fittet at T_{eff} = 100,000 K, log g = 5.0 and T_{eff} = 50,000 K, log g = 4.0, if a normal helium abundance is assumed.

In spite of these uncertainties, the locus of NGC 3242 in the (log g, log T_{eff})-plane, obtained from the comparison with non-LTE calculations, contains some additional information about the nature of the star. In Figure 5 the position of the star is shown, together with six absorption line central stars which have been analysed already before (Méndez *et al.*, 1981) and with theoretical evolutionary tracks computed by Schönberner (1979, 1981) (see also Hunger and Kudritzki, 1981, *Messenger,* No. 24, page 7). If we assume that these tracks represent the evolution of all the PN central stars shown here, we can conclude that NGC 3242 is slightly more massive than the other objects, which have masses from 0.6 $M_\odot$ to 0.55 $M_\odot$.

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Variability of the Continuum and the Emission Lines in the Seyfert Galaxy Arakelian 120

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Introduction

The brightness variability of Seyfert galaxies and quasars is one of the most direct pieces of evidence for the intrinsic smallness of the optical continuum source in these objects. If the power of a source varies with a time scale τ by a significant amount it must originate from a region which cannot have a size much larger than $c \cdot \tau$ across where c is the velocity of light; τ is observed to be typically of the order of months for such sources but may be much less. Not only the continuum strength but also the emission lines may vary in strength and shapes. This phenomenon is interesting with regard to the structure and kinematics of the line-emitting region as well as to the radiation mechanism within the continuum source.

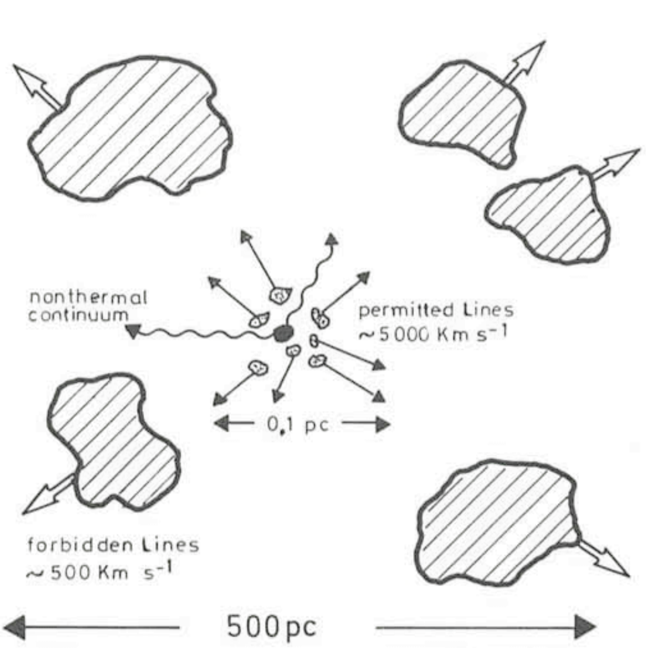

Fig. 1: *Schematic model for a Seyfert 1 nucleus with its three components: (i) a point-like central source of nonthermal continuum radiation, (ii) a broad emission line region* $\lesssim$ *1 light-year across with numerous fast moving dense* ($n_e > 10^6$ cm^{-3}) *clouds emitting the permitted lines, and (iii) a narrow emission line region* ~ *500 pc across containing less dense* ($n_e \lesssim 10^5$ cm^{-3}) *clouds with smaller velocities.*

A schematic sketch of an active galactic nucleus is shown in Figure 1. A nucleus of a Seyfert 1 galaxy or of a quasar consists of three components: (i) the optically unresolved (i.e. smaller than ~ 1 arcsec) continuum source which emits predominantly radiation exhibiting a nonthermal spectrum; (ii) a small inner region (~ 0.1–1.0 pc) from which the broad hydrogen and "permitted" lines originate with equivalent velocity dispersions typically 3,000 km/s up to 10,000 km/s and beyond. The electron density in the emitting clouds must in this region be larger than 10^6 cm^{-3} and may range up to 10^{11} cm^{-3}. In the latter case electron scattering may account for the full width of the permitted emission lines. Synthetic integrated line profiles for such a cloud aggregate show that the total number of these clouds must be enormous (E. Capriotti et al., 1981, *Astrophysical Journal* **245**, 396); it has been estimated to be as large als 10^{11} from observations (1981, H. Netzer, Proc. of the 5th Göttingen-Jerusalem Symposium, Göttingen 1980). A very clumpy structure has also been postulated on theoretical grounds (G. R. Blumenthal and W. G. Mathews, 1979, *Astrophys. J.*, **233**, 479). The total mass of the clouds is relatively small ($\lesssim$ 1,000 $M_\odot$). This region is probably entirely absent in the so-called Seyfert 2 galaxies; (iii) an outer region from which the narrow "forbidden" lines like the nebulium line of O^{++} originate and which is ~ 500 pc across.

