National Aeronautics and Space Administration

Roman Galactic Exoplanet Survey (RGES): Summary and Future Work

Roman Science Team Community Briefing

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(On behalf of the RGES-SIT)

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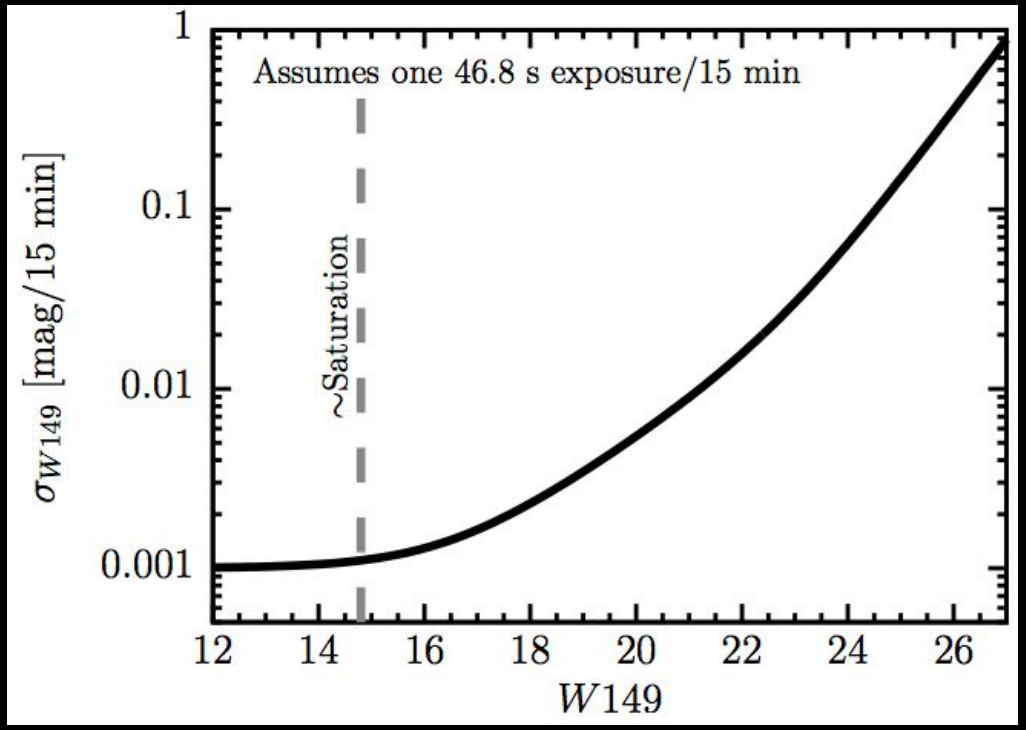
Statistical Power of the RGES Survey



- For a $W149_{AB}$~21.15 star:
  - Photon-noise relative photometric precision of σ~0.01 mag per exposure.
  - Total of ~10^9 photons over the survey.
  - Saturation @ $W149_{AB}$ ~14.8.

Root N: $\sqrt{41,000} \sim 200$

Penny et al. 2019

Number of Stars and Microlensing Events

Stars ($W149 < 15$)	$\sim 0.3 \times 10^6$
Stars ($W149 < 17$)	$\sim 1.4 \times 10^6$
Stars ($W149 < 19$)	$\sim 5.8 \times 10^6$
Stars ($W149 < 21$)	$\sim 38 \times 10^6$
Stars ($W149 < 23$)	$\sim 110 \times 10^6$
Stars ($W149 < 25$)	$\sim 240 \times 10^6$
Microlensing events $\lvert u_0 \rvert < 1$	$\sim 27,000$
Microlensing events $\lvert u_0 \rvert < 3$	$\sim 54,000$

Penny et al. 2019

Photometric and Astrometric Precision.
(Relative, Poisson Noise Only)

$W149_{AB}$	# of Stars	Relative photometric precision (per exp.)	Astrometric precision (per exp.)
19	6×10^6	~0.8%	~0.6 mas
21	40×10^6	~1%	~1.5 mas

