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GAS KINEMATICS IN THE CENTRAL REGIONS OF SEYFERT GALAXIES.
VI. MRK 34, 78, AND 270

V. L. Afanasiev, O. K. Sil'chenko[*]

ABSTRACT. *The results of kinematical study of ionized gas for the central parts of Seyfert galaxies Mrk 34, 78, and 270, obtained with the long-slit spectrograph at the prime focus of the 6-m telescope of the Special Astrophysical Observatory, are presented. Mrk 34 and 78 are found to possess dynamically distinct central gaseous disks; the central disk of Mrk 78 rotates more slowly than the external gas, and the central disk of Mrk 34 counter-rotates relative to the external parts. We confirm the existence of radial gas flows in Mrk 34 and Mrk 78 with the relative line-of-sight velocities up to 750 km/s; there are some arguments in favour of gas inflow onto the nuclei in both galaxies. In Mrk 270 we have found two gas flows oppositely directed near each radio lobe. These facts contradict the jet hypothesis in the galaxies under consideration.*

В настоящей статье представлены результаты исследования кинематики ионизованного газа в центральных областях сейфертовских галактик Mrk 34, 78 и 270, полученные на спектрографе с длинной щелью в прямом фокусе 6-метрового телескопа САО АН СССР. У Mrk 34 и 78 обнаружены динамически автономные центральные газовые диски; у Mrk 78 центральный диск вращается заметно медленнее, чем более внешний газ, а у Mrk 34 - вообще в противоположную сторону. Подтверждено наличие у этих галактик радиальных потоков газа с собственными лучевыми скоростями до 750 км/с; приведены аргументы в пользу того, что газ падает на ядро в обеих галактиках. У Mrk 270 в области каждой радиоконденсации обнаружено по 2 радиальных потока газа в двух противоположных направлениях. Все эти данные противоречат гипотезе двустороннего джета в исследуемых сейфертовских галактиках.

INTRODUCTION

The three galaxies considered in this paper, Mrk 34, 78, and 270, are Seyfert 2 galaxies, and according to their large-scale morphology they are early-type disk galaxies (S0-S0a) with the possible presence of the large bar

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[*] Sternberg State Astronomical Institute, USSR

(see for example the Catalogue of Seyfert galaxies of Lipovetsky et al., 1987, or a description of Seyfert galaxy direct images in the paper of Adams, 1977).

Mrk 78 is studied in more details than the others. On the early photographic spectra (Sargent, 1972), due to a very noticeable splitting in the line-of-sight velocity (~800 km/s), a double structure of emission lines in the central region of Mrk 78 was detected. From the long-slit spectra and from the direct images, Adams (1973) has made an inference that in the centre of Mrk 78 there are two line-emitting clouds, the distance between which is ~2 kpc; the difference of the cloud velocities was accounted for by their participation in the galaxy rotation. However, since beyond the main galaxy disk, up to radii of ~13 kpc, filaments and knots in emission have been observed, "exploding processes" like those that were observed in M 82 and NGC 1275 were not ruled out. De Robertis (1987) has extracted the spectra of these two clouds; he has pointed out that the excitation of emission spectrum of the "secondary" cloud is even higher than that of the main nucleus, and therefore this "secondary" cloud can be neither HII-region nor shock wave region because of [OIII] $\lambda 5007/H_\beta > 10$, but most likely is ionized by the proper non-thermal radiation source. De Robertis suggests that due to these facts the "secondary" cloud may be only the nucleus of the companion galaxy. Far from the nucleus, 5″ to the east and 10-15″ to the west and south-west, Mrk 78 images reveal "radiation excess" in [OIII] $\lambda 4959, 5007$ lines which De Robertis treats as evidences of interaction with the companion.

After Ulvestad, Wilson and Sramek (1981) have obtained the VLA radio map of the central region of Mrk 78, where several condensations are aligned in the east-west direction, there appeared a number of papers in which the galaxy structure in forbidden lines in optics was compared with the radio structure. Haniff et al. (1988) have confirmed the result of Adams (1973) that the narrow line region (NLR) has a double structure and is oriented at the same position angle as the radio structure. Unger et al. (1987) have detected in Mrk 78 extended narrow line region (ENLR), elongated mainly to the west up to 10 kpc from the centre. Whittle et al. (1988) have identified the "secondary" emitting cloud (the line-of-sight velocity of which is by 800 km/s higher than the galaxy nucleus velocity) with the east radio lobe, and have also extracted the "blue" component of [OIII] $\lambda 4959, 5007$ emission lines, which has the relative line-of-sight velocity approximately -400 km/s and is located at 1.5″ to the west from the nucleus, i.e. near the west radio lobe. At last, Pedlar et al. (1989) in their fundamental paper have confirmed all these results and have presented a hypothesis according to which the picture observed in Mrk 78 can be completely explained by a collimated beam of ionizing UV-radiation and relativistic electrons, emerging from the Seyfert nucleus in the cone with opening angle $\sim 50^\circ$.

According to observed characteristics, Mrk 34 resembles Mrk 78: it possesses the triple linear radio structure in the nucleus as well (Ulvestad and Wilson, 1984), double NLR, elongated at the same position angle as the radio structure (Haniff et al., 1988), ENLR with the similar orientation elongated up to 7 kpc from the centre (Unger et al., 1987), and red and blue components of [OIII] emission lines, located near the radio lobes, though with lower relative line-of-sight velocities (+280 and -260 km/s) than in Mrk 78

(Whittle et al., 1988).

