Multi-wavelength characterisation of activity in nearby S0 galaxies

Galaxy evolution

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This is the second paper in a series using data on more than 56,000 S0 galaxies of the local Universe (z ? 0.1) retrieved from the NSA catalogue. It builds on the outcomes of a previous work, which introduced a new classification scheme for these objects based on the principal component analysis (PCA) of their optical spectrum and its projections onto the first two eigenvectors (the PC1--PC2 diagram). We provide an exhaustive characterization of the activity of present-day S0 throughout both the broad-band PC1--PC2 and narrow-line BPT/WHAN spectral classifiers, contrasting the different types of activity classes they define, and present an alternative diagram that exploits the resemblance between WHAN and PCA spectral classes. The analysis is extended to the mid-infrared, radio and X-ray wavelengths by crossmatching our core sample with data from the WISE, FIRST, XMM-Newton and Chandra surveys. This has allowed us to carry out a thorough comparison of the most important activity diagnostics in the literature over different wavebands, discuss their similarities and differences, and explore the connections that exist between them and with parameters related to star formation and nuclear activity. Among the results obtained, we highlight the finding of evidence that the nebular emission from most of the S0–LINERs is generated by the diffuse UV field of evolved stars, and that the radio and X-ray luminosities in these systems, but also in much of the Seyfert class, are not driven by star birth. These and other outcomes from the present work should be transferable to other morphologies.