

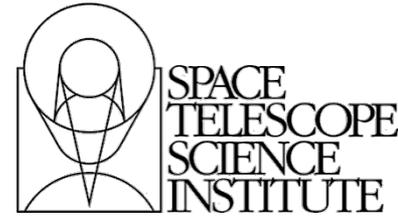
WFIRST-AFTA SCIENCE CENTER STUDIES

Roc Cutri, Lee Armus (IPAC)

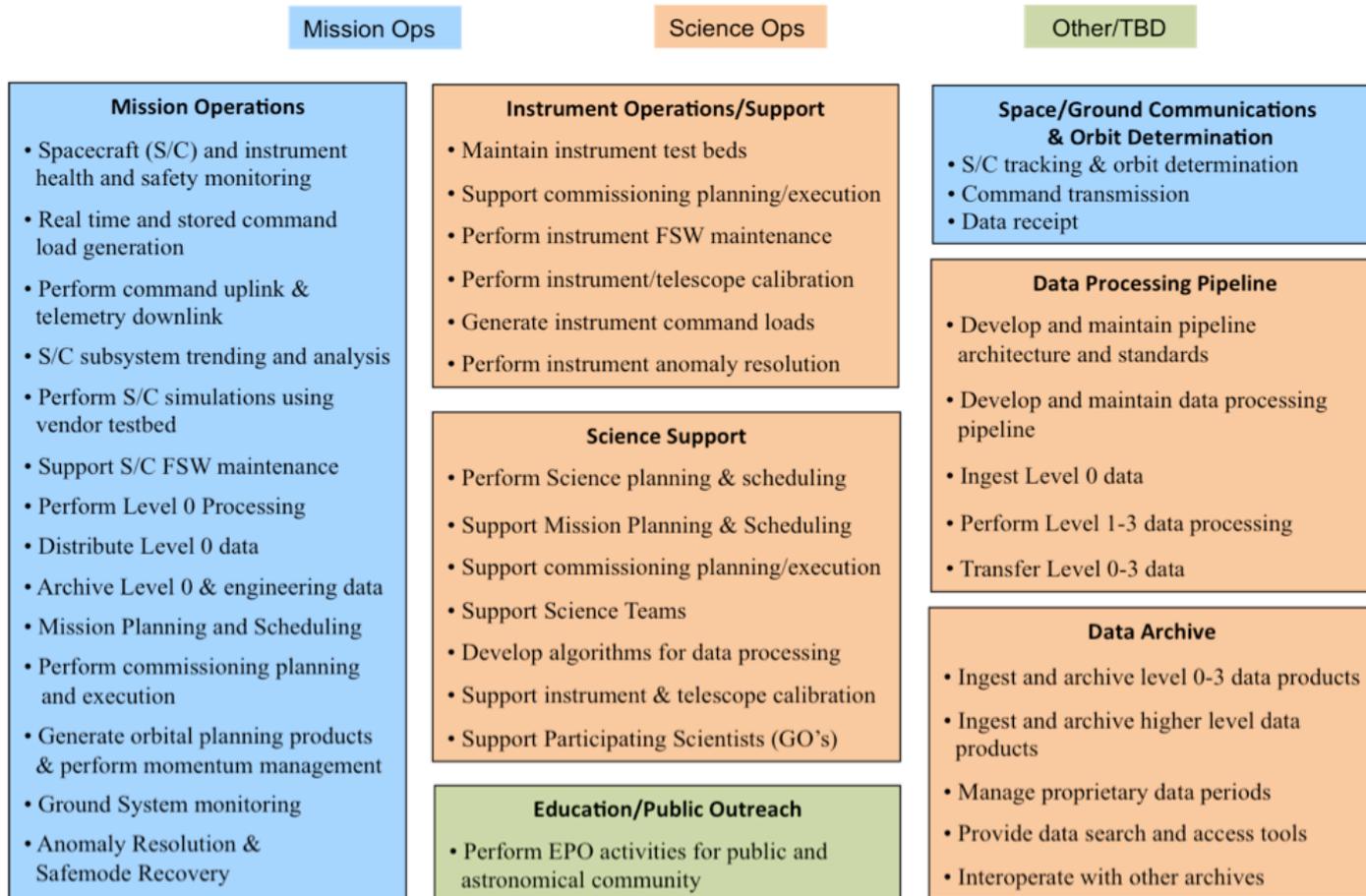
Roeland van der Marel, Marc Postman (STScI)



WFIRST-AFTA Will Have Ground System Functions Typical of a NASA Great Observatory