Mrk 270 is less studied than the other two; however it also has two radio lobes, at 1.5″ to the north-east and 0.7″ to the south-west from the nucleus (Ulvestad and Wilson, 1984), and NLR, elongated approximately along the radio structure (Haniff et al., 1988). Whittle et al. (1988) have failed in detecting shifted components of [OIII] λ4959,5007 emission lines in Mrk 270.

All the three galaxies were included in our observational programme and have been attentively considered from the view point of ionized gas kinematics.

OBSERVATIONS

In October, 1987 observations of Mrk 34, 78, and 270 were carried out at the prime focus of the 6-m telescope using the long-slit UAGS; the spectra were registered with the two-dimensional photon-counting system (Afanasiev et al., 1986). The journal of observations is presented in the Table. Six spectra for Mrk 34 and so many for Mrk 78 were obtained in the green spectral range (4700 - 5400 A) with a dispersion of 1.5 A/pix; for Mrk 270 we have obtained three spectra. The slit sizes and a scale along the slit were 100″ × 2″ and 0.37″/pix, respectively. The line-of-sight velocities of ionized gas were determined from emission lines [OIII] λ4959,5007 and H_β by two ways. For outer parts of the galaxies, where the lines are narrow and have a symmetrical shape, we used the standard procedure of V_r determination from emission line peak (Alyavdin et al., 1988). For inner parts (depending upon the seeing conditions which determine the spatial resolution, for Mrk 34 and Mrk 78 it was $R \leqslant 5''$, for Mrk 270 - $R \leqslant 3''$) interactive Gaussian component analysis of the line profiles was used. As a rule, from 3 to 5 kinematical gas subsystems were distinguished.

MRK 78

a) Gas rotation

Fig. 1 presents radial distributions of the line-of-sight velocities of ionized gas for all 6 cross-sections of Mrk 78 taking into account component separation of emission lines. The results of our Gaussian component analysis are in a good agreement with those of Whittle et al. (1988), therefore we shall follow their terminology: the central component will be noted as *A*, the most high-velocity one ($<V_r> \cong 11750$ km/s) as *B*, the low-velocity one ($<V_r> \cong 10520$ km/s) as *C*, and rather faint component between *A* and *B* ($<V_r>$=11450-11550 km/s) as *D*. However our advantage compared with Whittle et al.(1988) is that we have taken our cross-sections at 6 position angles, and they did the same only at two P.A.s. It is clearly seen from our data that the "central" kinematical gas subsystem consists really of two ones. Best of all it is seen at the cross-sections P.A. 30° and 123° where we observe the spatial overlapping of these two systems. And at P.A. 149° and 2°, where they are spatially separated, the presence of two different kinematical systems imitates counter-rotation of the central part. As for rigid-body and rather slowly rotating central part of the galaxy we shall designate it, as usually, as component *A*, and as for more outer region starting at 1-2″ from the nucleus, we shall designate it as component *R*. Both subsystems, *A* and *R*, are practically visible within the full range of position angles (component *A* is faint only in the north-east quadrant) and reveal rather prominent rotation.

