An ancient, stormy black hole

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In a very distant past, 13.1 billion years ago, a supermassive black hole spewed a humongous amount of galactic wind – a gigantic flow of gas that blows away the material that forms stars, or interstellar matter. The Universe is about 13.8 billion years old, so this happened really close to the Big Bang!

Astronomers found it out by using the Atacama Large Millimeter/submillimeter Array (ALMA). This is the earliest example of this kind of galactic winds: a sign that black holes have had a huge influence on how galaxies grow since the beginning of time.

Many large galaxies hide supermassive black holes in their center. These objects are millions (or billions!) of times more massive than our Sun. Even with all that mass, such black holes are usually much smaller than the central region of the galaxy they live in – but they're roughly proportional, which is pretty interesting!

The central region of this galaxy astronomers found (the J1243+0100 galaxy) has the mass of 30 billion Suns and the supermassive black hole inside has about 1% of this mass. This mass proportion is almost identical to what we see in younger galaxies in our modern Universe!

Based on this proportional relationship between the masses of two objects that are so different in size (the black hole and its host galaxy), astronomers believe that galaxies and black holes grew and evolved together – at least since the Universe was less than a billion years old. Black holes and galaxies might have suffered the effects of the same physical interaction, after all.

Galactic winds can show this physical interaction. A supermassive black hole swallows a huge amount of matter. As this matter starts swirling around at incredible speed – because of the immense gravity inside a black hole – it emits lots of energy, pushing matter out the black hole. This is how galactic winds are formed.

The galactic wind from the J1243+0100 galaxy's central black hole is the oldest astronomers have found to date. It is at least 100 million years older than the previous record-holder, a galactic wind about 13 billion years old!

Astronomers plan to observe more galactic winds blowing out from black holes to check whether galaxies and black holes have indeed evolved together. This could tell us a lot about what our infant Universe looked like.

Artist's impression of a galactic wind "blown" by a supermassive black hole located in the center of a galaxy.

Image credit: ALMA (ESO/NAOJ/NRAO)

COOL FACT

Scientists used the Subaru Telescope in Japan to look for ancient supermassive black holes in the early Universe and found more than a hundred of them. With this data in hand, the team knew exactly where to point ALMA to look for galactic winds!

This Space Scoop is based on Press Releases from ALMA , NAOJ .
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