

NANCY GRACE
R.OMAN



SPACE TELESCOPE

Synergizing SPHEREx and Roman for Galactic Plane Background and ISM Studies

INFRARED GALACTIC BACKGROUND

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What is the SPHEREx?

- The Spectro-Photometer for the History of the Universe, Epoch of Reionization, and Ices Explorer (SPHEREx)
- Spectral imaging survey
- Using Linear Variable Filters
- 0.75 - 5 μm
- 102 spectral channels
- Angular resolution ~ 6 arcsec
- Year 1 Data Release in November (all sky maps)

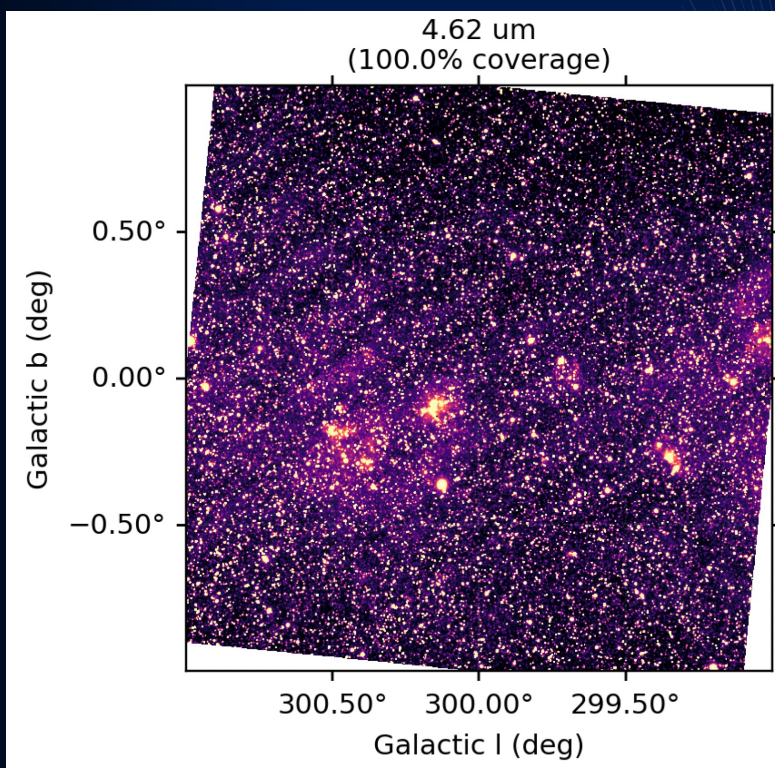


