Erick Powell

Ken Rines

Are the Brightest Galaxies in Clusters also the Slowest?

The first evidence to suggest the presence of dark matter in our universe was the deviation of galaxy cluster dynamics from what would be predicted with only the matter we observe. The technique to estimate the total mass of a cluster uses the velocity distribution of member galaxies. This is only accurate if the velocities of cluster galaxies we observe are distributed the same as randomly drawn test particles of a virally bound system. Several numerical simulations of galaxy clusters have shown that this effect could be as large as 20%. Specifically, Wu et al (2013, MNRAS, 436, 460) claims that the brightest five galaxies have a velocity significantly smaller than the global value. Over the summer, I will use a sample of ~200 clusters that in total have ~20,000 members to test these models. This 200-cluster sample covers various masses, so we can test if there is a trend with respect to cluster mass. We will be able to compare our dynamic estimate of mass to other techniques like gravitational lensing, X-ray, and SZ. This will show how well these techniques agree with the dispersion of different luminosity cuts. Cluster cosmology relies the accuracy of cluster mass estimates, meaning this research may have an impact on the analysis of large cluster surveys.