There is evidence that the radiation from at least the inner regions (i) and (ii) may vary. We report in this article on continuum and spectrum variations in the Seyfert 1 galaxy Arakelian 120 which we observed in the optical with the ESO 3.6-m and 1.5-m telescopes and in the UV using the IUE telescope operated from Villafranca near Madrid.

Long-term optical variabilitiy of Akn 120 since 1929 has been established by Miller from the University of Georgia, Atlanta, who inspected archival plates of the Harvard College Observatory. In addition, he reported rapid variability during the epoch 1977–78 with amplitudes ~ 0.3 mag on a time scale of ~ 1 month which confirms earlier work by Lyutyi from the Soviet Union. Variability of this source on somewhat longer time scales ($\lesssim$ 1 year) are also known from radio and X-ray measurements.

Continuum Variations

We first observed Akn 120 in October/November 1979 in the optical and UV (for observational details see an article by H.

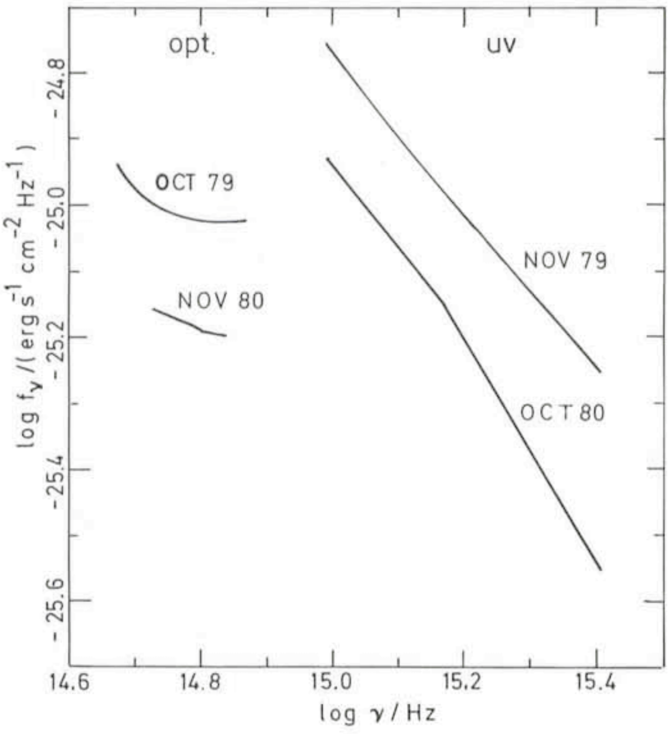

Fig. 2: *The optical and UV continuum flux distributions for Akn 120 at two epochs.*

Schleicher and H. W. Yorke in the *Messenger* No. 22). We found in this source an unusually high Lyα/Hβ ratio, very strong UV Fe II emission and a jump of the continuum between 3000 and 4000 Å, a phenomenon which already was known from some other sources. We then re-observed Akn 120, again nearly simultaneously, in the optical and UV, a year later. Figure 2 shows for both epochs the optical and the UV continua. At the second epoch the continuum emission had dropped by a factor ~ 1.5, everywhere conserving the strength of the jump between the UV and optical portions of the continuous spectrum.

