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■ Title

Probing dark dwarf galaxies and dark matter with ALMA

■ Summary

On scales smaller than 10 kpc, the theory of structure formation does not seem to comply with observations. The so-called “missing satellite problem” is one of such small-scale issues. In order to solve the problems, our research group devised a new method using gravitational lens systems that show an anomaly in the flux ratios of lensed images. In particular, we obtained a new constraint on the mass of warm dark matter particles using gravitational lens systems that we observed in the mid-infrared band using Subaru. Moreover, we first obtained an evidence of a lensing substructure in the strongly lensed submillimeter galaxy SDP 81, which is possibly associated with a dark dwarf galaxy in the line of sight. The goal of our project is to extend our research achievement: 1) to build more realistic lens models based on numerical simulations, 2) to apply the obtained models to gravitational lens systems observed with ALMA, 3) to put constraints on dark dwarf galaxies in lens galaxies, 4) to put constraints on small-scale non-linear structures of dark matter and baryon in the line-of-sight. Our research achievements will help us to advance toward the resolution of the small-scale problems. For more detail, see our project site:

<https://www.researchgate.net/project/Small-scale-cosmology-with-gravitational-lensing>