

Cosmic Cartography 2022: Exploring the Cosmic Web and Large-Scale Structure



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Pre-processing galaxies in protoclusters

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Like their lower redshift counterparts, high-redshift clusters host an excess of massive quiescent galaxies. In this talk will explore where these galaxies were quenched. I will present a study of protocluster galaxies that reside in the distant outskirts of 15 galaxy clusters at $0.8 \leq z \leq 1.5$. I will show that the massive protocluster galaxies are already quenched to a similar level as the cluster core, implying that massive galaxies are pre-processed before they fall into the cluster. I will then explore why massive galaxies are quenched to such a high level in the protocluster. I will compare the radial distribution of satellite galaxies around the massive protocluster and field galaxies, which are both are well fit by an NFW profile. We find that protocluster galaxies are surrounded by twice as many satellites and the NFW scale radius of the protocluster galaxies is significantly larger than that of the field galaxies. This suggests that the massive protocluster galaxies reside in larger dark matter haloes than similar-mass field galaxies. We interpret these results as evidence that the halos surrounding high-redshift clusters have a top-heavy mass function, which alters the galaxy properties before they become satellites of the clusters.

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