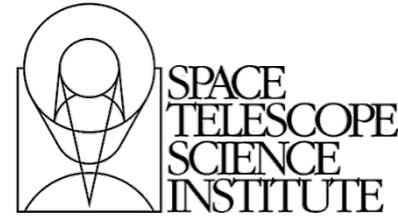


- Most Science Operations functions will be executed by Science Centers





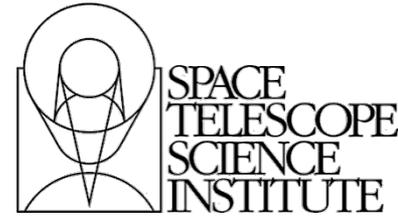
Currently Funded WFIRST-AFTA Science Center Studies



- Joint effort of the Infrared Processing and Analysis Center (IPAC) and Space Telescope Science Institute (STScI)
- Leverage combined strengths and experience with science operations, data processing, archiving for NASA's Great Observatories, and major UVOIR sky surveys
- Work closely with WFIRST-AFTA study science office to support ongoing mission definition and initial Science Center design and implementation
- Current efforts funded through FY15, with extensions expected and evolving scope



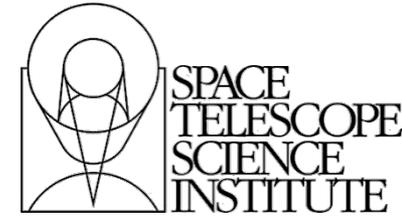
Work With GSFC on WFIRST-AFTA Community Engagement



- Organize AFTA-based science workshops and conferences
 - e.g., 2014 IR Survey Science & Techniques Meeting in Pasadena; Summer 2015 “Mocking the Universe” Workshop in Baltimore
- Maintain presence at AAS Meetings through dedicated sessions and workshops
- Establish collaborative WFIRST-AFTA website with basic information, news, slide sets, and access to tools and simulation framework
 - Single point-of-access for latest information for the community
- Provide support to Project Science Office on WFIRST-AFTA Science Book



WFIRST-AFTA web site at IPAC

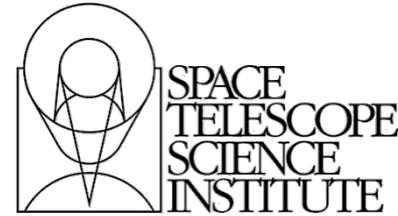


- Currently updating IPAC WFIRST-AFTA website with basic information, news, slide sets, and access to tools and simulations.
- Latest information for the science community – workshops, science team news, proposer information, etc.
- Links to key documents and project news from main NASA/GSFC WFIRST site, and other IR sky surveys at IPAC.

The screenshot displays the 'Wide-field Infrared Survey Telescope-AFTA' website. The main header includes navigation links for HOME, NEWS, SCIENCE, and DOCUMENTS. A central feature is a 'WFIRST-AFTA WFI Grism Simulation' showing a 0-degree roll, with a 'News' tab (1) and an 'Images' tab (1, 2). To the right, there are three sidebar sections: 'Simulations' with links for Microlensing, Grism, and Coronagraph; 'Community Engagement' with links for Workshops and Meetings, and Preparatory Science; and 'External Links' with links for WFIRST@GSFC, WFIRST@JPL, and IPAC. A fourth section, 'Infrared Sky Surveys at IPAC', lists IRAS, 2MASS, WISE, and PLANCK. The footer contains logos for ipac, Caltech, JPL, NASA, Space Telescope Science Institute, and Goddard.



