

A SURVEY OF THE INTERSTELLAR MEDIUM IN ELLIPTICAL GALAXIES: THE IONIZED GAS

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We have carried out an extensive program of observations of the ionized gas in 74 luminous elliptical and lenticular galaxies, selected to include a variety of properties in radio and X-ray emission, and in kinematical behavior. For each galaxy we have obtained broad-band R and V images and narrow-band images, centered at the $H\alpha$ and [NII] emission lines, to derive the luminosity and distribution of the ionized gas. We found that a large fraction ($\simeq 70\%$) of E and S0 galaxies in our sample contain ionized gas. The gas morphology and size varies from small disks (mean diameter 1–4 kpc) to large filamentary structures (extending up to 10 kpc from the galaxy center). Comparison with previous measurements shows reasonable agreement for a few galaxies, but considerable scatter for a large fraction, possibly due to differences in the limiting flux thresholds.

A significant correlation between $H\alpha + \text{NII}$ and X-ray luminosities is found for those galaxies (38% of the sample) for which we have detected ionized gas and are listed as X-ray sources. Only weak correlations are present between infrared luminosities and the $H\alpha + \text{NII}$ luminosity. A strong correlation is also found between the $H\alpha + \text{NII}$ flux and the B-band flux within the region occupied by the line-emitting gas. This finding seems to support a scenario in which the ionization and excitation of the gas is in part or fully provided by UV photons produced by post-AGB stars.