SPHEREx
homepage



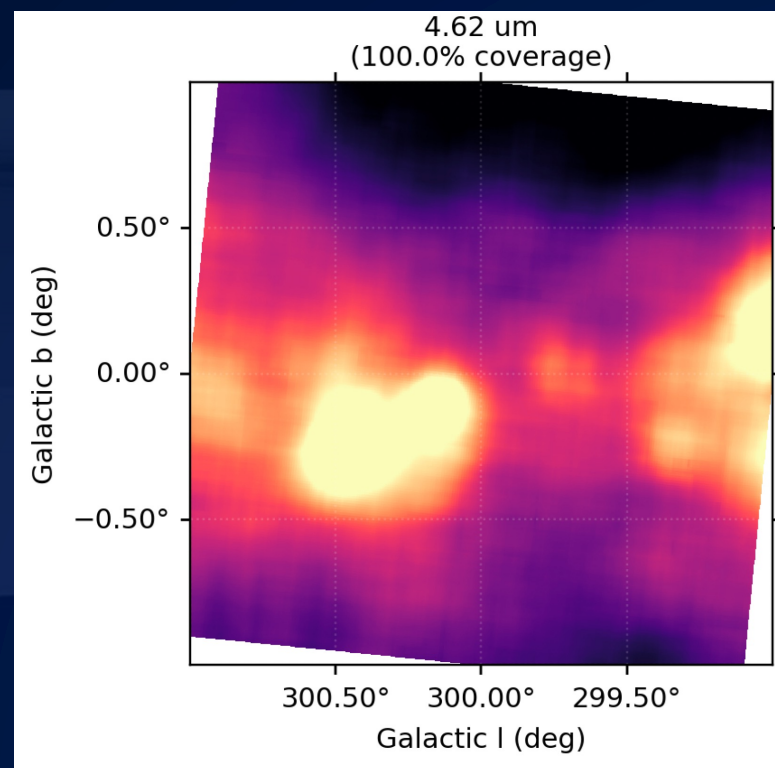
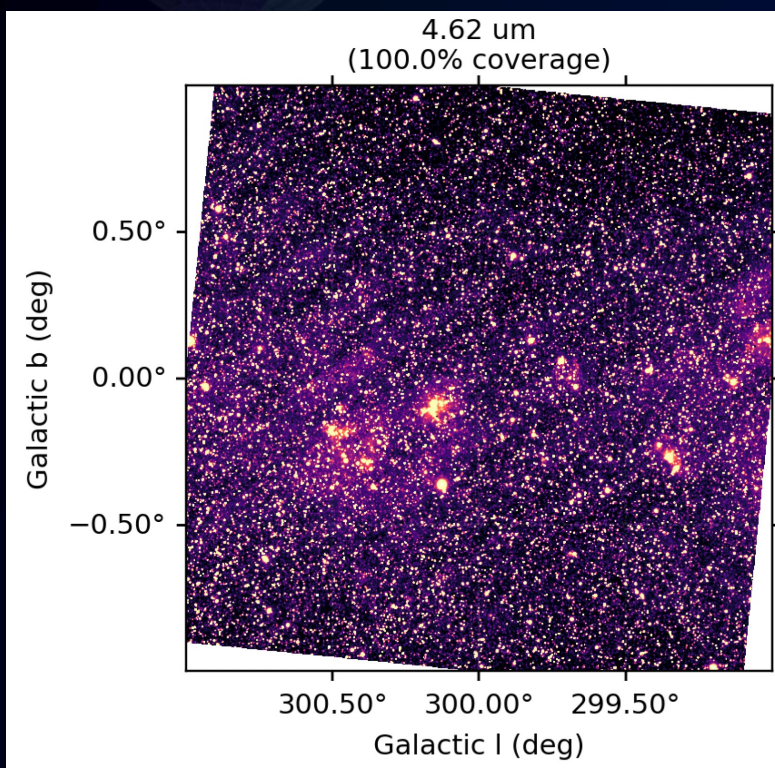
IRSA SPHEREx
tools

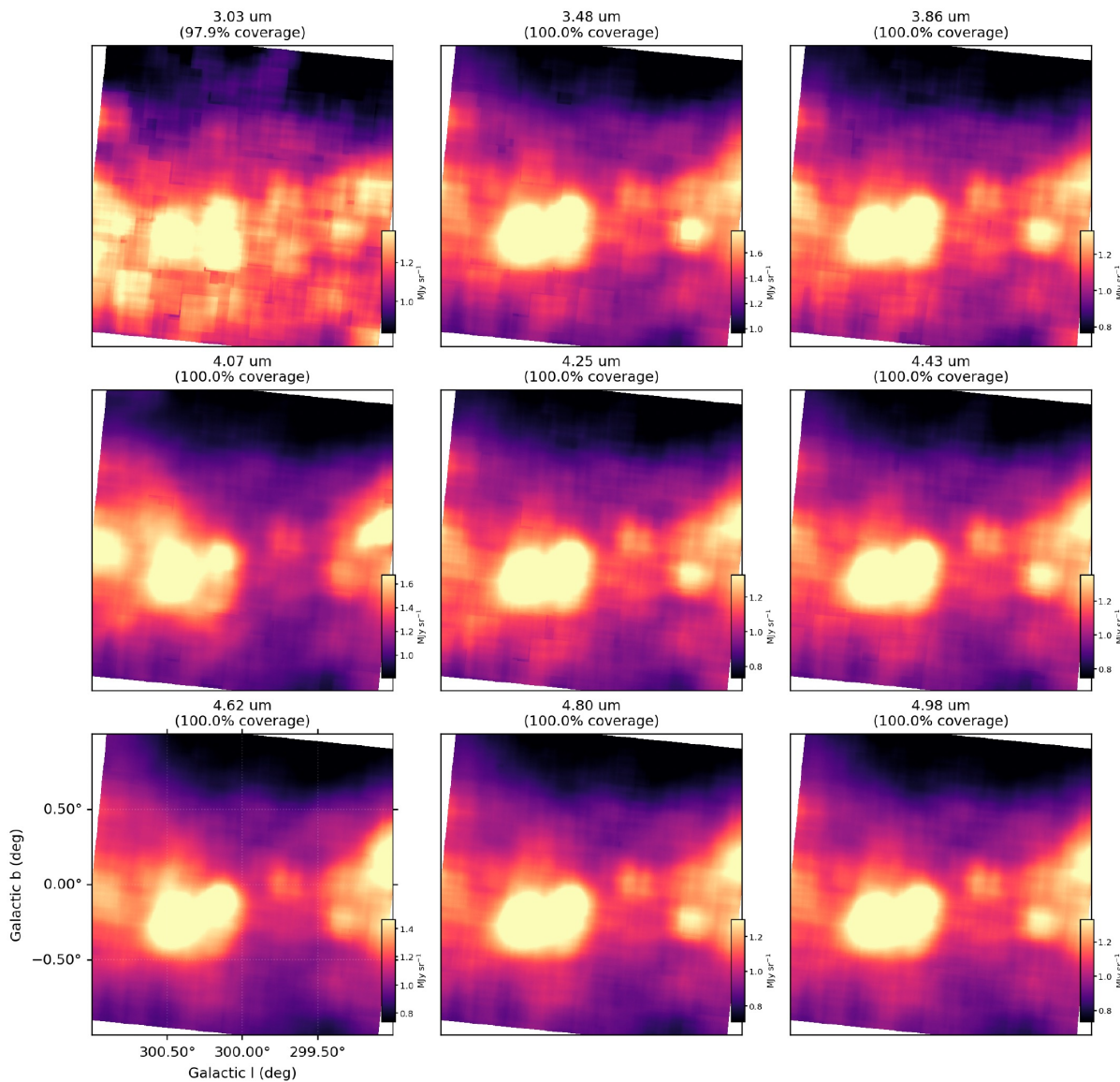
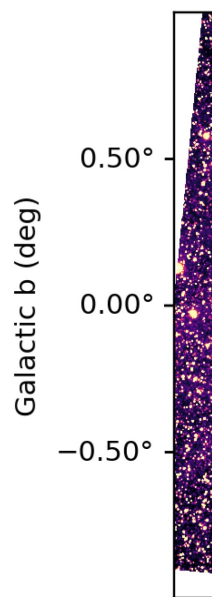
Our Goal: Building a Diffuse Galactic BG model for each SPHEREx channel