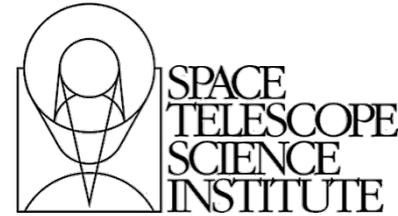
Data Simulation Support



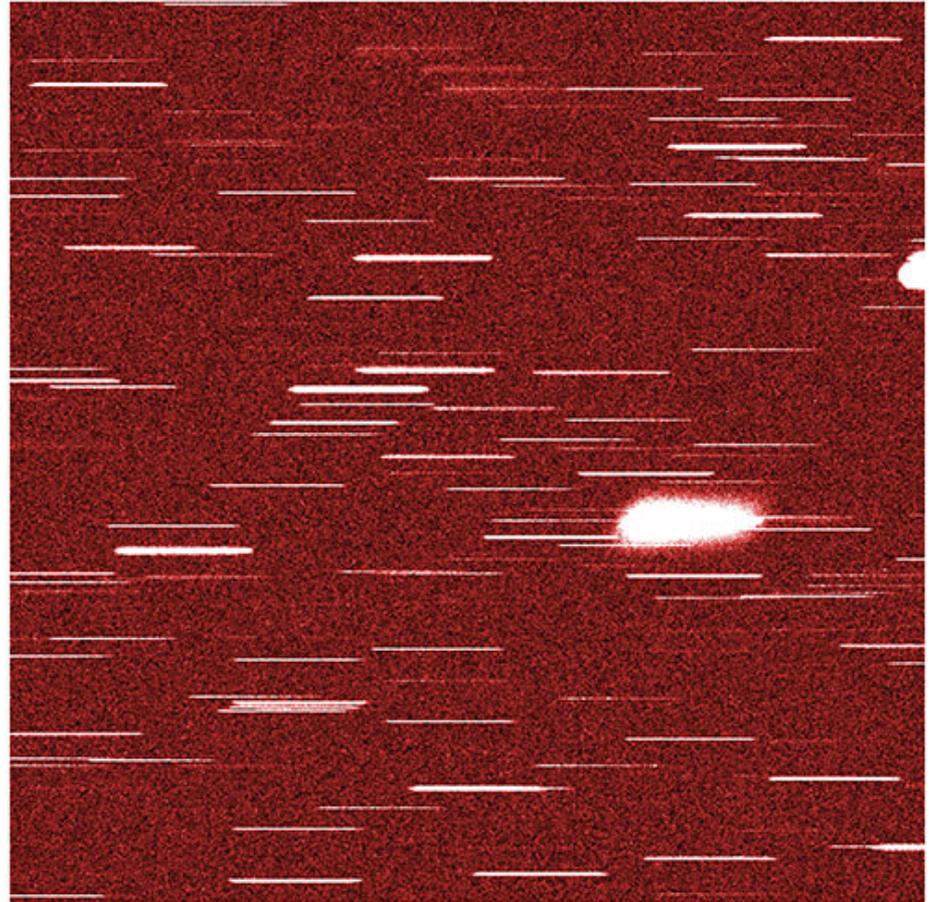
- Establish a repository for simulation information, tools and results
- Develop a common framework for WFIRST-AFTA WFI, Grism and Coronagraph simulations, focusing on robust instrument modules
- Develop spectral simulations to feed AFTA Grism simulator module
- Work with SDT, WPS and other simulation teams to support static and dynamic celestial scene simulations
- Develop prototype analysis pipelines to assess simulated performance



Data Simulation Repository



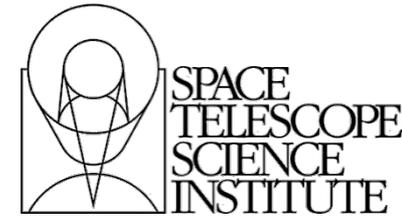
- Links to and descriptions of current simulation efforts and updated database of telescope/instrument parameters
- Currently focusing on grism sims using WISP, CANDELS and 3D-HST data.
- Exploring data quality and key spectral diagnostics (redshift, line ratios, etc.) as a function of roll angle, contamination, spectral overlap and detector/pixel effects



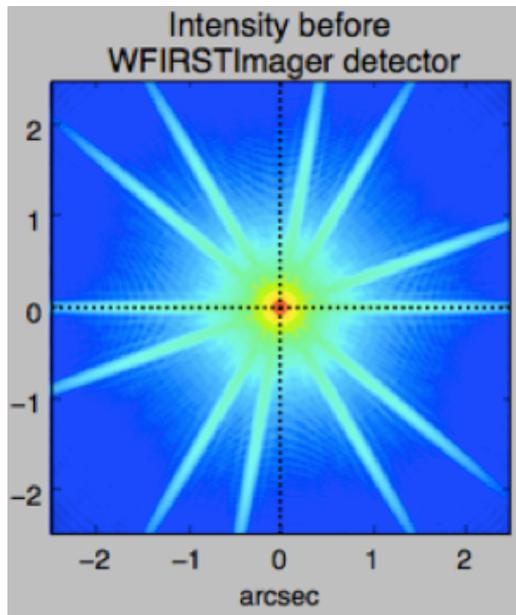
Grism simulation of a single WFIRST 4kx4k chip with $R \sim 600$, $0.11''/\text{pxl}$, covering $1.35\text{-}1.95 \mu\text{m}$. Realistic distribution of more than 100 galaxies with SEDs based on WFC3 data



