SPECTROPOLARIMETRY AND VARIABILITY OF SEYFERT 1.8 AND 1.9 GALAXIES

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Twelve AGN classified as Seyfert 1.8s or 1.9s were observed with a CCD spectropolarimeter on the 3-m Shane telescope on Mount Hamilton. The instrument and data reduction procedures are described in Miller, Robinson, and Goodrich (1988). Three of the objects (NGC 2622, NGC 7603, and Mrk 1018) have undergone extreme variability, at times being classified as Seyfert 1.8s or 1.9s and at other times having spectra classifiable as Seyfert 1s. A set of IDS data on these three objects was generously provided by D. E. Osterbrock and collaborators, and allows comparison of the spectra in the "low state" (i.e. Seyfert 1.8 or 1.9) and the "high state" (Seyfert 1 spectrum).

Spectropolarimetry of IRAS 1958–183 (Seyfert 1.9) shows that the redness of the featureless continuum and large $H\alpha/H\beta$ ratio are casued by reddening in this highly-polarized object. Spectropolarimetry of NGC 2622 also indicates the presence of dust. Two polarization components in the spectrum are interpreted as due to dust reflection and transmission through aligned dust grains, the latter component also showing reddening by the dust. An absorption feature of Na I D indicates the presence of cool gas (and presumably dust) moving at ~ -800 km s^{-1} along our line-of-sight in NGC 2622.

Analysis of the variability of the line fluxes of broad $H\alpha$ and $H\beta$, and the flux of the featureless continuum near these two lines, was performed for the three variable cases. In all three cases the flux changes were consistent with simple changes in extinction along the lines-of-sight to the nuclei. This further suggests that the phenomenon which produces the Seyfert 1.8/1.9 spectra is generally related to extinction and reddening of the broad-line region (and in some cases the featureless continuum) by dust grains.

Small-scale variability of the $H\beta$ line in NGC 7603 was also noted (on top of the extreme variability which caused the classification change). In 1983 two small peaks appeared on the $H\beta$ profile, at velocities relative to the NLR of -2500 and $+1000$ km s^{-1}. In Mrk 1018 the subtraction of the 1978 low-state data from the 1986 high-state leaves a similar doubly-peaked profile, with velocities of -1700 and $+300$ km s^{-1}. A similar situation has been found by other authors in NGC 5548 (Peterson 1987; Stirpe *et al.* 1988) in which one component is at a high negative (blue) velocity and the other is at a lower, positive (red) velocity. Note that models which use accretion disks to produce double peaks show the opposite effect; the red peak is at a higher velocity than the blue peak.

D. E. Osterbrock and J. S. Miller (eds.), Active Galactic Nuclei, 103–105.

References

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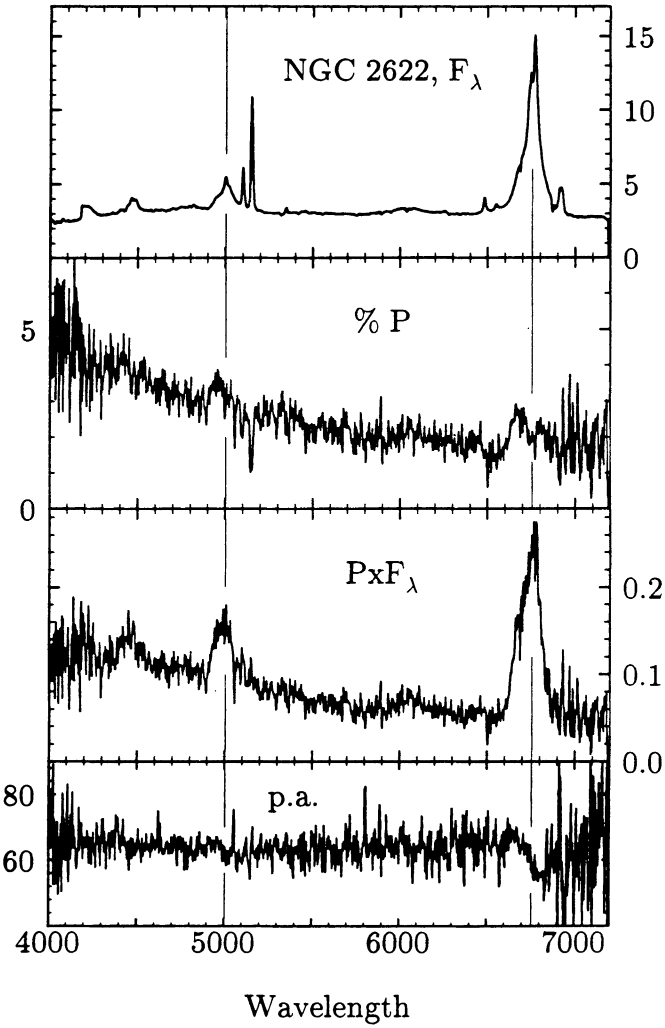

DISCUSSION

WHITTLE In what part of the forbidden-line profile does the blueshifted Na D absorption feature lie – in the wing or beyond?

GOODRICH I do not remember, but I believe it lies in the wings. The true position of the absorption line is not clear – there may even be two absorption lines.

GASKELL The changes in $H\alpha/H\beta$ with continuum flux could be a consequence of the changing ionization parameter. This is what occurs in the standard Ferland model in some range of Γ. Other evidence for the idea of variable dust coverage comes from the possible changes in $\lambda2200$ which Barr found in NGC 3783.

GOODRICH That is true. Qualitatively the $H\alpha/H\beta$ ratio can decrease with increasing ionization parameter. However, in cases in which we agree that there is continuum variability, such as NGC 4151 (Antonucci and Cohen) and the variable quasars analyzed by Zheng, the quantitative line flux changes are inconsistent with charges in extinction.