- Channel-by-channel BG estimation
- (BG emission is 'mostly' from dust)
- 14 arcmin median filter scale
- Robust against bright point sources
- Recovers diffuse Galactic emission
- Provides survey-ready background products
- pilot study region at centered (l , b) = (300°, 0°)
- Galactic plane BG models will be publicly available

Our Goal: Building a Diffuse Galactic BG model for each SPHEREx channel

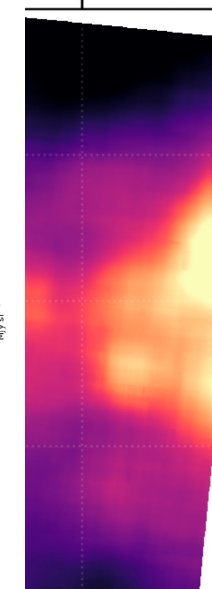




model for

Lim et al. 2026, submitted

ge)



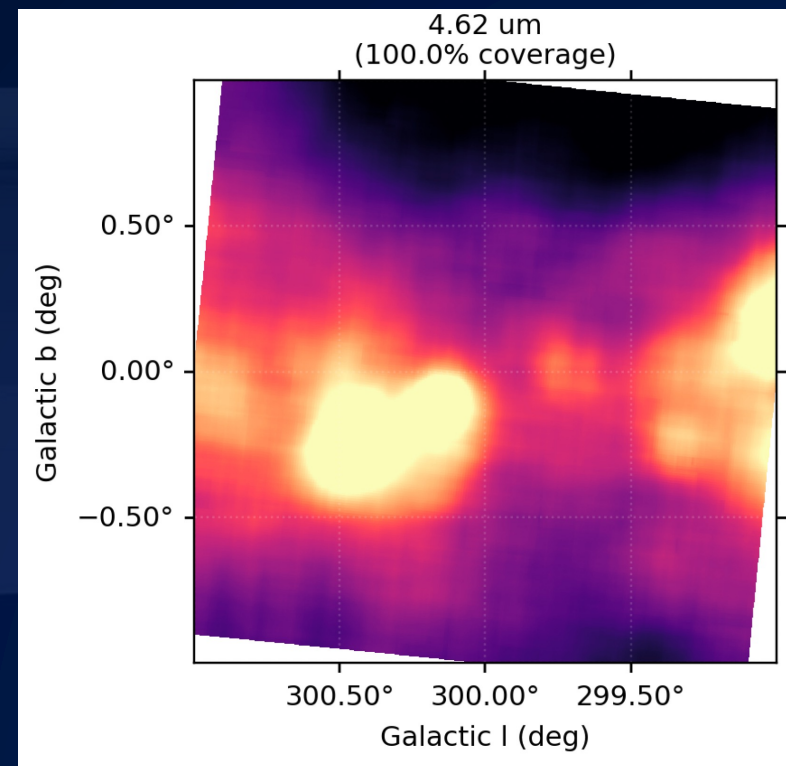
299.50°

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Our Goal: Building a Diffuse Galactic BG model for each SPHEREx channel

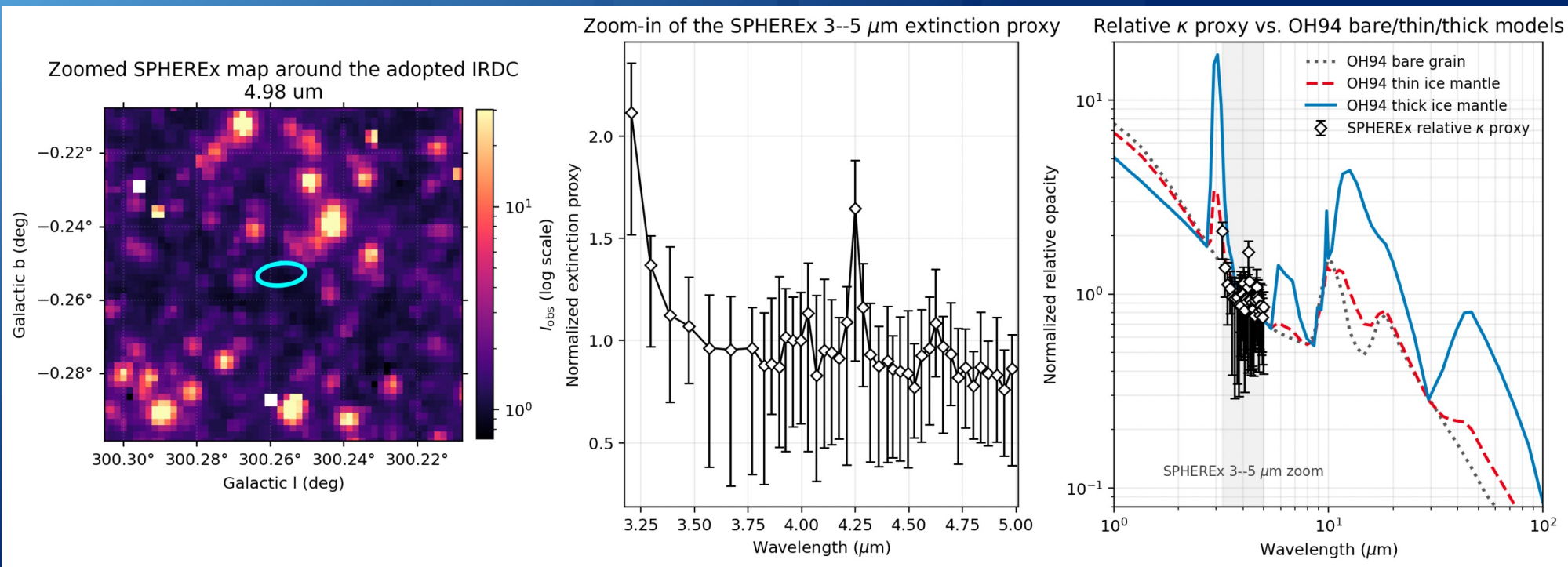
With the BG models you can do

- Channel-resolved extinction mapping
- Dust property and opacity constraints
- Background correction for compact sources
- Large-scale Galactic ISM studies
- And more!

