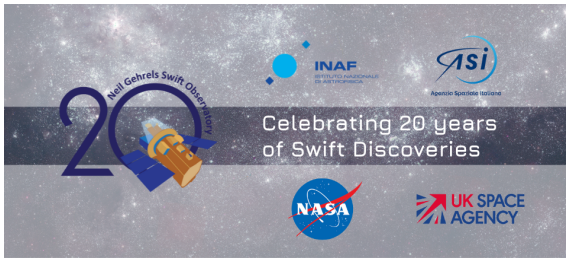

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A first time in the history of astronomy: Observing the formation and evolution of a radio jet from a super massive black hole in real time.

Friday 28 March 2025 10:10 (20 minutes)

We present results from a high cadence multi-wavelength observational campaign of the enigmatic changing look AGN 1ES 1927+654 from May 2022- April 2024, coincident with an unprecedented radio flare ~60 times in a few months and the emergence of a spatially resolved jet at 0.1-0.3 pc scales. This is the first time in the history of astronomy that we discover a jet form and evolve in real time from a supermassive black hole system. We have also detected a recurrent quasi-periodic oscillation (QPO) in the 2-10 keV band with an increasing frequency (1-2 mHz) over the same period. During this time, the soft X-rays (0.3-2 keV) monotonically increased by a factor of ~8, while the UV emission remained nearly constant with < 30 % variation and the 2-10 keV flux showed variation by a factor < 2. The weak variation of the 2-10 keV X-ray emission and the stability of the UV emission suggest that the magnetic energy density and accretion rate are relatively unchanged, and that the jet could be launched due to a reconfiguration of the magnetic field (toroidal to poloidal) close to the black hole. Advecting poloidal flux onto the event horizon would trigger the Blandford-Znajek (BZ) mechanism, leading to the onset of the jet. The concurrent softening of the coronal slope (from $\Gamma = 2.70 \pm 0.04$ to $\Gamma = 3.27 \pm 0.04$), the appearance of a QPO, and low coronal temperature ($kT_e = 8^{+8}_{-3}$ keV) during the radio outburst suggest that the poloidal field reconfiguration can significantly impact coronal properties and thus influence jet dynamics. These extraordinary findings in real time are crucial for coronal and jet plasma studies, particularly as our results are independent of coronal geometry.

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Session Classification: AGN: accretion and outflows, blazars and jets