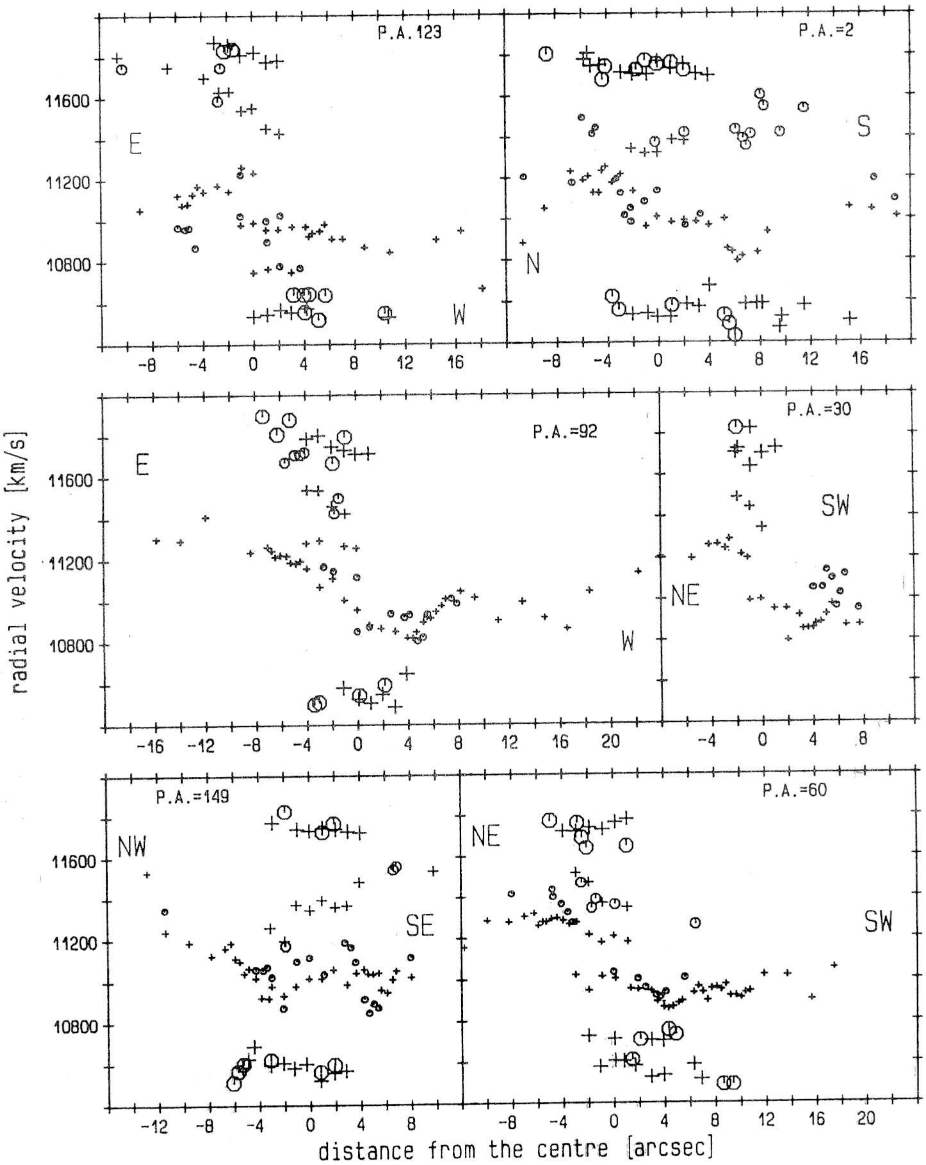

Fig. 1. Radial distributions of line-of-sight velocities of ionized gas for six cross-sections of Mrk 78. The crosses - [OIII] λ4959, 5007 lines, the circles - H_β. The symbols of larger sizes indicate components associated with the linear gas flows.

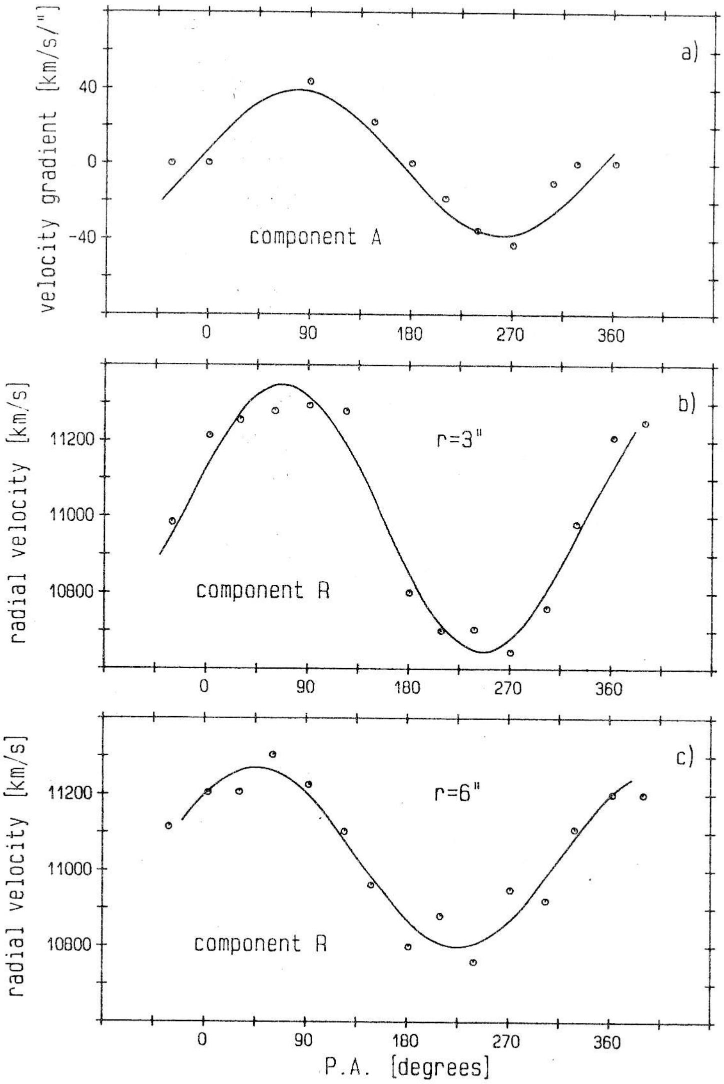

Fig.2. Azimuthal distributions:
a) of the line-of-sight velocity central gradient for the component A of Mrk 78;
b) of the line-of-sight velocity of ionized gas for the component R of Mrk 78 at a distance of 3″ from the centre;
c) of the line-of-sight velocity of ionized gas of the component R of Mrk 78 at 6″ from the centre.

Fig. 2 shows azimuthal dependences of the line-of-sight velocity central gradient for component *A*, and V_r at the fixed distances from the centre, 3″ and 6″, for the component *R*. All three dependences are well approximated by the cosine laws:

A: $dV_r/dR = 39$ km/s/″ cos (P.A. − 81°),

R: for 3″ $V_r = 348$ km/s cos (P.A. − 67°) + 10994 km/s, for 6″ V_r = 233 km/s cos (P.A. - 46°) + 11033 km/s.

First, note that dynamical major axis of *A*-component is coincident with the line of nodes of the large-scale galaxy disk, which position angle obtained from the orientation of the outer isophotes is $P.A._0=85^{\circ}$. This fact indicates the circular rigid-body rotation of the central gaseous disk of Mrk 78, which is the subsystem *A*. The gas of the subsystem *R* rotates faster than the central disk; this rotation is not circular, since we observe the turn of the dynamic major axis by 35° with respect to the line of nodes at *R*=6″, and not rigid-body: at ~6″ from the centre (4.1 kpc) we see the "corotation" of *A*- and *R*-components.

