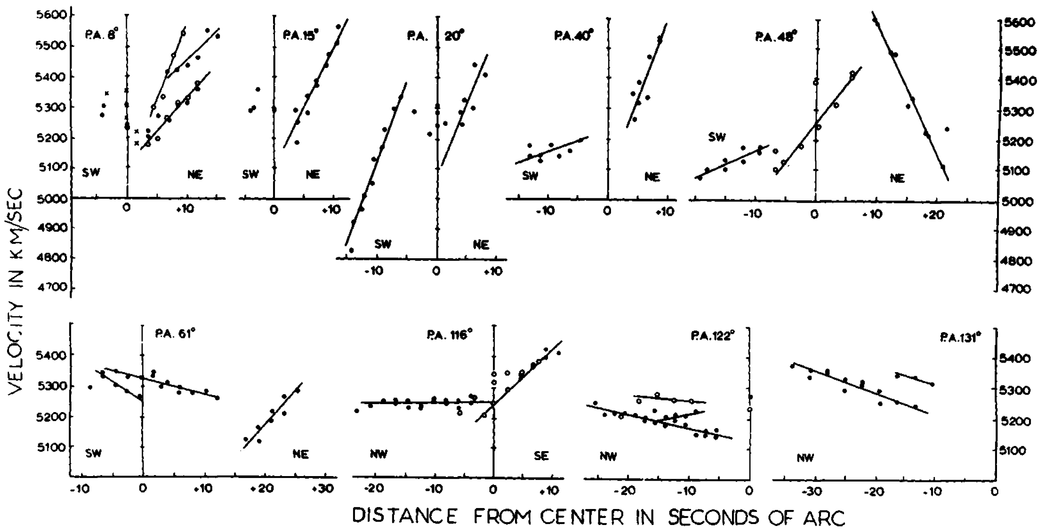


**Figure 2.** The dependences "radial velocity versus angular distance" for different positional angles of spectrograph slit according to the observations of Burbidge and Burbidge [13]. The majority of them pass through the zero-distance line at $V_r$ = +5265 and $V_r$ = 5110 km/s.

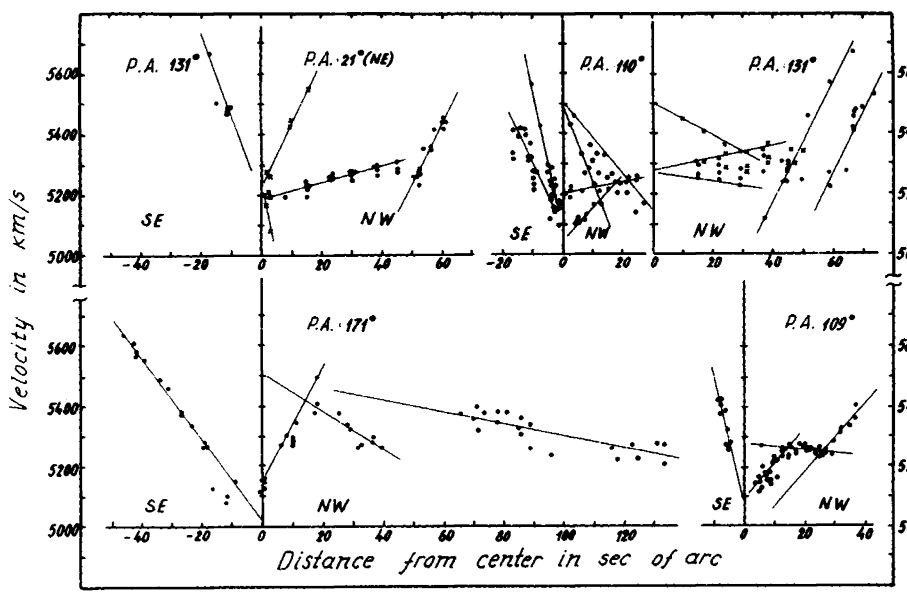


**Figure 3.** The same as in Figure 2 according to observational data of Rubin et al. [14]. Different spectra are labelled by signs. The following nucleus velocities are distinguished : $V_r$ = +5200, 5500, 5100 and 4200 km/s.

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(1978) [14]). The observations reveal the existance of numerous filaments stretched in radial direction from the nucleus, whose radial velocity is proportional to the angular distance from the nucleus (full analogy with the kinematics of the Crab nebula filament, see Trimble [15] ). It permits us to estimate the radial velocity of the nucleus - the kinematical centre of gas expansion. According to the observations [13,14] in the NGC 1275 nucleus there exist several centres of bursts (Figures 2 and 3) with radial velocities +5265, 5130, 5000 and 4300 km/s. At the same time the direct measurements of radial velocity in the nucleus, according to Burbidge and Burbidge (1965) [13], give the value +5265 km/s, and from Rubin, Ford, Peterson and Lynds (1978) [14], it equals to +5150 km/s (the difference in velocities exceeds the error of observations by several times). Curously, that both velocities are also obtained for kinematical centres of expansion. We think, that two different values of radial velocities that were measured at different times are the result of variability of profiles of [OI], [SII], [NII] and H$\alpha$ lines. Even more curious is the fact, that in OIII line profile published by Dibaj and Esipov [2] and Dibaj [16] at 1 Å resolution the maximum of OIII line profile consists of two narrow details separated by about 2 Å (or 120 km/s). The blue component and the maximum are separated by one more detail. The radial velocities of "maximum" details are unknown, but their relative location is about the difference of radial velocities of four kinematical centres. Thus, the difference of two values of nucleus radial velocities measured directly at different times can be an additional indication of the time variability of main component narrow detail intensity in the profiles of forbidden lines.

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