Local Group *Stealth* Galaxies: Fossils Of The First Galaxies

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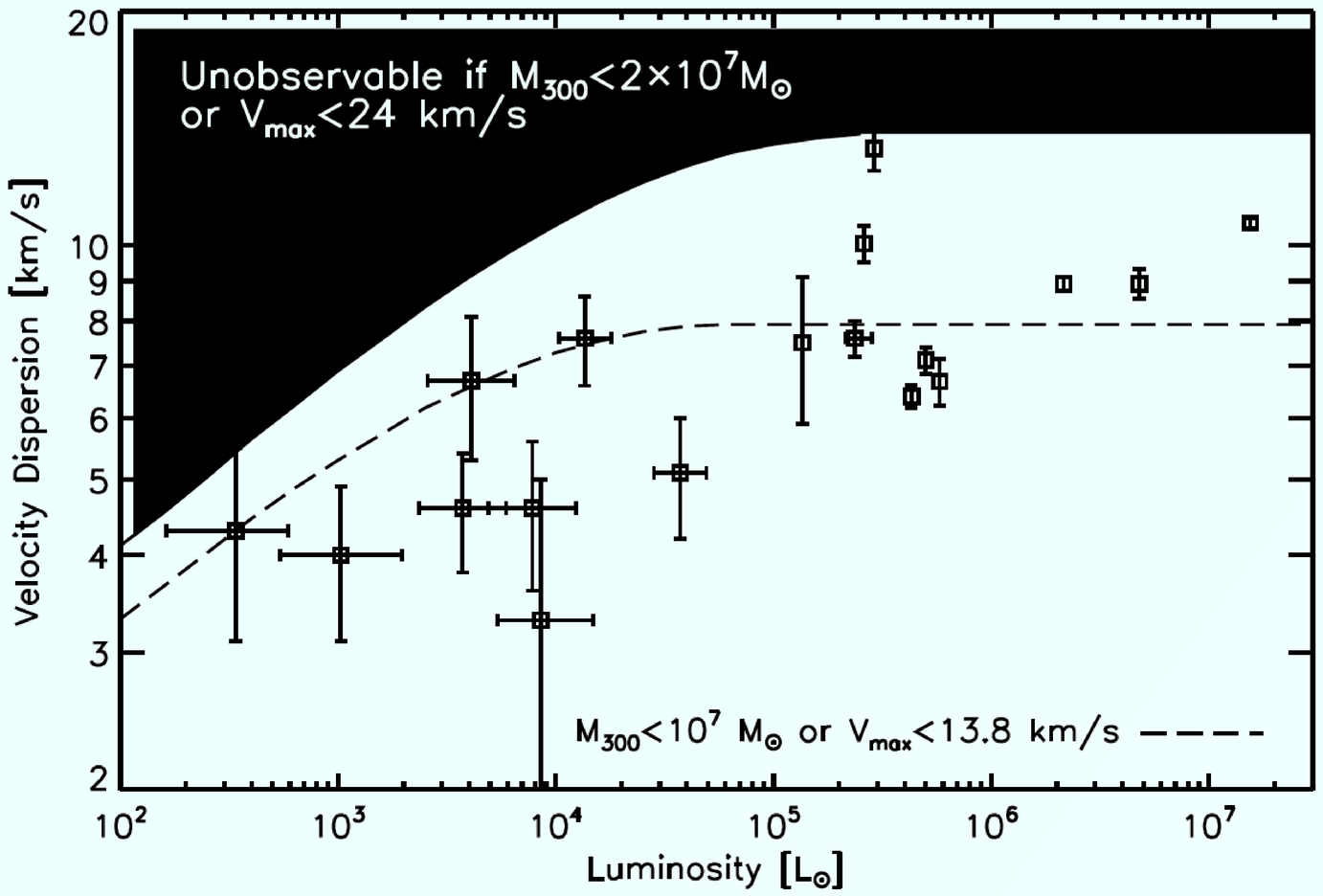
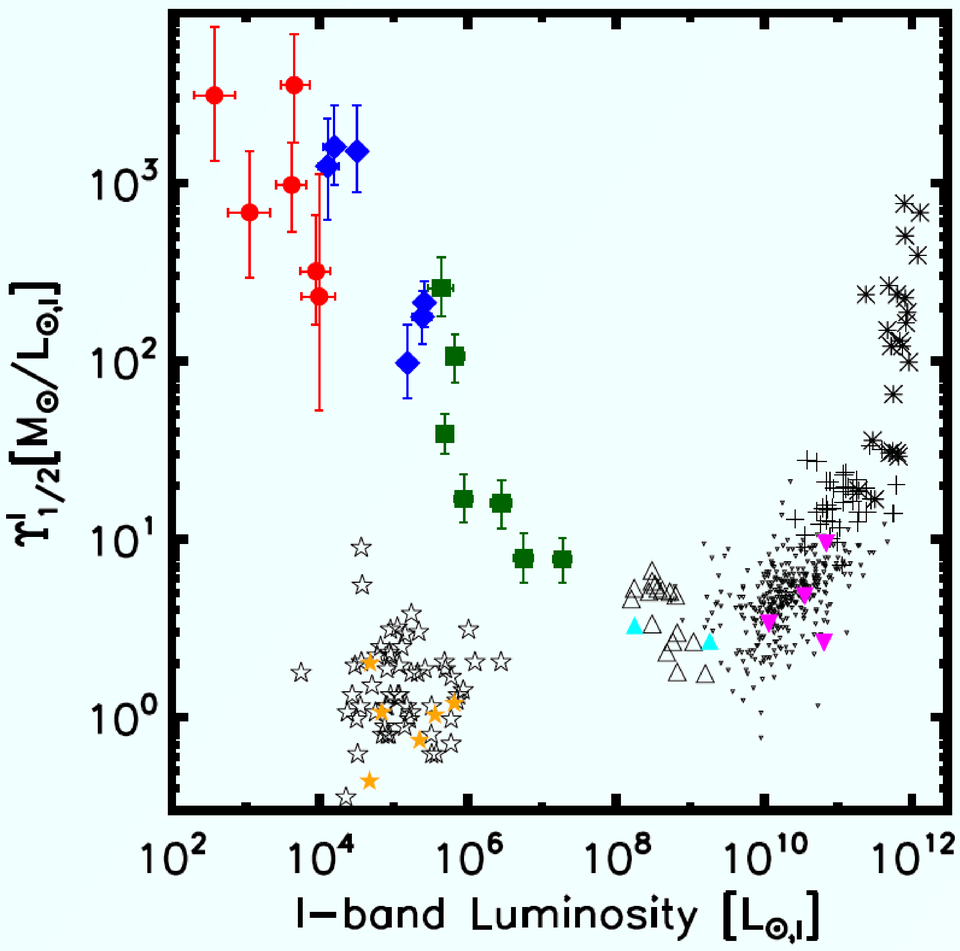
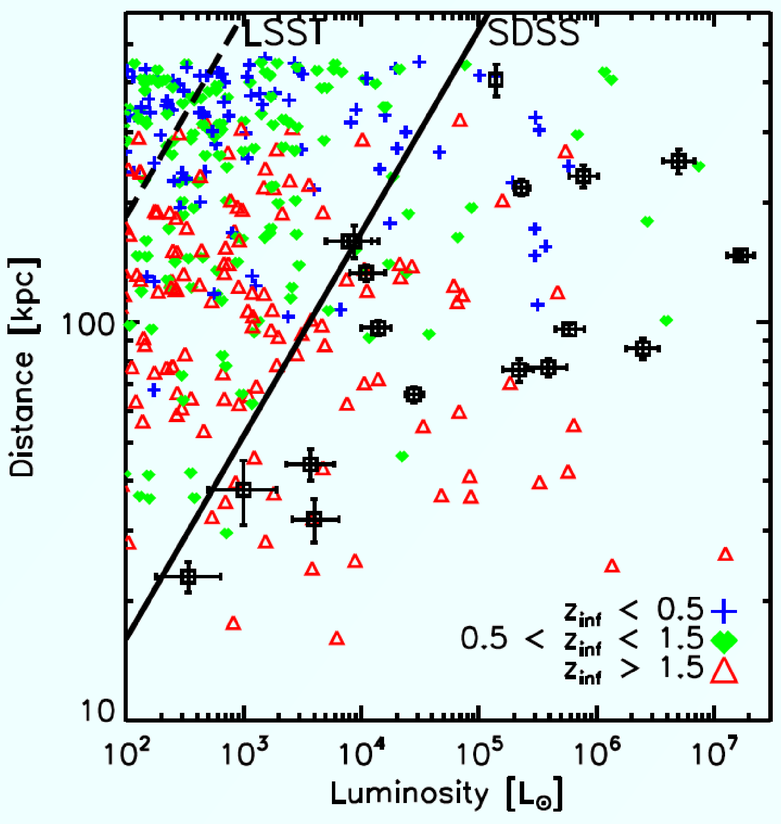
Abstract: We show that LSST will find many well-preserved fossils of the first galaxies orbiting within the dark matter halo of the Milky Way. These *stealth* galaxies are extremely dark-matter dominated, and their discovery will allow for additional tests of galaxy formation theories.