To estimate the mass within *R*=6″ (4.1 kpc), we must know the tangential velocity component. As it is known, when measuring line-of-sight velocities on the line of nodes the radial velocity component does not contribute anything to the observational velocity projection on the line of sight; so from the cosinusoid for *R*=6″ we take the velocity value at the P.A. 85° - it is the projection of the tangential component which is equal to 181 km/s. If estimating the inclination of the Mrk 78 disk according to Keel (1980): $\cos i = 0.41$, then we shall get V_ϕ=198 km/s, and $M(R=4\ \mathrm{kpc})\cong4\cdot10^{10}M_\odot$.

Since the gas rotation in the *R*-region occurs in elliptical orbits and since we observe asymmetry in the distribution of component intensity (the *R*-component is better seen in the east half plane, and the *A*-component - in the west one) we can make a conclusion that according to its shape the *R*-region is not a disk, but ellipsoid, the major axis of which is not aligned with the line of nodes of the galaxy; and that to the east from the nucleus we observe gas of the *R*-component in front of the A-region, and in the west it is vice versa.

Beyond *R*=6-8″ emission lines became weak, though at some position angles (for instance, at P.A. 92°) they are visible almost up to *R*≅20″ (13 kpc). It is difficult to estimate the galaxy rotation velocity at these distances from the centre; probably it does not exceed 60-80 km/s or even it is close to zero. Thus, we may conclude on essential mass concentration in the centre of Mrk 78.

And at last, on the systemic velocity of the galaxy. According to the [OIII] emission line measurements in the nucleus (*R*=0″), *A*-component gives the line-of-sight velocity averaged over 6 spectra 10990±11 km/s. Azimuthal dependence of V_r for *R*-component at a distance of 3″ from the centre gives V_r^0= 10994 km/s, i.e. systemic velocities for *A*- and *R*-components coincide, and the brightness centre in continuum which determines 0″ on the abscissa axis in Fig. 1, is the dynamical centre. However according to Vrtilek and Carleton (1985), the absorption lines in the nucleus spectrum give the stellar population V_{sys} = 11090±24 km/s, i.e. 100 km/s higher than V_{sys} for the gas. And according to our data for *R*-component at 6″ from the nucleus (see Fig. 2) V_r^0 is 11033 km/s. It is very likely that the gas of the central region of Mrk 78 has systematic velocity shift with respect to the galaxy mass centre - but to speak more confidently we need the velocity field from absorption lines in the Mrk 78 central part.

b) Radial gas flows

We identify *B*-, *C*-, and *D*-components with the linear gas flows. They are strongly localized in the position angle and in the radii. Fig. 3 presents radial distributions of relative intensity (with respect to the central component) of *B*-, *C*-, and *D*-components near the position angles where they are better visible. Component *B* has the mean $\langle V_r \rangle \cong 11750$ km/s (+750 km/s relative to the nucleus), it is very compact and located at 1.5″-2″ to the east from the nucleus. Component *D* is rather faint, its $\langle V_r \rangle = 11400-11500$ km/s (+400 - +500 km/s), it is more extended than *B* component, and is at 2″-3″ to the east from the nucleus. Component *C* has $\langle V_r \rangle \cong 10550$ km/s (-450 km/s), it is very extended (it extends up to 4″ to the west from the nucleus). Probably this flow originates in ENLR, since even at 7″-10″ to the west from the nucleus Pedlar et al. (1989) have detected [OIII] emission line splitting with $\Delta V_r \cong 100$ km/s. Thus we confirm completely the result of Whittle et al. (1988) on the association of radial gas flows with the radio lobes in Mrk 78 nucleus (compare our description of location of *B*-, *C*- and *D*-components with the radio map of Ulvestad, Wilson and Sramek, 1981). However, are these flows the *out*flows as it is assumed by Whittle et al. (1988)?

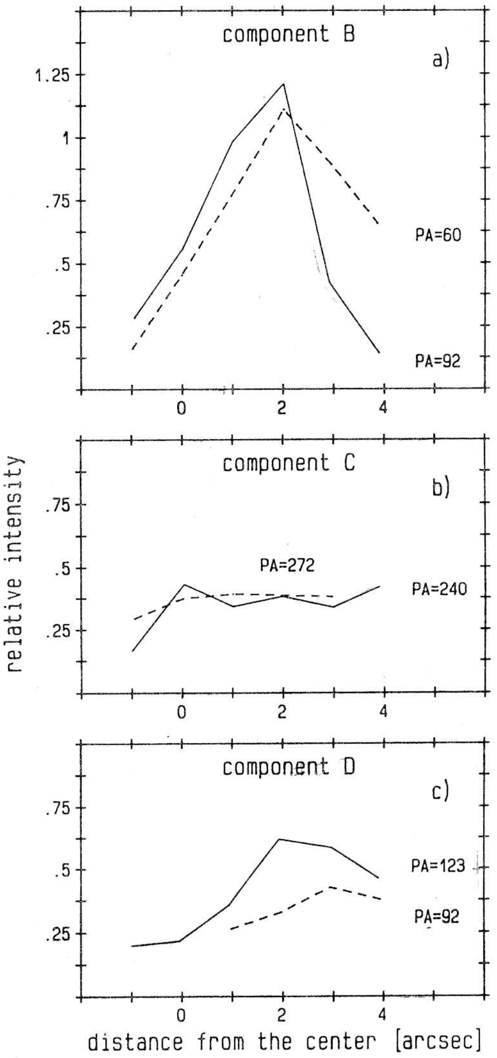

Fig. 3. Radial distributions of relative intensity of the components B (a), C (b) and D (c) of Mrk 78 at P.A. 60°-123°.