Emission-Line Variations

The absolute intensities of all emission lines varied not more than by a factor of 2 and in the same direction as the continuum. Lyα and Hβ changed in absolute strength approximately proportional to the continuum, i.e. their equivalent widths stayed nearly constant. The line profiles, however, varied markedly and in a different fashion from line to line. This is apparent from Figures 3 and 4 where the Lyα and Hβ profiles are compared for both epochs. The variations in the relative profile of Lyα are only slight but clearly visible. The Hβ profile on the other hand developed a pronounced double-horn structure through a relative enhancement of its red wing. Such variations in the Hβ profile had not been observed during the previous years from 1974–79 in spite of the detection of continuum variability during this time. A detailed description of the line and continuum variations is contained in a forthcoming paper (Kollatschny, Schleicher, Fricke and Yorke, 1981, *Astronomy and Astrophysics,* in press). Variations of the Balmer line profiles at different epochs have independently been observed by C. B. Foltz and B. M. Peterson of the Ohio State University.

Conclusions

The parallel variation of the broad components of the hydrogen lines and of the continuum with the equivalent widths remaining nearly constant is consistent with the picture that the broad emission (cf. Fig. 1) is confined to a spatial region less than a light-year across, since only then a variability in the ionizing continuum flux is propagated fast enough to the emitting cloudlets in this region.

The explanation of the different behaviour of the shapes of Lyα and Hβ is not straightforward. It probably indicates that these lines originate from different locations in the emitting clouds. The change of a line profile as such may be due to a time variation in the spatial distribution of the ensemble of clouds emitting the broad lines; this in turn might be caused by large-scale instabilities or by coalescence of clouds. Alternatively, partial obscurations of this region by surrounding absorbing clouds may cause observed phenomena like the disappearance and reoccurrence of emission in the line wings.

Presumably, it is a long way from now until a detailed explanation of such line variations can be given. Parametrized calculations in terms of the multi-cloud model for the broad line region, adopting a flattened and inclined cloud distribution, are presently being done by us and hopefully will prove useful.

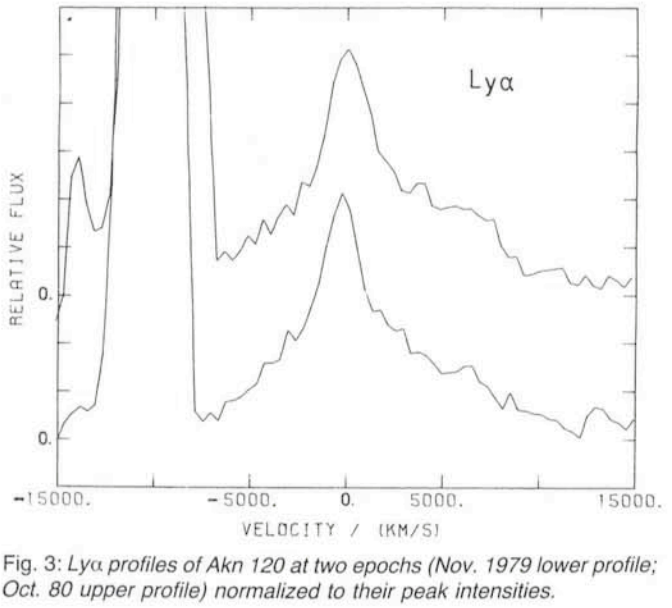

Fig. 3: *Lyα profiles of Akn 120 at two epochs (Nov. 1979 lower profile; Oct. 80 upper profile) normalized to their peak intensities.*

