Mystery gas discovered near center of Milky Way

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The Atacama Pathfinder Experiment (APEX), on the 5000-meter altitude plateau of Chajnantor in the Chilean Andes. Credit: ESO/B. Tafreshi/TWAN (twanight.org)

An international team of researchers have discovered a dense, cold gas that's been shot out from the center of the Milky Way "like bullets".

Exactly how the gas has been ejected is still a mystery, but the research team, including Professor Naomi McClure-Griffiths from The Australian National University (ANU), say their findings could have important implications for the future of our galaxy.

"Galaxies can be really good at shooting themselves in the foot," Professor McClure-Griffiths said.

"When you drive out a lot of mass, you're losing some of the material that could be used to form stars, and if you lose enough of it, the galaxy can't form stars at all anymore.

"So, to be able to see hints of the Milky Way losing this star forming gas is kind of exciting—it makes you wonder what's going to happen next!"

The study also raises new questions about what's happening in our galactic center right now.

"The wind at the center of the Milky Way has been the topic of plenty of debate since the discovery a decade ago of the so-called Fermi Bubbles—two giant orbs filled with hot gas and cosmic rays," Professor McClure-Griffiths said.

"We've observed there's not only hot gas coming from the center of our galaxy, but also cold and very dense gas.

"This cold gas is much heavier, so moves around less easily."

The center of the Milky Way is home to a massive black hole, but it's unclear whether this black hole has expelled the gas, or whether it was blown by the thousands of massive stars at the center of the galaxy.

"We don't know how either the black hole or the star formation can produce this phenomenon. We're still looking for the smoking gun, but it gets more complicated the more we learn about it," lead author Dr. Enrico Di Teodoro from Johns Hopkins University said.

"This is the first time something like this has been observed in our

galaxy. We see these kind of processes happening in other galaxies. But, with external galaxies you get much more massive black holes, star formation activity is higher, it makes it easier for the galaxy to expel material.

"And these other galaxies are obviously a long way away, we can't see them in a lot of detail.

"Our own galaxy is almost like a laboratory that we can actually get into and try to understand how things work by looking at them up close."

The research has been published in the journal *Nature*.

The gas was observed using the Atacama Pathfinder EXperiment (APEX) operated by the European Southern Observatory (ESO) in Chile.

More information: Cold gas in the Milky Way's nuclear wind, *Nature* (2020). DOI: 10.1038/s41586-020-2595-z , www.nature.com/articles/s41586-020-2595-z

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