Pedlar et al. (1989) have presented the radial distributions of *A*-, *B*- and *C*-component intensity at P.A. 90°. We see that in its maximum component *B* is brighter than *C*. Assuming that the difference in brightness is caused by the dust in the circumnuclear region, we come to a conclusion that the flow from us is located nearer to us, than the flow to us, and thus the gas falls onto the nucleus. This contradicts to the hypothesis of plasmons thrown from the nucleus as the reason of velocity anomalies and enhanced radio emission in these regions.

At the cross-section P.A. 92° (Fig. 1) it is well seen that *B*- and

D-components have a slope (a slope of *C*-component is more noticeable at P.A. 60°). Thus, as in the case with Mrk 573, Mrk 3 and other galaxies of our sample, the linear gas flows trace rotation, but whose rotation, of *A*- or *R*-system? The slope of *B*-component is smaller than that of component *D*; and component *B* is closer to the nucleus than *D*; therefore we may suppose that *B*-flow is associated with the inner disk *A*, and *D*-flow originates in *R*-region. The flow *C* is also associated with the disk *A*, but due to the complex spatial distribution its behaviour is not definite.

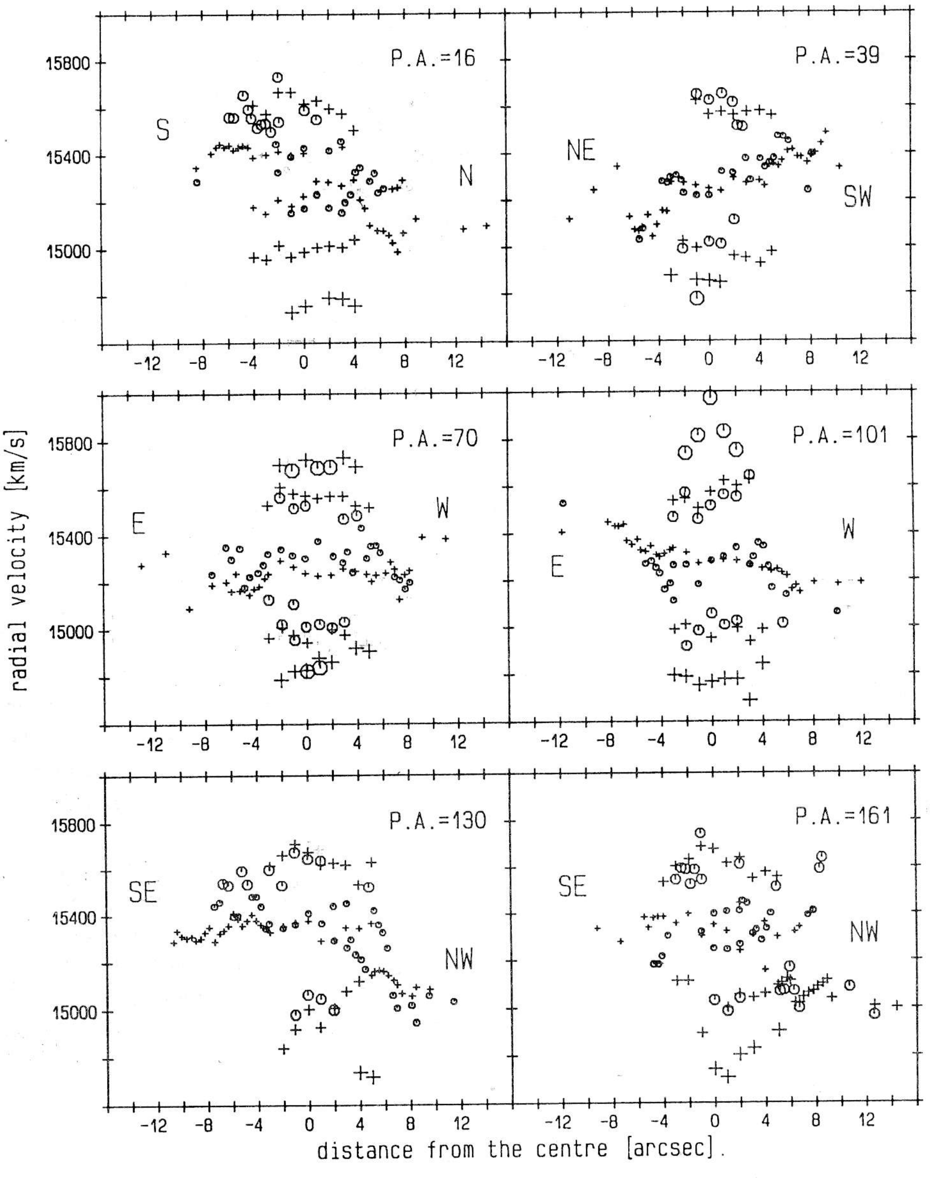

Fig. 4. Radial distributions of the line-of-sight velocities of ionized gas for six cross-sections of Mrk 34. The crosses - [OIII] λ4959, 5007, the circles - H_β. The symbols of larger sizes indicate the components associated with the linear gas flows.

These facts strongly suggest that the interaction of two gas systems, *A* and *R*, which rotate with different velocities, results in formation of shock waves in the regions of the system contacts, which are seen as brightness centres in radio continuum; here the linear gas flows are formed, since the clouds lost their rotation moment and fall onto the nucleus.

