For galaxies, having neighbors matters

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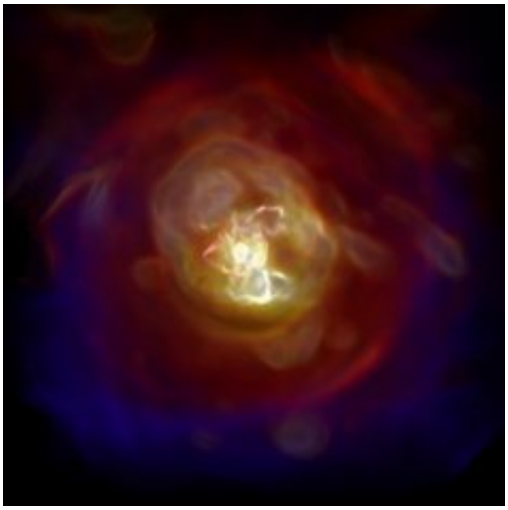

Gas around young galaxy

Where galaxies live has an enormous effect on how they form stars, a puzzle that a new Canadian study is helping to solve. "To understand how galaxies evolve, we need to study the link between stars and gas, and the effects of the surrounding environment on these two crucial components," said Angus Mok, a Ph.D. student from McMaster University.

How much gas a galaxy contains provides crucial information about how they are currently forming stars and how their star formation will continue in the future. Most star formation occurs inside spiral galaxies similar to our own Milky Way galaxy. Inside these galaxies, stars are born inside clouds of molecular hydrogen gas that are just a few degrees

above absolute zero. This gas is too cold to produce light that we can see with our eyes, but shines brightly in the submillimeter range of the electromagnetic spectrum.

In the universe, galaxies live in a variety of environments, from largely isolated galaxies, to groups of tens of galaxies, to massive clusters of hundred and thousands of member galaxies. Previous studies have found that galaxies located in the densest environments, such as galaxy clusters, form stars at a slower rate. Possible explanations include gravitational interactions between the member galaxies inside clusters, the removal of a galaxy's hot gas envelope upon entering the cluster, and the stripping of the cold gas from a galaxy by its passage through the hot intracluster medium.

New results presented at the 2014 meeting of the Canadian Astronomical Society show that although the amount of molecular gas per galaxy is largely the same between the three environments, galaxies inside the dense Virgo Cluster are forming stars at a slower rate with respect to their gas reservoirs, conserving their gas by using it up more slowly. In contrast, group and isolated galaxies are on track to deplete their gas in a much faster time. "Angus's research has highlighted some really interesting diversity among the galaxies in our local neighborhood," Dr. Christine Wilson of McMaster University, the principal investigator of the NGLS, remarked.

This research uses data from the Nearby Galaxies Legacy Survey (NGLS), a large international research project that is studying gas and dust in a large sample of nearby galaxies. The NGLS uses the James Clerk Maxwell Telescope (JCMT), which is the world's largest single dish submillimeter radio telescope, probing wavelengths far longer than optical light.

Provided by McMaster University