Contribution ID: **28** Type: **not specified**

A tale of two galaxies (and everything in between) inside a cluster progenitor at z~3

Thursday, 1 July 2021 16:05 (20 minutes)

We report the results from a combination of very deep optical, near-IR (HST, Vista, Spitzer) and sub-mm (ALMA) data, that has provided a very comprehensive picture of the highest redshift galaxy-group to have an observationally characterised halo, RO-1001 at z=2.91. There is direct evidence of a massive Ly-alpha detected cold gas reservoir in this galaxy-cluster progenitor, being fed by accretion streams. This provides enough fuel for the extreme star formation in the three spectroscopically confirmed primary massive galaxies inside the group, that feature a total rate of ~1250 Msun/yr. However, based on a detailed photometric study, possibly within the same environment also exists an extremely old quiescent galaxy passively evolving for about 1.7 +/- 0.4 Gyr (mass-weighted stellar age). Such conflicting characteristics of similarly massive galaxies (≥10^11 Mstar) within the same group raises the question: HOW? We make a one-to-one comparison to answer this, using the quiescent galaxy and one of its star-forming counterparts. Adding another plot-twist is the ALMA detection of diffuse dust with a net flux of ~3 mJy, distributed over the intergalactic medium within the core of RO-1001. This, we propose, could be an additional channel for cooling the surrounding gas: through IR radiation from collisionally excited dust. This would further deepen the mystery of how a passive galaxy can exist in a gas-rich environment, while also initiating a discussion on this cooling mode that is usually not considered in studies of such galaxy-cluster progenitors or 'protoclusters'.

Primary author: KALITA, Boris Sindhu (CEA-Saclay)

Presenter: KALITA, Boris Sindhu (CEA-Saclay)