MRK 34

Fig. 4 presents radial distributions of the line-of-sight velocities of ionized gas for 6 cross-sections of Mrk 34 taking into consideration the component separation of emission lines. Though due to a small difference in the line-of-sight velocities the Mrk 34 components are more strongly blended than those of Mrk 78, our results of component separation agree completely with the results of Gaussian component analysis made by Whittle et al. (1988). We have also distinguished the central component (*A*), low-velocity one with $<V_r>\cong 15000$ km/s (*B*), and high-velocity one with $<V_r>\cong 15600$ km/s (*C*). There is only one difference with the results of Whittle et al. (1988): we did not measure the very high-velocity component with $<V_r>\cong 16260$ km/s, and instead of this as *D*-component we defined an excess in the blue wing of emission lines with $<V_r>\cong 14800$ km/s.

a) Gas rotation

And again, as in the case of Mrk 78, scanning over the position angle has allowed to detect a complicated behaviour of the central component: it really consists of two distinctly rotating gaseous subsystems. They are visible best of all in two perpendicular directions: at P.A. 16° we observe spatial overlapping of these two subsystems, and at P.A. 101° they are spatially separated and we observe plateau in the centre of line-of-sight velocity curve. It is interesting that the existence of two dynamically different subsystems produces a very unusual line-of-sight velocity curve at the cross-section P.A. 130°: to the south-east from the centre one subsystem dominates, and to the north-west the other, so in the centre we observe a turn-over point on the curve.

As in the case of Mrk 78, we name the innermost rigid-body rotating gas system as the component *A*, and the more extended and fast rotating one as the component *R*. Fig. 5 shows azimuthal dependencies of the line-of-sight velocity central gradient for the component *A*, and of gas line-of-sight velocity at 6″ from the centre for the component *R*. Approximation by a cosinusoid using the least-square method gave the following results:

A: from [OIII] $dV_r/dR = 24$ km/s/″ $\cos(\mathrm{P.A.}\ -9^\circ)$,
from H_β $dV_r/dR = 30$ km/s/″ $\cos(\mathrm{P.A.}\ +25^\circ)$,
R: for 6″ $V_r = 186$ km/s $\cos(\mathrm{P.A.}\ -174^\circ) + 15245$ km/s.

First of all we see that the components *A* and *R* are really counter-rotating: at approximately coincident orientation of gaseous cloud orbits the sense of the component *A* rotation is exactly opposite to that of the component *R*. Except this, the component *A* reveals a clear emission stratification: dynamical major axes over [OIII] and H_β are essentially different (more clearly it is seen at P.A. 101°, where [OIII] shows plateau, and H_β - a noticeable slope). Besides it should be pointed out that neither the both dynamical major axes of the component *A* nor the dynamical major axis of the component *R* coincide with the line of nodes of the galaxy disk, which (according to the outer isophotes) has P.A.$_0$ 27°. Thus, in both subsystems we deal more likely with elliptical orbits of gaseous clouds; therefore the potential shape in the centre must be triaxial, and this fact, together with instabilities on the boundary of two counter-rotating systems, should cause generation of shock waves and radial gas inflows to the nucleus.

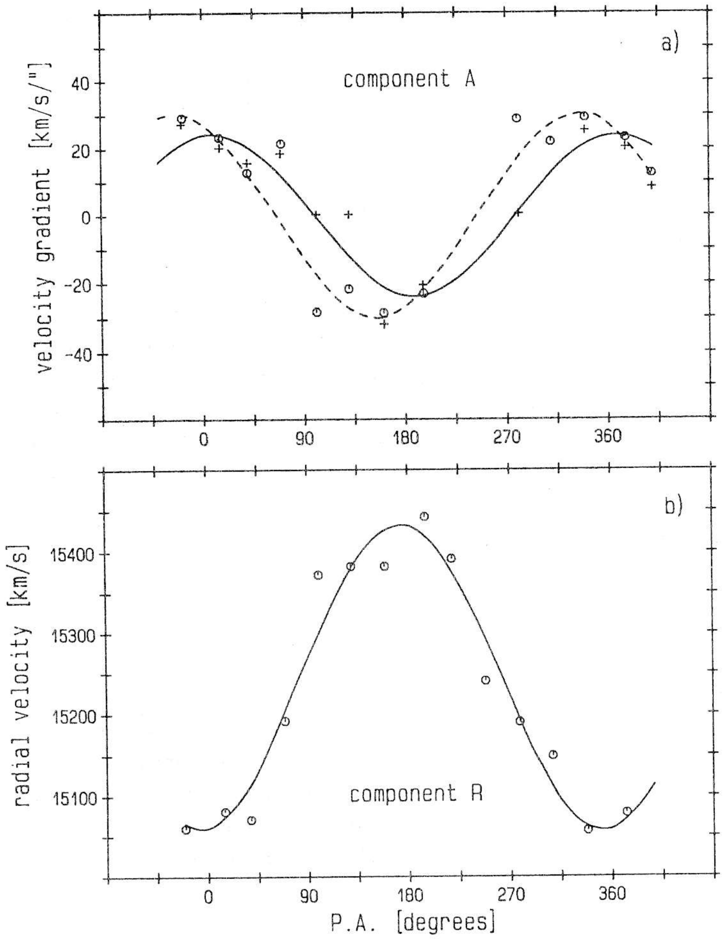

Fig.5. Azimuthal distributions:
a) of the line-of-sight velocity central gradient for the component A of Mrk 34; the crosses and solid lines indicate the data and approximating cosinusoid from [OIII] lines, the circles and the dashed lines - from H_β;
b) of the line-of-sight velocity of ionized gas for the component R of Mrk 34 at 6″ from the centre.