WFI Simulations – Extensions of JWST Tools



- Point Spread Function: **WebbPSF**
- ETC (x,y, λ) Simulator : **Pandea**
- Astronomical Scenes : **STIPS**



Stellar Population Parameters:

Population 1

Metallicity of Stars: From [Fe/H] = to [Fe/H] = (Minimum -2.2, Maximum 0.5)

Number of Stars (1 to 1000000000):

Age of Stars: From yrs to yrs (Minimum 1e+06 yrs, maximum 1.35e+10 yrs)

IMF: : (from -3 to -1)

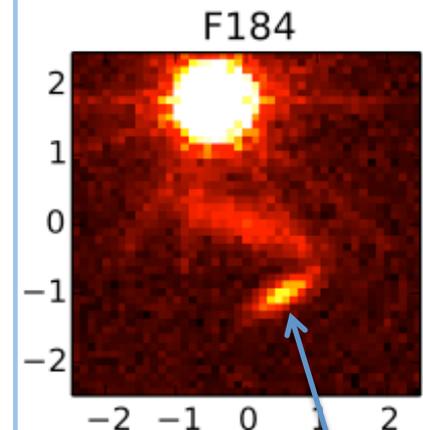
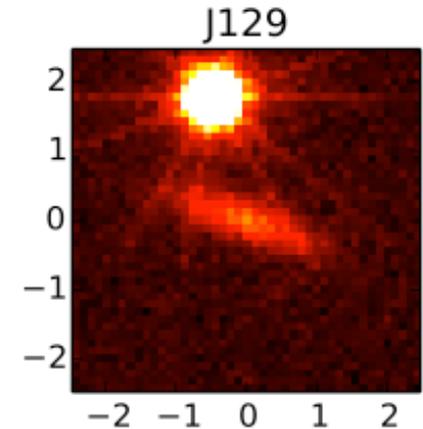
Cluster Stellar Distribution: : Move higher-mass stars closer to centre

Cluster Radius:

Cluster Binary Fraction:

Cluster Offset from Centre: (RA,DEC) = (,)

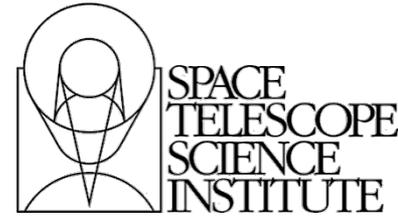
Distance in kpc: Ranging from kpc to (Minimum 0.0, Maximum 4200000.0)



High-z dropout galaxy

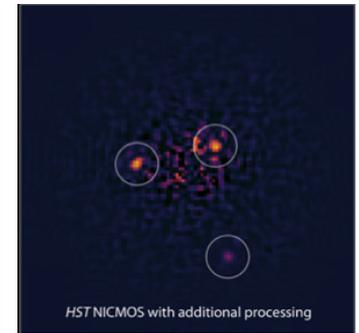
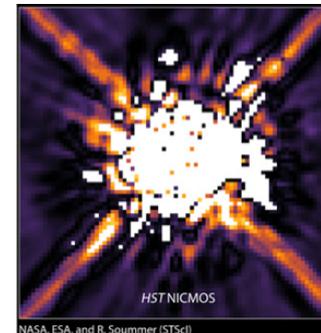


Data Reduction Software and Instrument Modes



- Grism Analysis Software: examine approaches for extracting information from grism data
 - Assess current approaches (e.g. based on HST ACS and WFC3 experience)
 - Explore new spectral extraction strategies best suited to large scale WFIRST surveys
 - Grism Observing Mode: assess tall-poles and complexities in meeting science requirements with currently envisioned hardware design
- Coronagraph: Study options for observing mode and post-processing analysis

March 2015

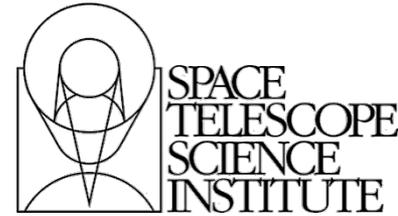


NASA, ESA, and R. Soummer (STScI)

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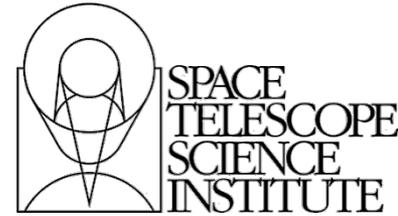
Guide Stars and Guiding Mode



