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## First Identification of 10-kpc Scale [CII] 158um Halos around Star-Forming Galaxies at $z=5-7$

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Contributed talk

Abstract:

We report the discovery of 10-kpc scale [CII] 158um halos surrounding star-forming galaxies in the early Universe. We choose deep ALMA data of 18 galaxies each with a star-formation rate of  $\sim 10-70 M_{\odot}$  with no signature of AGN whose [CII] lines are individually detected at  $z=5.153-7.142$ , and conduct stacking of the [CII] lines and dust-continuum in the uv-visibility plane. The radial profiles of the surface brightnesses show a 10-kpc scale [CII] halo at the  $9.2\sigma$  level significantly extended more than the HST stellar continuum data by a factor of  $\sim 5$  on the exponential-profile scale length basis, as well as the dust continuum. We also compare the radial profiles of [CII] and Ly $\alpha$  halos universally found in star-forming galaxies at this epoch, and find that the scale lengths agree within the  $1\sigma$  level. The existence of the extended [CII] halo is the evidence of outflow remnants in the early galaxies and suggest that the outflows may be dominated by cold-mode outflows, which challenges current galaxy evolution models.

**Presenter:** Dr FUJIMOTO, Seiji

**Session Classification:** Cosmology