

Title: “Circumgalactic molecular gas fuels the growth of massive galaxies in protoclusters”

Massive galaxies, especially at the early stages of their formation, accrete a large amount of gas from the intergalactic/circumgalactic medium (IGM/CGM) to sustain their prolonged and vigorous star formation. This scenario is invoked by most models, but a direct observational evidence for such gas fuelling is still sparse. A few pieces of evidence come from recent detections of large molecular gas reservoirs located in the surroundings of massive galaxies within protoclusters and extending over more than tens of kpc. After briefly reviewing previous and current research on this topic, I will present recent ALMA results (Ginolfi et al. 2017, MNRAS, 468, 3468), showing evidence for a large scale cold gas reservoir feeding Candels-5001, a massive galaxy at $z \sim 3.5$, located in a forming protocluster. In such overdense environment, the chemical enrichment is efficiently enhanced by galactic winds and massive outflows (starburst- and/or AGN-driven), polluting the IGM/CGM with recycled material. ALMA observations reveal an extended elongated distribution of molecular gas on circumgalactic scales (40 kpc). The molecular gas kinematics shows the presence of different dynamical components, which cannot be ascribed to simple rotation, and instead are consistent with tracing streams of enriched gas accreting onto the central massive galaxy.