

Gluttonous black holes power ancient cosmic 'blobs'

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Mysterious blobs of gas dotting the early universe seem to be lit by ravenous black holes at the hearts of massive galaxies, a new study suggests. Further study of the strange clouds could reveal how young galaxies regulate their meals to become the galaxies we see today.

For about a decade, astronomers have puzzled over the power source behind vast reservoirs of glowing hydrogen gas that can span about 500,000 light years across, several times the size of our own Milky Way. These Lyman-alpha "[blobs](#)" are named after [a wavelength of light released](#) when an electron loses energy in a hydrogen atom.

One idea was that the blobs might be the next meals of growing galaxies. In this scenario, the gas clouds would radiate energy as they were tugged inwards by gravity and cooled down.

But a new study suggests the clouds are actually lit by almost-full galaxies that prevent the gas from falling inwards. Here, [supermassive black holes](#) inside the galaxies are thought to be devouring their surroundings, spawning powerful outpourings of energy.

This energy, along with that radiated by abundant young stars in the galaxies, is thought to heat up nearby gas, causing it to glow as Lyman-alpha blobs. At the same time, this heat prevents the gas from cooling down and falling into the galaxies.

Self-regulation

"This is a phase where the galaxies are nearly finished growing and are now trying to prevent further growth by stopping fresh gas from cooling ... basically a form of self-regulation," astronomer [James Geach](#) of Durham University in the UK told reporters on Wednesday.

Geach and colleagues used the orbiting [Chandra X-ray Observatory](#) to measure the X-ray light emanating from a patch of sky containing 29 Lyman-alpha blobs. The blobs are so distant they appear to us as they were just 2 billion years after the big bang.

Five of the blobs had regions that glowed brightly in X-rays, a sign of galaxies with ravenous central black holes.

The team's calculations suggest that the energy jettisoned by the feeding black holes, along with bursts of star formation in the galaxies, is sufficient to power the blobs. Intergalactic gas may actually surround the galaxies but only be lit in certain regions, creating the blobs we see.

'Blob phase'

"It's possible that nearly all massive galaxies could go through a blob phase," Geach said.

In the study, the blobs that did not glow brightly in X-rays were generally dimmer, suggesting that if they are associated with black holes, the holes' outbursts were too weak to be seen, the team says. If all young massive galaxies do go through a blob phase, it may be visible only briefly – perhaps for just a few hundred million years, Geach added.

"We are seeing these objects at a stage when the gas is still present and is maximally conspicuous because it's being energised by the black hole and by stars," said [Martin Rees](#) of the University of Cambridge, who was not affiliated with the study. "If you were to watch one of the blobs for the next one or two billion years, you would see the gas would either be blown away or it would turn into stars."

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