WFIRST Guest Investigator & Parallel Observation Science

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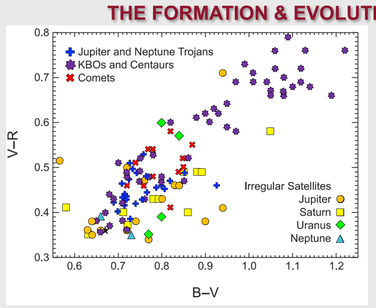
WFIRST GI Science

WFIRST is optimized to perform a range of surveys that will enable archival researchers (a.k.a. guest investigators) to conduct many scientific investigations that exceed the scope of those initial surveys. The WFIRST archive will enable guest investigators to greatly enhance WFIRST science by providing access to a variety of high-level science products and software services to analyze data in-situ.

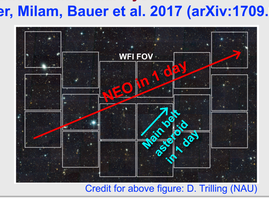
Potential GI Science Cases

- **Planetary Science – studies of satellites, KBOs, and other asteroid families**
- **Milky Way Structure – constraints on MW structure from proper motions of RR Lyrae stars in the Microlensing Survey (MLS)**
- **Stellar Evolution – asteroseismology observations from MLS data**
- **Transiting Exoplanets – measure galactic distribution of exoplanets from MLS**
- **Galaxy Cluster Evolution – based on high-z cluster survey from the High Latitude Survey (HLS)**
- **Galaxy Evolution – galaxy space densities and H-alpha luminosity function**
- **Epoch of Reionization – via measurement of high-z galaxy luminosity functions and cross-correlation with deep radio surveys**

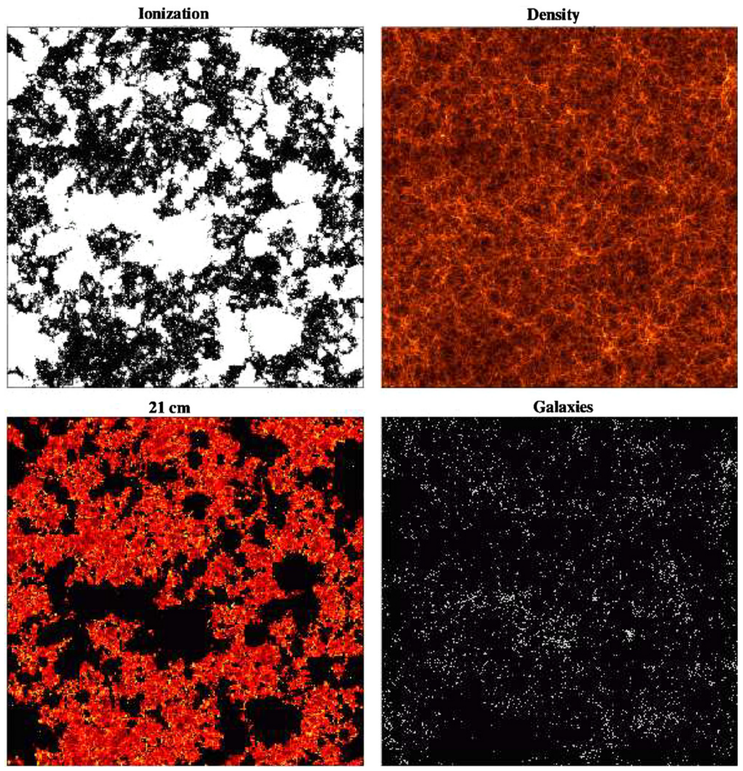
WFIRST GI SCIENCE WILL CONTRIBUTE TO THEORIES OF THE FORMATION & EVOLUTION OF THE SOLAR SYSTEM



"WFIRST will help improve orbit characterization, gather color information, and increase the number of known irregular satellites, leading to clues about their origins and the dynamical evolution of the Solar System." – Holler, Milam, Bauer et al. 2017 (arXiv:1709.02763)