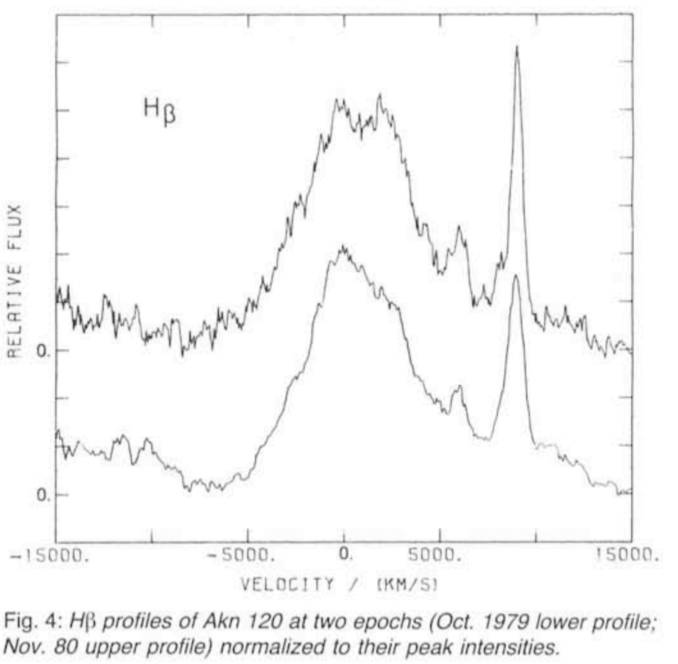

Fig. 4: *Hβ profiles of Akn 120 at two epochs (Oct. 1979 lower profile; Nov. 80 upper profile) normalized to their peak intensities.*

Akn 120 is certainly an excellent object for optical photometric and spectroscopic monitoring. It also recommends itself for long-term observations in the radio, infrared and X-ray spatial regions.

Acknowledgements

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Announcement

SECOND ESO INFRARED WORKSHOP

19–22 April 1982

Organizing Committee: R. van Duinen (Groningen), M. Grewing (Tübingen), A. Moorwood (ESO, Chairman), P. Salinari (Florence), F. Sibille (Lyon).

This Workshop is being organized with the aims of reviewing the status and performance of the many infrared groundbased facilities and instruments which have come into operation since the last ESO Infrared Workshop in Sweden in 1978 and to promote discussion on three topics of interest for the future:

- *the infrared astronomical requirements of future Very Large Telescopes on the ground,*
- *the areas in which groundbased and airborne observations can best complement future space missions,*
- *the use of array detectors and the possible spin-offs to be expected from infrared space technology in groundbased and airborne instrumentation.*

An exchange of views in these particular areas is considered to be timely bearing in mind ESO's on-going VLT studies, the imminence of the IRAS launch, the advanced technical state of the GIRL Spacelab project and the widespread interest being displayed in a European Astroplane and ESA's study of an Infrared Space Observatory.

The meeting will be organized around invited reviews of the major projects plus contributions, submitted in response to this announcement, on the capabilities of current instruments and techniques, detector and instrumental developments. In keeping with the desired Workshop atmosphere, however, we intend to devote considerable time to discussion and will particularly welcome contributors interested in expressing their ideas and prejudices on the above themes.

It is hoped that the results will be suitable for publication by ESO. Attendance will have to be limited to around 70.

Further information and application forms can be obtained by contacting

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Observations of the Giant Bubbles in the Large Magellanic Cloud

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M. Rosado, Instituto de Astronomía (Mexico)

Introduction

Deep monochromatic photographs through narrow-band interference filters on nearby spiral galaxies reveal large numbers (50–100) of circular shaped H II regions, with usually weak or absent central emission. They are called by various names; arcs, loops, rings, shells, etc. . . ., and are clearly the two-dimensional projections of more or less spherical bubbles of ionized gas.

This is by no means a new phenomenon: Hubble (1925, *Astrophysical Journal* **62**, 409) had already described three "ring nebulae" in the spiral of the Local Group NGC 6822. But it is the advent of large narrow-band interference filters that had made possible the detection of tens of bubbles in the galaxies in our vicinity. A number of surveys have recently been published, including one by Sivan (1974, *Astronomy and Astrophysics Suppl.* **16**, 163) of our Galaxy with a 1-m telescope and one of M 33 with the Soviet 6-m telescope (Courtès *et al.*, 1981, *The Messenger* No. 23).

In our Galaxy, 21-cm surveys show numerous H I bubbles, and in fact some of the H II rings do have H I counterparts. This phenomenon is thus not restricted to ionized gas, and appears as one of the fundamental ways by which interstellar gas is being shaped in galaxies. Further kinematical and physical studies appear essential to understand the basic processes at work. Our Galaxy, however, is not quite suitable for this kind of studies: Although it has the unique advantage that one can use a home-made telescope, the observer is unfortunately embedded in the galactic disk, which reduces detection, except for close and unobscured regions. In the nearest outer galaxies (M 31, M 33, etc. . . .), the angular resolution of even the largest telescopes is not sufficient for a fair view, and detailed studies would need anyway too many of their severely distributed nights. The Magellanic Clouds—and especially the large one—appear (as usual!) as the best compromise between maximum closeness and unobstructed global view.