For the galaxy mass estimation we determine the tangential component of the gas velocity from the line-of-sight velocity curve at the cross-section more close to the line of nodes: P.A. 16°. Since V_{sys} appeared to be equal to 15245 km/s, then at 15″ from the centre (13.8 kpc) $\Delta V_r \cong 140$ km/s, and taking into account that cos i=0.64 (Keel, 1980), we obtain $V_\Phi \cong 190$ km/s, and the galaxy mass within the radius 14 kpc turns out to be equal to ~$10^{11} M_\odot$.

b) Radial gas flows

As linear gas flows we treat the components *B*, *C*, and *D*, whose proper line-of-sight velocities relative to the centre (250-450 km/s) exceed considerably the amplitude of ΔV_r, defined by the galaxy rotation. Whittle et al. (1988) have identified the component *B* (-250 km/s) with the north-west radio lobe, and the component *C* (+400 km/s) with the south-east one. Our data are in agreement with such identification: really at P.A. 161° (close to the radio structure orientation) the component *B* is localized mainly to the north-west, and the component *C* - to the south-east from the nucleus (localization of the component *D* (-450 km/s) does not differ from that of the component *B*, therefore we won't consider the component *D* separately). We could not precise their localization from the radial distributions of relative component intensity because of the fast drop of central component brightness by the radius.

Is it possible to determine the direction of these linear flows? Again, as in the case of Mrk 78, the brightness maximum of the component *C* (the flow from us) is somewhat higher than that of the component *B* (the flow to us) according to Fig. 7 from Whittle et al. (1988), that again allows to conclude that we deal with the gas infall onto the nucleus.

As for the slope of the components *B*, *C*, and *D*, it is well observed especially at the cross-sections P.A. 16°, 161°, and 130° (near the dynamical major axis of the central components), and is approximately parallel to the component *A* slope. However, for instance, the component *B* in its far edge from the nucleus is linked with the component *R*. Probably, here we observe how the gas of the *R*-system, loosing the rotation moment, appropriate to this system, falls into the centre and is involved into the more slow rotation of the component *A*. Only the detailed hydrodynamical calculations will show if in such a situation gaseous clouds may get oppositely oriented moment.

MRK 270

The Fig. 6 presents radial distributions of line-of-sight velocities of ionized gas at three cross-sections of Mrk 270. Though the catalogues MCG (Vorontsov-Vel'yaminov and Krasnogorskaya, 1962) and UGC (Nilson, 1973) classify Mrk 270 as the galaxy seen face-on, nevertheless all the three cross-sections show a noticeable gas rotation. Taking as a starting point the circular rotation formula

$$dV_r/dR \propto \cos\ (\text{P.A.} - \text{P.A.}_0),$$

we have compared the central gradients of line-of-sight velocities. All the three cross-sections are in agreement at P.A._0 125°±3°, such is the location of dynamical major axis. At the cross-section P.A. 126°, along the dynamical major axis, the line-of-sight velocity curve extends up to $R=7''$ (1.4 kpc); at this distance from the centre $\Delta V_r=230$ km/s. In contrast to *MCG* and *UGC* Adams (1977) gives the galaxy axis ratio $\cos i=0.63$, and Keel (1980) - 0.77; using these data we obtain the rotation velocity of this galaxy part 300-360 km/s and mass inside the radius 1.4 kpc, equal to $(3\text{-}4)\cdot 10^{10} M_{\odot}$. It is interesting also to note that the nucleus velocity obtained from the emission lines is by ~80 km/s lower than the systemic galaxy velocity, which is, due to both line-of-sight velocity curves and measurements by Vrtilek and Carleton (1985) of absorption lines in the nucleus spectrum, equal to 3210 km/s.

