Eight galaxies found with “reignited” central black holes

Researchers have detected a rare type of active galactic nuclei (AGNs) that have characteristics of both young and old AGNs.

By Centro de Astrofisicada Universidade do Porto, Portugal — Published: December 12, 2011

Artist's impression of an AGN with interrupted jets. *Aurore Simonnet, Sonoma State University*

A team of researchers, mainly from Centro de Astrofísica da Universidade do Porto (CAUP) in Portugal, has detected a rare type of active galactic nuclei (AGNs) that have characteristics of both young and old AGNs. This apparent discrepancy is thought to be due to a recent reignition of the central black hole.

The team cross-correlated a catalog of more than 13,000 clusters with a catalog at radio frequencies, searching for a link between AGNs and the clusters in which they reside. “Our initial project aimed to study radio galaxies in clusters,” said Mercedes Filho from CAUP. “By chance, we found eight radio sources with extended structure — radio jets and lobes — that didn’t show up in the optical images, which we found strange. So we decided to drop the initial project and pursue these strange radio galaxies.”

In order to get more information about these eight objects, further observations in the infrared were made with the Very Large Telescope at the European Southern Observatory. This allowed the team to detect the host galaxies where the extended radio structures originated.

While comparing the obtained spectra with known galaxy models, the team was able to conclude that these eight sources are rare objects — galaxies with characteristics common to active AGNs (that still have jet emission) and inactive AGNs (where the jet emission has turned off). This apparent discrepancy can be explained with a relatively recent reactivation of the AGN due to new material being accreted by the central black hole.

In general, when a black hole is active, it produces a jet along the galaxy’s rotation axis. This jet can travel great distances, creating lobes visible at radio frequencies. When the black hole is not active, the jet shuts down, but the lobes can persist for a long time — a minimum of one million years.

The original jet emission must have been interrupted sometime in the past, while the lobes, though fading, remain visible in the radio. “Our objects have radio lobes, a sign of past activity, but the spectra tell us that the central black hole and the jet have recently been reactivated,” said Mercedes Filho.

The black hole must have recently been replenished with new material — either through internal disk instabilities or interactions with other galaxies — which instigated a new jet emission that started before the original radio lobes faded completely.

The team will now carry out a new set of observations, both in radio and gamma rays, to try to detect direct hints of young jets associated with the reignited central black hole.

Related Articles

- New all-sky map shows the magnetic fields of the Milky Way with the highest precision
- Mars rover finds mineral vein deposited by water
- Two meteor showers put on shows this December
- Massive stars are born as giants