

NAOJ ALMA Scientific Research Grant 2019

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■ Title

Revealing the large-scale structure, proto-clusters and sub-millimeter galaxies by combining ALMA observations and cosmological simulations

■ Summary

Recent observations have successfully discovered proto-clusters in the early Universe. How did galaxies form and evolve in overdense regions like proto-clusters? This environmental effect is a key to understand galaxy evolution. In this project, we will study galaxy evolution in proto-cluster regions by combining ALMA observations and cosmological simulations. In particular, this project consists of three parts: (1) studying the physical conditions of galaxies via comparison between ALMA data and numerical simulations; (2) carrying out new ALMA observations motivated by numerical simulations; (3) constructing a multi-band database of simulated galaxies by radiative transfer calculations and making it public for ALMA users. Finally, we aim to reveal the evolutionary mechanism from a proto-cluster at $z > 6$ (consists of blue galaxies) to a mature proto-cluster like the SSA-22 region at $z=3.1$ which includes various galaxy populations.