X31a **How galaxies were formed in a over dense region in the early universe? : Deep Jansky VLA S-band view of dusty starburst galaxies in a proto-cluster at redshift z=2.5**

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We report the recent results on observations of proto-cluster around radio galaxy 4C23.56, using our JVLA (2-4 GHz) deep continuum data sets. Our narrow band survey of H-alpha emitters(HAEs) with Subaru/MOIRCS has revealed that this proto-cluster has an overdensity exceeding 5 times bigger than blank fields. This proto-cluster is likely a progenitor of a present-day cluster of galaxies. AzTEC/ASTE deep 1.1 mm imaging and PdBI 1.8 mm high-resolution observations followed them up, disclosing overlaps of submm galaxies(SMGs) and HAEs. This implied the heavily dust-obscured starbursts, although the redshifts of SMGs were poorly constrained. Uncertainties on star formation rates(SFRs) of each galaxies and the associations of SMGs hindered translations of environmental effects on galaxy formation in the proto-cluster. Our μJy-JVLA deep continuum observations elucidate solutions on these questions. We achieved subarcsec resolution ($\sim 0.7'' \times 0.7''$) with $\sim 4\mu$Jy rms level in the central region where the datasets were terribly affected by radio frequency interferences(RFIs). We will report the latest results of the observations with implications of galaxy formation in an over-dense region.