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X-rays from the youngest extragalactic radio jets

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Formation and launching of relativistic jets is one manifestation of black hole activity. Jets impact the black hole surrounding and thus affect further black hole feeding and growth. This coupling is believed to be essential to the idea of AGN-galaxy feedback. Theory predicted that young radio jets should be strong high-energy emitters. However, they proved to be relatively faint and observing them has been challenging before the Chandra and XMM-Newton era. Here, we discuss the most recent results for a sample of Compact Symmetric Objects (CSO; radio structure sizes < 1 kpc) based on the new high quality spectral energy distributions including XMM-Newton, Chandra, NuSTAR and Fermi/LAT data. For the first time, we have now means to test theoretical scenarios for the high energy emission of the young radio jets (radio lobes origin, shocked ISM, jet, disk corona). We were able to refute the radio lobes origin in at least one source. In addition, we find evidence to support the dichotomy of the CSO environment that we have recently discovered. This dichotomy may suggest that X-ray obscured CSOs have smaller radio sizes than X-ray unobscured CSOs with the same radio power. Thus, the environment may play a crucial role in regulating the early growth of the radio jets. Importantly, X-rays emitted by the X-ray absorbed CSO sub-population, in conjunction with the recent developments in the optical/IR and radio bands, offer new insights for understanding the structure and size of the AGN obscuring torus, as they provide information about the radiative processes and environment on the torus (parsec) scale. We discuss the implications of our results for the earliest stages of a radio galaxy evolution, high energy emission models of radio jets, diversity of the medium in which the jets expand, and jet-galaxy co-evolution.

Topic

Active Galactic Nuclei: accretion physics and evolution across cosmic time

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