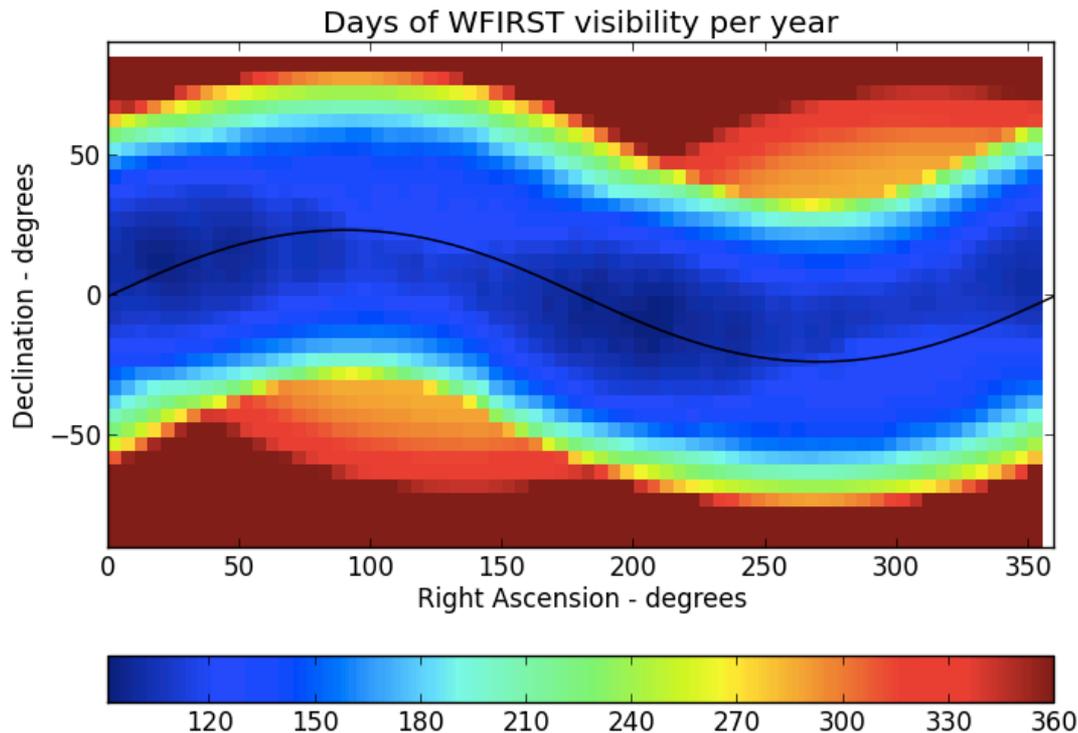
- Assess whether requirements for Guide Star surface density, limiting magnitude, astrometric and proper motion knowledge are met by existing and expected future catalogs; develop plan forward if not the case
- Assess feasibility and tall-poles for presently envisioned guiding concept



Telescope Scheduling Efficiency Study

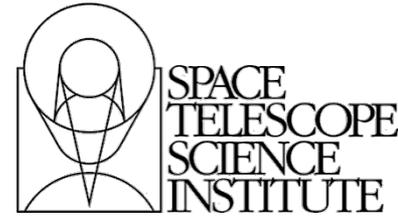


- Study telescope efficiency using proven space telescope optimized scheduling tools
- Develop straw-man observing program





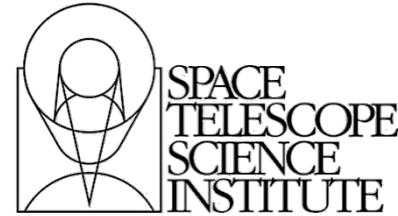
Data Volume and Processing



- Develop a preliminary model for the science data products and the archive ingest volume as a function of time since launch.
- Perform a trade study on the feasibility of any on-board data processing tasks vs. extra processing capabilities in the ground segment systems.



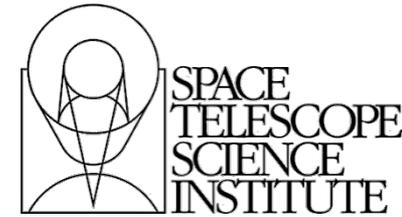
Ground System Architecture Support



- Work in collaboration with the Project office to:
 - Assist with overall science implementation concept
 - Prepare the initial layout of an end-to-end concept of how the ground-segment element will operate
- Assist with development of a model for the overall science center operations to improve the precision of resource and schedule estimates
 - Investigate re-use strategies from other SOC models



Conclusions



- Science Centers are actively engaged in preparation and planning for the mission
- Science Centers are looking forward to collaborate with the ROSES proposal teams to
 - Exchange information
 - Build synergies
 - Leverage common tools

