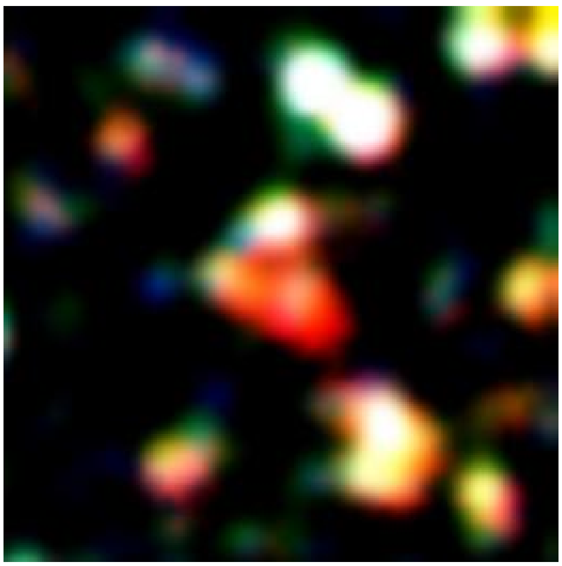
GOODS-Herschel reveals gas mass role in creating fireworks versus beacons of star formation

March 27 2012



False colour image from the Herschel Space Observatory of starburst galaxy GN20, 1.5 billion years after the Big Bang, or more than 12 billion years back into the history of the Universe. This is a "firework", with an extreme, but short-lived nevertheless, star-forming episode, believed to be triggered by a major merger. Credit: ESA/GOODS-Herschel Team and R. Gobat

(PhysOrg.com) -- A study of galaxies in the deepest far-infrared image of the sky, obtained by the Herschel Space Observatory, highlights the two contrasting ways that stars formed in galaxies up to 12 billion years ago. Dr. Georgios Magdis will present the results at the National

Astronomy Meeting in Manchester.

Recent results from Herschel show that gas-rich galaxies in the early universe were able to create stars at an intense rate. In the nearby universe, we only see such high rates of star formation when galaxies collide. However, the Herschel data shows that while star-formation in some galaxies in the early universe were triggered by mergers, the majority of star forming galaxies were not undergoing interactions. The formation was driven by the amount of gas present.

Magdis and his colleagues have now carried out a detailed study of an example of a normal and a merging galaxy observed as part of the Great Observatories Origins Deep Survey (GOODS) Herschel programme. GOODS Herschel is led by David Elbaz of CEA/Saclay, France.

"The aim of this study was to estimate the amount of gas that the galaxies contained and understand how that affected the way that they formed stars. In contrast to what we see in the nearby universe, it was only in the minority of the intensively star forming galaxies that star formation activity was triggered by merging of galaxies," said Magdis, of the University of Oxford.

"The dominant population had very large gas reservoirs that could induce and maintain a high birth rate of stars without the need of galaxy 'cannibalism'. Such episodes of star-formation naturally resulted from steady, long lasting accretion of gas, forming these 'cosmic beacons' of our Universe. However, our study shows that the other population – merging galaxies – had ten times less gas, but the interactions made them much more efficient in converting gas into stars. These galaxies experienced an extreme but nevertheless short-lived firework of star formation," said Magdis.

The team selected the galaxy BzK-21000, observed approximately 4 billion years after the Big Bang, as an example of the 'normal' gas-rich galaxy and GN20, a member of a rich proto-cluster of galaxies observed approximately 1.5 billion years after the Big Bang, as an example of an interacting galaxy. The mass of the gas in the galaxies cannot be measured directly as it mostly consists of hydrogen, which is difficult to detect. Instead the team measured levels of dust and carbon monoxide and, assuming that there are constant ratios with the mass of hydrogen present, used these to estimate the amount of gas present. The measurements were supplemented by radio detections from the Very Large Array (VLA) to constrain the uncertainties in the estimates for the mass of dust.

"This result comes to highlight the minor contribution of mergers in the history of star formation activity and point towards a more quite, smooth and ‘independent’ evolution of galaxies throughout the cosmic time," said Magdis.

Provided by Royal Astronomical Society

Citation: GOODS-Herschel reveals gas mass role in creating fireworks versus beacons of star formation (2012, March 27) retrieved 25 April 2024 from https://phys.org/news/2012-03-goods-herschel-reveals-gas-mass-role.html