Penny et al. 2019

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"Auxiliary" Science with the *Roman* Galactic Exoplanet Survey

- Measurement of the mass function of condensed objects of 10 orders of magnitude, including remnants and binarity
- Detection of ~10^5 hot and warm Jupiters & Neptunes via transits (Montet+2017)
- Asteroseismology of ~10^6 bulge giants (Gould+2014b)
- Parallaxes and Proper Motions of ~6×10^6 Bulge and Disk Stars
- Detection of ~5×10^3 Trans-Neptunian Objects (Gould+2014a)
- Variable stars
- Much, much more..

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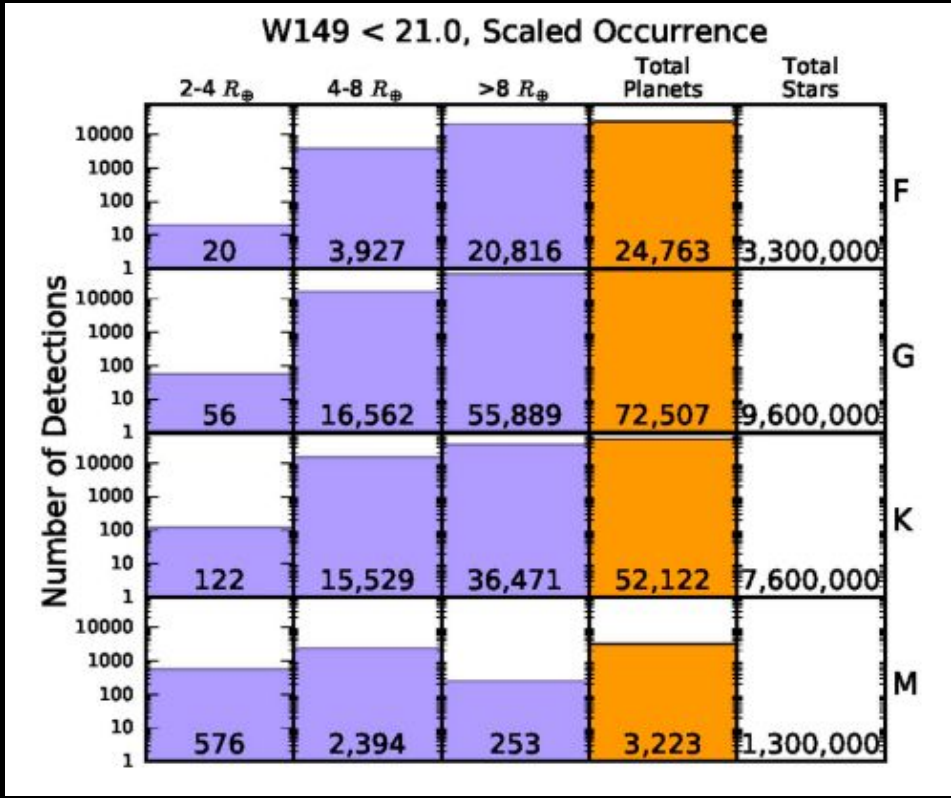
Citizen Science

- The microlensing, transit, and variable star science of the Roman Bulge Variability Survey lend themselves well to “Citizen Science”, e.g.,
  - Classifying variable stars and identifying exotic systems
  - Identifying transiting planets
  - Finding planetary microlensing events, including:
    - Free-floating planets
    - Bound planets
    - Exotic systems

Thank you!

~10^5 Transiting Planets!



Expected yield of transiting planets orbiting dwarfs with $W149_{AB}$<21 (Montet et al. 2017)

- WFIRST will detect ~10^5 transiting planets with radii down to ~2R⊕.
- Most host stars will have measured distances.
- Several thousand can be confirmed by the detection of their secondary eclipses.
- Some systems will have measured transiting timing variations.

Bennett & Rhie 2002
Montet et al. 2017

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