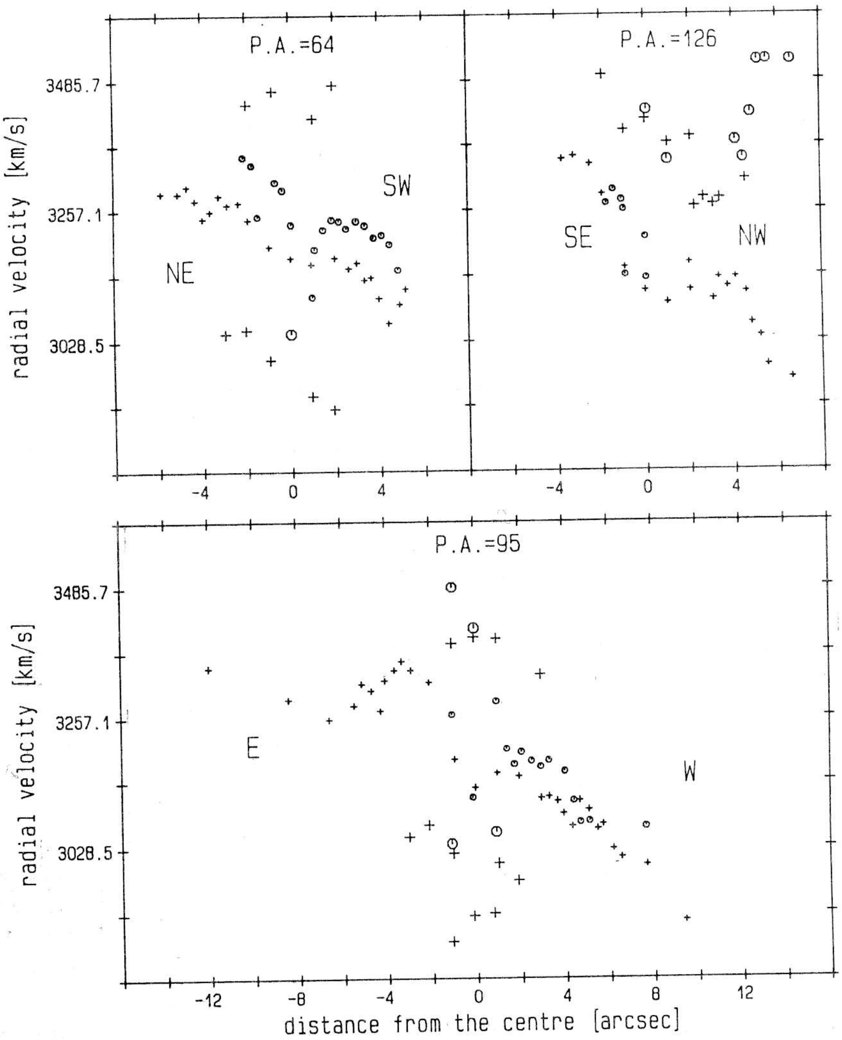

Fig. 6. Radial distributions of the line-of-sight velocities of ionized gas for three cross-sections of Mrk 270. The crosses - [OIII] λ4959, 5007 lines, the circles - H_{β}. The symbols of larger sizes indicate the components associated with the linear gas flows.

Orientation of the nuclear double radio structure (P.A._r 48°) is practically perpendicular to the dynamical major axis. Isophotes of the central region of Mrk 270 in [OIII] according to Haniff et al. (1988) are elongated at P.A. 58°, i.e. at the small angle to the radio structure. Whittle et al. (1988) failed in detecting the substructure of the emission line profiles; however at the cross-section P.A. 64° we succeeded in detection of the red and blue wings of [OIII] λ4959, 5007 emission lines at 1.5″-2″ from the nucleus. This fact should undoubtedly indicate the proximity of the radial gas flow regions and radio lobes if there did not appear 4 radial flow regions, 2 at each side from the nucleus! And three of them are confirmed at the cross-section P.A. 95°. The north-east radial gas flows possess the line-of-sight velocities relative to the dynamical galaxy centre -180 km/s and +240 km/s, and the south-west radial flows - +240 km/s and -300 km/s. The components are rather faint and their slope is difficult to be confidently detected.

CONCLUSION

A detailed consideration of the central component of emission lines in Mrk 34 and 78 has revealed their complicated nature: in the centre of each galaxy there exists a distinctly rotating gaseous subsystem, disk or bar, and in Mrk 34 it rotates even in opposite sense to that of more outer rotation. In the region where two gaseous subsystems come into contact, due to considerable difference in angular rotation velocities there must inevitably appear instabilities, shock waves, and, as a result, strong linear gas flows. We observe their appearances: emission line red and blue wings or even separate line components; projections of the linear gas flow velocities onto the line of sight reach sometimes 800 km/s. As Whittle et al. (1988) have successfully proved the localization of these linear flows is marked by the high surface brightness in radio continuum. However interpretation of these regions as plasmons, thrown out of the nucleus with the high velocity, appears to be unconvincing: according to the fact that in Mrk 34 as well as in Mrk 78 the flow from us is brighter in [OIII]-line, than that to us, in this case (as for the majority of galaxies from our sample) we deal with the gas infall onto the nucleus.

Due to weak emission lines Mrk 270 appeared to be less studied galaxy in our sample as it was in Whittle et al.'s (1988) investigation. Since its radio structure axis is approximately perpendicular to the dynamical major axis of the gaseous disk, we cannot rule out the idea of outburst from the nucleus in this case. However, the fact, that in the region of each "plasmon" the gas flows in both directions are observed (both to us and from us), makes us to suspect more complicated picture than simple two-sided jet.

The authors thank A.I. Shapovalova for participation in observations.

Table 1. A journal of long-slit observations for the galaxies Mrk 34, 78, and 270

Spectrum	Object	Date	Exposure (s)	P.A. of slit (degrees)	Seeing (″)
M07103	Mrk 34	23/24.X.87	435	16	3
M07104	Mrk 34	23/24.X.87	420	161	3
M07105	Mrk 34	23/24.X.87	510	130	3
M07106	Mrk 34	23/24.X.87	425	101	3
M07107	Mrk 34	23/24.X.87	420	70	3
M07108	Mrk 34	23/24.X.87	420	39	3
M06609	Mrk 78	18/19.X.87	600	123	2
M06610	Mrk 78	18/19.X.87	600	92	2
M06611	Mrk 78	18/19.X.87	600	60	2
M06612	Mrk 78	18/19.X.87	600	30	2
M07009	Mrk 78	22/23.X.87	600	2	1.5
M07010	Mrk 78	22/23.X.87	420	149	1.5
M06516	Mrk 270	17/18.X.87	600	126	1
M06517	Mrk 270	17/18.X.87	600	95	1
M06518	Mrk 270	17/18.X.87	600	64	1

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