

Abundant molecular gas and inefficient star formation in a ram pressure stripped galaxy's wake

With the ESO APEX telescope we reveal large amounts of cold molecular gas in a ram pressure stripped tail of the Norma cluster galaxy ESO 137-001, out to a large “intracluster” distance of 40 kpc from the disk. It is the first time that an abundant cold molecular gas is found in a ram pressure stripped tail. ESO 137-001 is an excellent candidate for recent transformation from a blue to a gas-poor type. It has a long (80 kpc) and bright X-ray tail associated with a shorter (40 kpc) tail of numerous star-forming HII regions. Our CO observations have revealed more than $10^9 M_{\odot}$ of molecular gas (assuming a Galactic value of the CO-to- H_2 conversion factor) in three $H\alpha$ bright regions along the tail. The amount of $2 \times 10^8 M_{\odot}$ of H_2 found in the most distant region is similar to molecular masses of tidal dwarf galaxies. Along the tail, the amount of molecular gas was found to drop, while masses of the X-ray emitting and diffuse ionized components stay roughly constant. We find a very low star formation efficiency ($\tau_{\text{dep}} > 10^{10}$ yr) in the stripped gas and suggest that this is due to a low average gas density in the tail, or turbulent heating of the interstellar medium that is induced by a ram pressure shock. The CO-bright gas-stripped tail of ESO 137-001 represents a special environment that is distinct from typical regions of star formation.