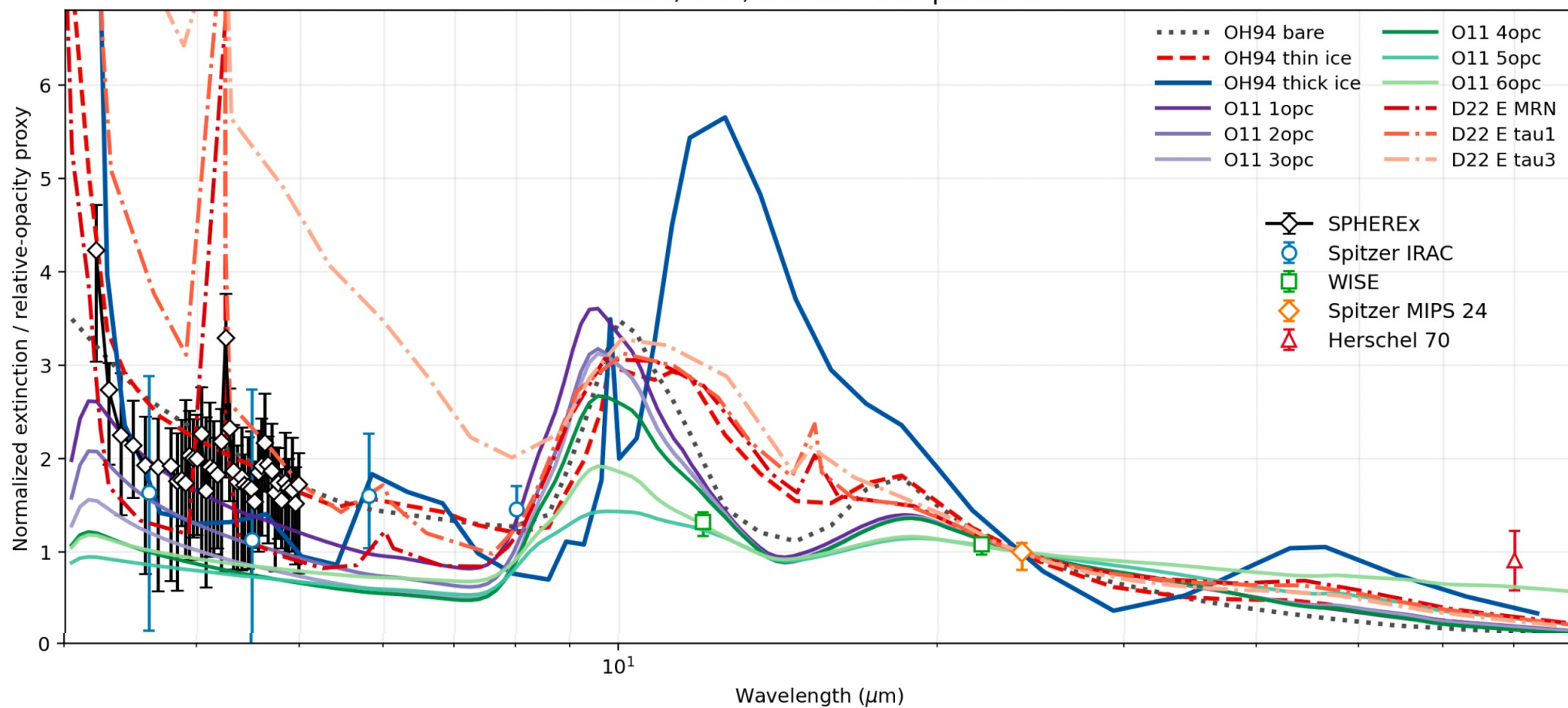


Case Study: Dust opacity curve via multiband extinction maps

Lim et al. 2026, submitted



OH94, O11, and D22 Comparisons



SPHEREx BG models for Roman's Galactic Science

1. Extinction-aware Roman stellar parameters

- Replace a single average extinction law with field dependent law tied to dust environment.
- Correct Roman colors and magnitudes before deriving luminosity, mass, age, and distance.
- Reduce CMD degeneracy between reddened hot stars and intrinsically cool stars.
- Flag compact sources whose red colors may be affected by structured diffuse background.