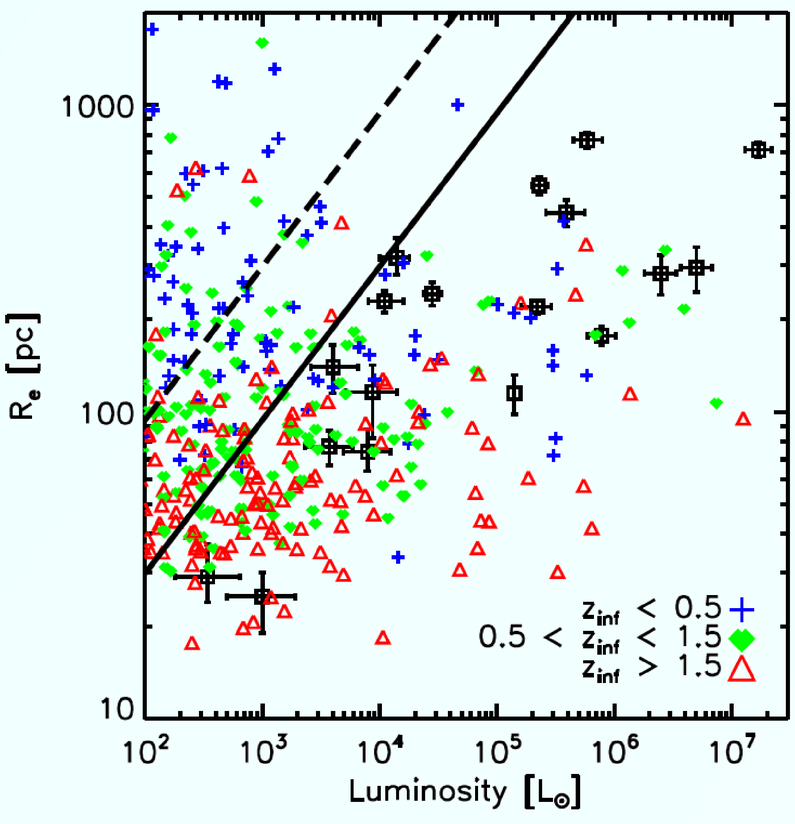


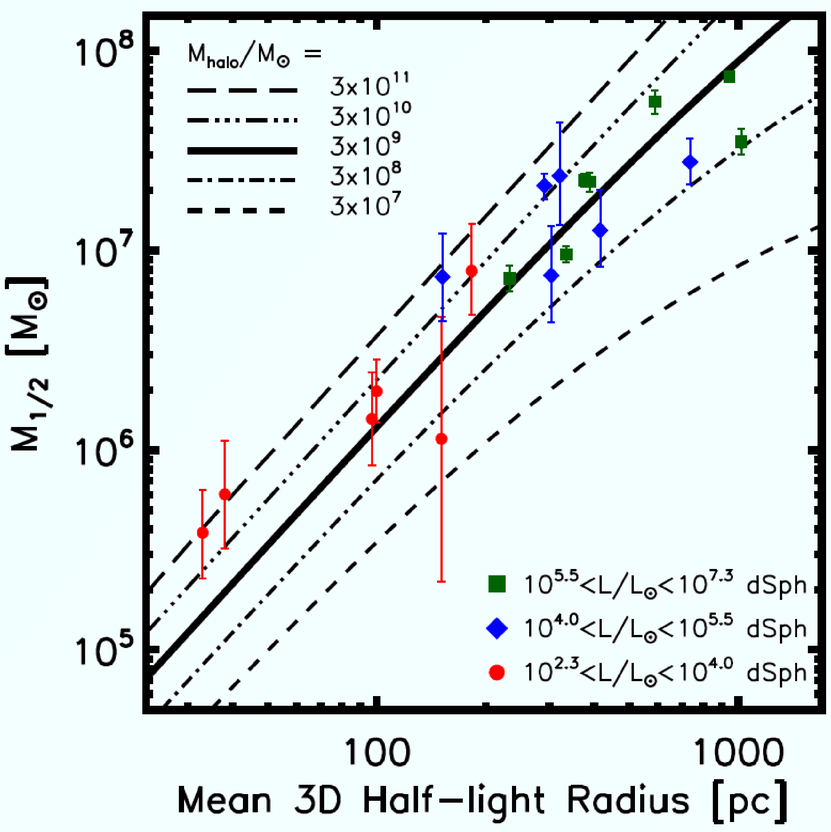


Faint, low mass dwarf spheroidal galaxies (dSphs) will have larger velocity dispersions measured at larger half-light radii than those currently detected, making their discovery a challenge. (Bullock et al. 2009; arXiv:0912.1873)

Current dSphs are the most dark matter dominated objects known, and future discoveries should continue to expand the above relation to the left. (Wolf et al. 2009; arXiv:0908.2995)







Left: Distance from Earth vs. Luminosity. *Middle*: Projected half-light radius vs. Luminosity. Based on the model presented in Bullock et al. (2009), a large number of early infall ($z_{infall}>1.5$), low mass dSphs are waiting to be found with LSST. These surviving systems should have their properties preserved since their infall, making them interesting candidates for tests of theoretical models of first galaxies. *Right:* Dynamical mass vs. 3D half-light radius (Wolf et al. 2009). When attempting to model the current MW dSph population, their mass scale ($M_{halo}>10^8$ M_o) is indicative of systems where HI-cooling is dominant, and seems to point of a threshold scale in galaxy formation near the photoionizing limit ($M_{halo}\sim10^9$ M_o). Interestingly, even the ultrafaint dwarfs are well above the mass scale where H2-cooling is required ($M_{halo}\sim10^6$ M_o). If these H2-cooling systems do exist within the halo of the Milky Way, it is likely that they will have surface brightnesses below what is currently detectable (i.e., the *stealth* galaxies in the left and middle plots).