Roman Infrared Nearby Galaxies Survey

Ben Williams (University of Washington)
PI: Nearby Galaxies GA Science Investigation Team
Once known as WINGS
Near-Field is Inherently Wide-Field
Near-Field is Inherently Wide-Field

- Resolution improves as $D$
- Limiting depth improves as $\sim D^2$
- Required survey area degrades as $D^{-2}$
Roman’s Nearby Potential

![Graph 1: Major Axis vs. Distance](image1.png)

- **X-axis**: Distance (Mpc)
- **Y-axis**: Major Axis (arcmin)

- **Roman**
- **HST**

![Graph 2: Absolute B-magnitude vs. Distance](image2.png)

- **X-axis**: Distance (Mpc)
- **Y-axis**: Absolute B-magnitude

November 15, 2021
Stellar Halos with Roman

M101: 7.4 Mpc

WFC3-IR-PID: 12298

130 kpc

1.9 kpc

0.9 kpc

130 kpc

Representative Ground-Based

Representative Space-Based

Williams: Roman Infrared Nearby Galaxies Survey
The Story is in the Stars

They generically tag the ages of past events, along with the associated masses and energies.
Stellar Halo Structures

Number, luminosity, shape of streams → Types, timing and orbits of galaxies accreted. Disrupted streams → Small-scale dark matter halos.

Roman Infrared Nearby Galaxies Survey
November 15, 2021
414 Hubble Pointings
414 Hubble Pointings
HST 7 POINTINGS

Roman SIMULATED <1 DETECTOR

Blair et al. 2014
Near-field science overview figure; Akeson et al. 2019
Simulated Roman Observation of M31
Roman Imaging of FIRE Simulations

Halo populations by Robyn Sanderson (see Sanderson et al. 2020)

Roman Infrared Nearby Galaxies Survey

November 15, 2021
Simulating Halo Images

Background: CANDELS-based catalogs

Stars: Galaxia catalogs of simulations

Blue = Z087
Red = H158
Simulating Halo Images

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Simulating Halo Images

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Galaxia catalogs of simulations

Blue = Z087
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## Projects and Lead Co-Is

**PI:** Williams (U. Wash.)  
**Postdoc:** Adrien Thob (U.Wash.)

**Deputy PI:** Dalcanton (U. Wash.)  
**And many more collaborators!**

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### Providing Tools for the Community

- **wingspipe**: event-based pipeline software package (A. Thob, [https://github.com/benw1/WINGS](https://github.com/benw1/WINGS))
- **PARSEC**: Stellar evolution models in Roman bands (L. Girardi, [http://stev.oapd.inaf.it/cgi-bin/cmd](http://stev.oapd.inaf.it/cgi-bin/cmd))
- **walter**: Predicting star counts for Roman observations (L. Lancaster, [https://github.com/ltlancas/walter](https://github.com/ltlancas/walter))
- **SCUDS**: detecting and classifying halo substructure from catalogs (D. Hendel, [https://github.com/davidhendel/scuds](https://github.com/davidhendel/scuds))
- **HSS**: Finding streams in catalogs (S. Pearson, [https://github.com/sapearson/HSS](https://github.com/sapearson/HSS))
- **STIPS**: Generating simulated science-quality Roman images from input catalogs (STScI, [https://github.com/spacetelescope/STScI-STIPS](https://github.com/spacetelescope/STScI-STIPS))