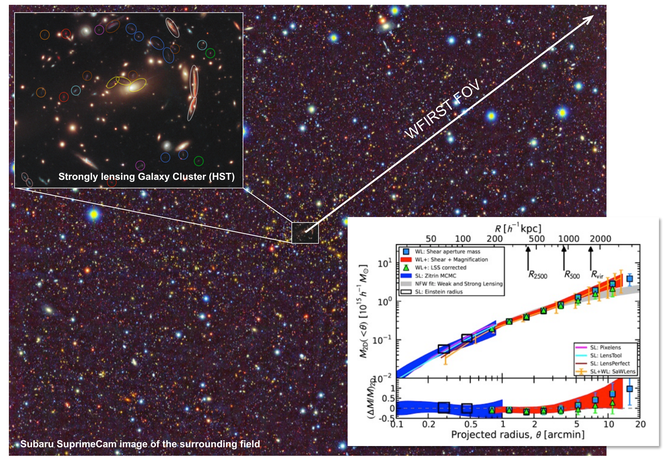


Credit for above figure: D. Trilling (NAU)



Above: Simulated maps from Lidz et al. (2009, ApJ, 690, 252) of structure at z = 7.3 are shown. Boxes are 130 Mpc/h wide.

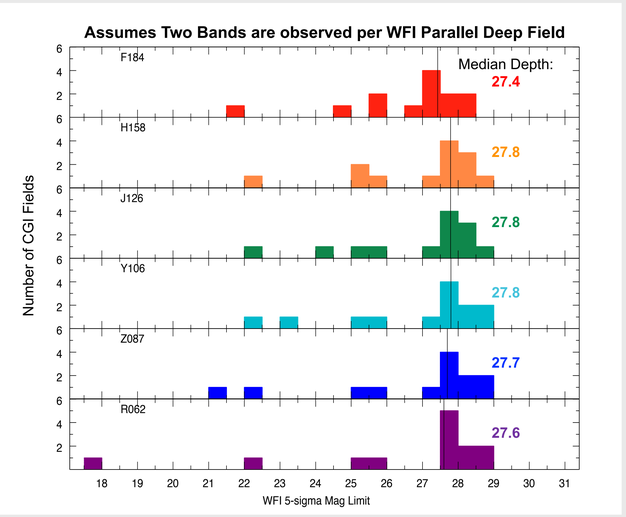
Guest Investigator cross-correlation studies between galaxies detected in the WFIRST HLS with low frequency radio measurements of the highly-redshifted 21-cm line allow us to measure the reionization process directly by matching the sources of reionization to the IGM structure as a function of halo mass.



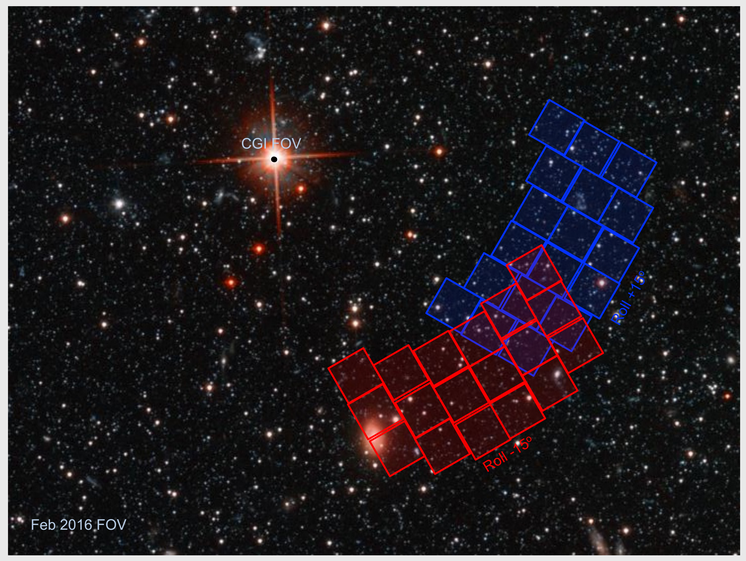
Above: The HLS may contain up to 40,000 massive galaxy clusters. The combination of WFIRST's angular resolution and FOV will allow GI studies of their dark matter profiles via gravitational lensing analyses.

Parallel Observations

The Wide-Field Imager (WFI) can be used in parallel during long exposures with the Coronagraphic Instrument (CGI) to produce deep, multi-band images over many independent fields. The depth covered with the WFI used in parallel during a possible small CGI exoplanet campaign of ~135 hours spread over a dozen targets is shown below.



Above: The distribution of 5-sigma limiting magnitudes reached over **each full WFI FOV** during CGI campaigns to observe 12 nearby star systems. The integration time to complete all 12 targets is 133 hours.



Above: The WFI field of view at two different roll angles likely to be used during a coronagraphic observation. The overlap between the two WFI pointings is about 35%. The WFI FOV is sufficiently far from the bright target star that deep imaging data can be acquired.