

Witness Formation of Galaxies at $z=2.23$: Resolving their H I Gas and Star Formation in Distant Lyman-alpha Emitting Galaxies

Jiasheng Huang (CfA)

June 10, 2016

A deep narrow-band survey at 393.8 nm shows line emission associated with faint galaxies. In many cases, the line emission is anisotropic and spatially extended far beyond the ultraviolet continuum of the emitting galaxies. Both ground-based narrow-band and Hubble Space Telescope (HST) images that include the line emission show a filamentary morphology. HST images at a longer wavelength that includes only continuum show that the galaxies are small in the rest-frame far ultraviolet and often lie at the endpoint of the filament. We interpret the line as Lyman alpha at redshift $z = 2.23$. Studies of local Lyman alpha emitters (LAEs) have shown that the extended line emission comes from Lyman alpha photons generated in star formation regions being resonantly scattered by neutral hydrogen gas well outside the galaxy. If the same process is at work in the distant galaxies we have observed, their Lyman alpha morphologies trace the neutral gas distribution. We suggest that LAEs with extended morphologies are undergoing hot-mode gas accretion with accreted gas heated by the shock. Theoretical models predict that the cold gas stream can penetrate the shock wave and supply star formation.