SPHEREx BG models for Roman's Galactic Science

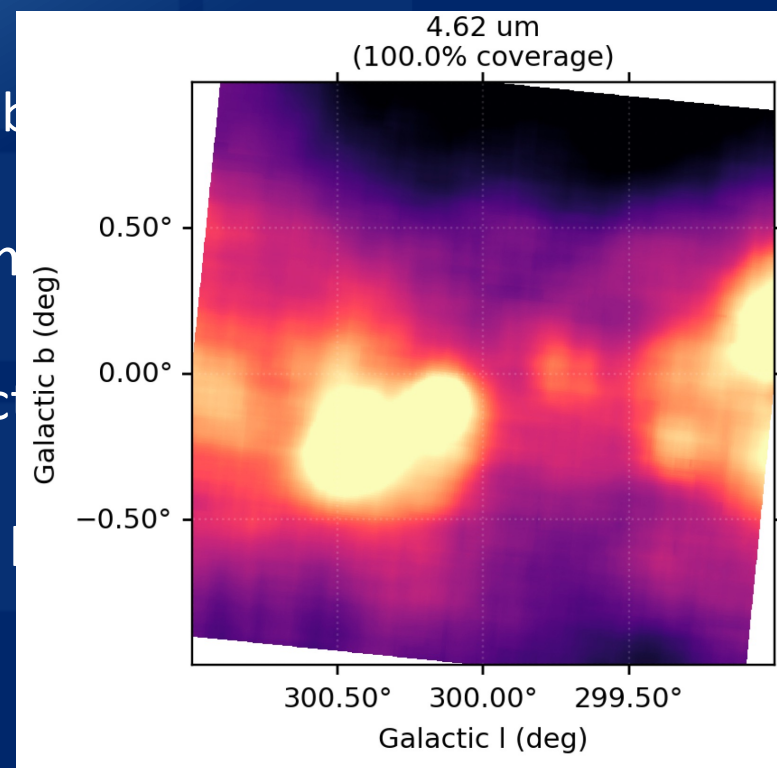
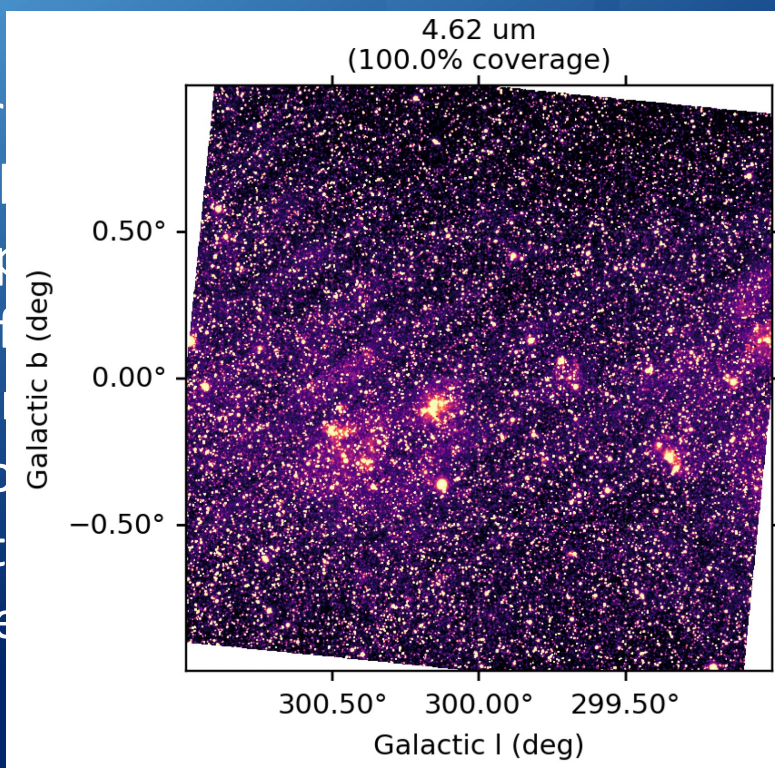
2. Completeness, clusters, and environment-dependent populations

- Stratify Roman injection recovery tests by diffuse brightness, gradients, and nebulosity class.
- Separate real stellar underdensities from dust/background driven source deficits.
- Compare luminosity functions, YSO fractions, variability fractions, and motions by cloud/PDR/H II region.
- Attach Roman catalog QA flags for high background, high gradient, or spectrally unusual environments.

SPHEREx BG models for Roman's Galactic Science

2. Completeness, clusters, and environment-dependent populations

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SPHEREx BG models for Roman's Galactic Science

3. Diffuse light and compact source interpretation

- Convolve SPHEREx 0.75–5 μm BG SEDs through Roman filters to predict large scale diffuse brightness.
- Compare scale matched Roman diffuse maps with SPHEREx predictions to identify residual systematics.
- Distinguish dust associated diffuse light from unresolved stellar background where possible.
- Interpret compact source and YSO colors against the local diffuse SED, not Roman aperture flux alone.
- Prioritize follow-up fields where Roman sources sit in unusual SPHEREx spectral environments.

Summary

- **Diffuse Galactic BG models for all 102 SPHEREx channels**
- **Field-dependent ISM and dust characterization**
- **Improved Roman Galactic Plane science**
- **Reduced environmental systematics for Roman Galactic Science**
- **Public data products for the community**