



# Towards a Full-sky, High-Resolution Dust Extinction Map with *WISE* and *Planck*



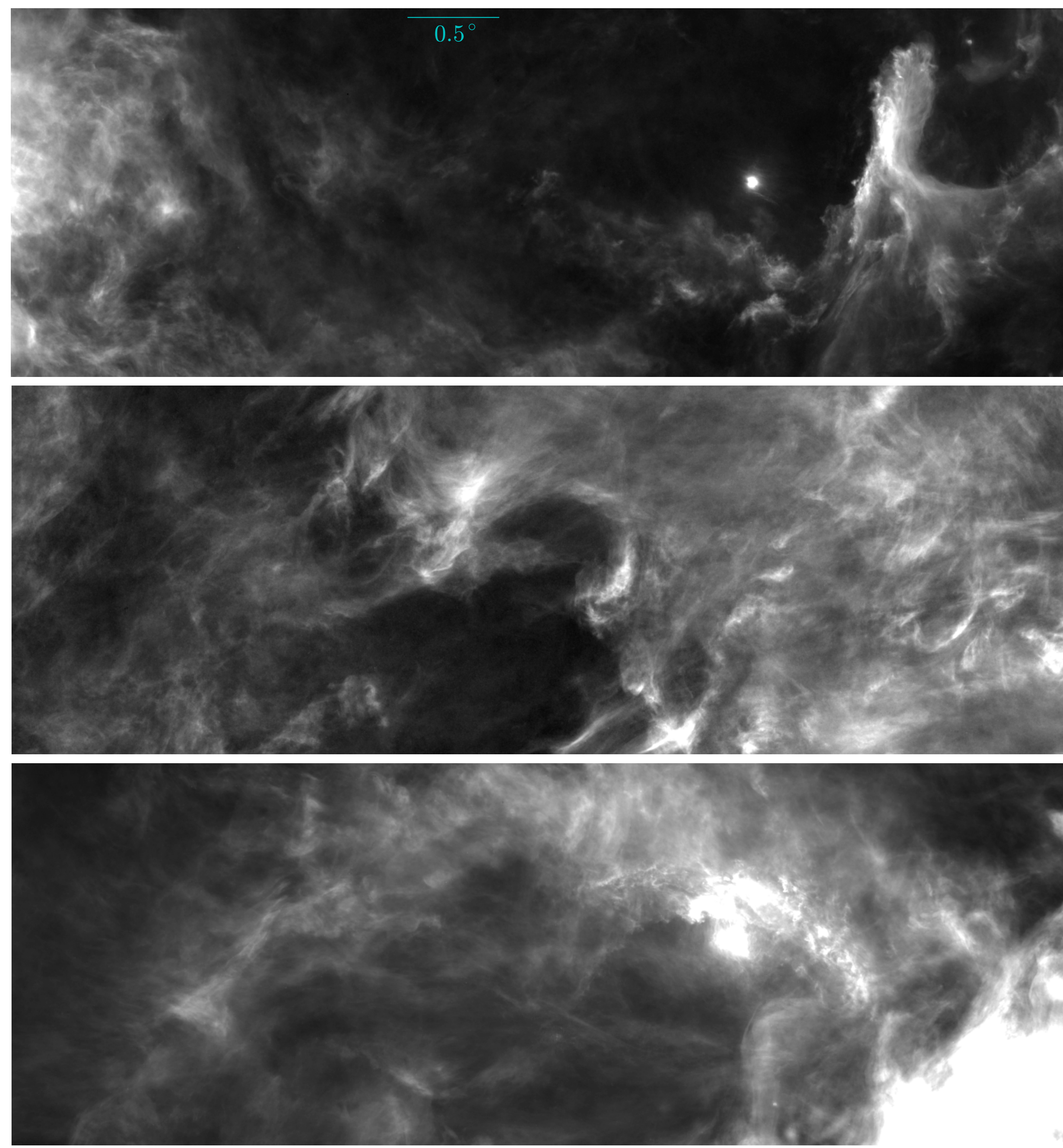
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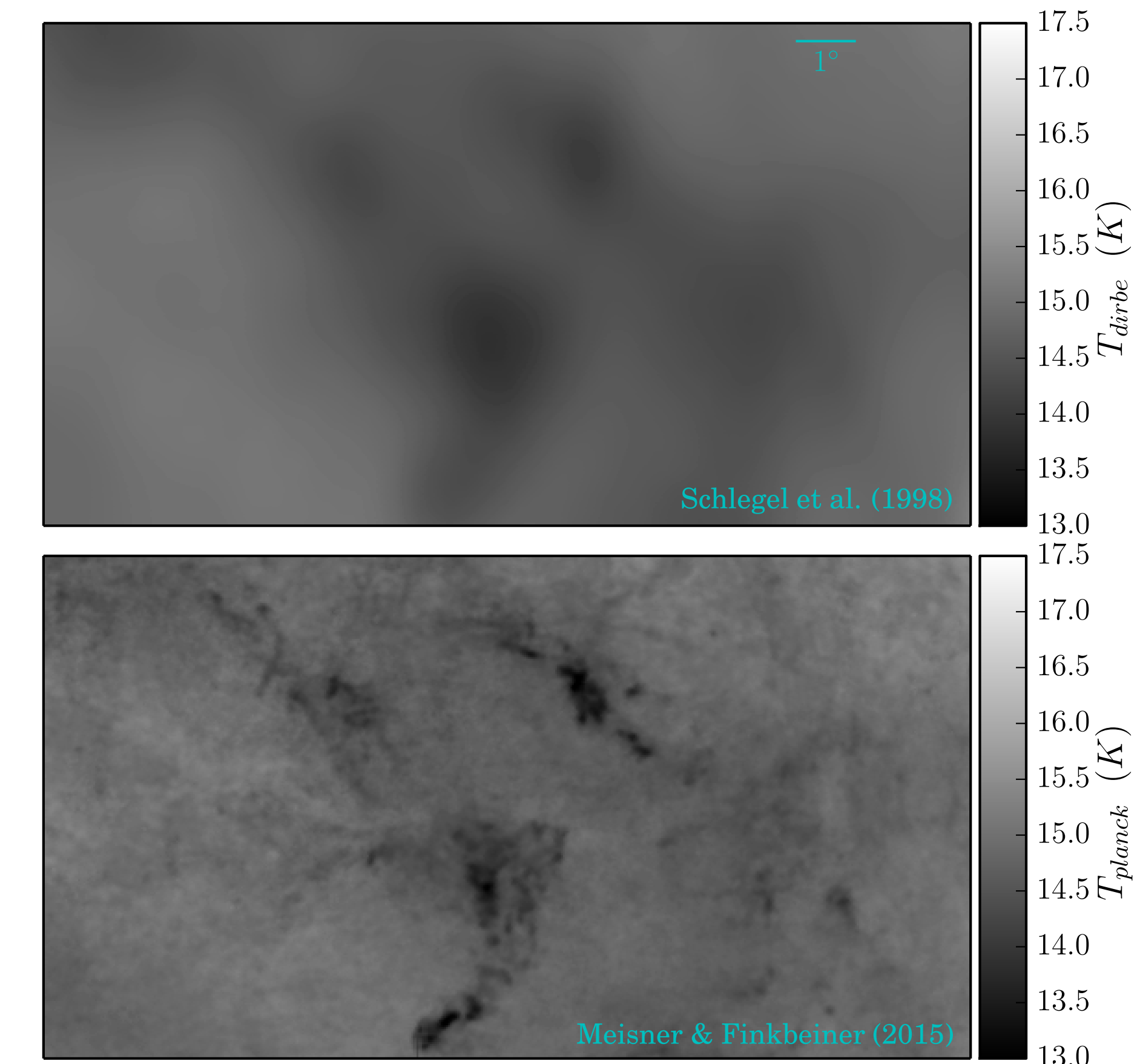
## Abstract

We have recently completed a custom reprocessing of the entire *WISE* 12 micron All-Sky imaging data set. The result is a full-sky map of mid-infrared Galactic dust emission at 15 arcsecond resolution, with contaminating artifacts such as compact sources removed and large angular scale modes preserved. We have also created the first *Planck*-based thermal dust emission model applicable from 100-3000 GHz, yielding full-sky maps of both dust temperature and optical depth at 6 arcminute resolution. Taken together, these *WISE* and *Planck* dust maps present an opportunity to improve upon the widely used Schlegel et al. (1998) extinction estimates by virtue of dramatically enhanced angular resolution.

## Results: *WISE* 12 $\mu$ m Dust Emission Map

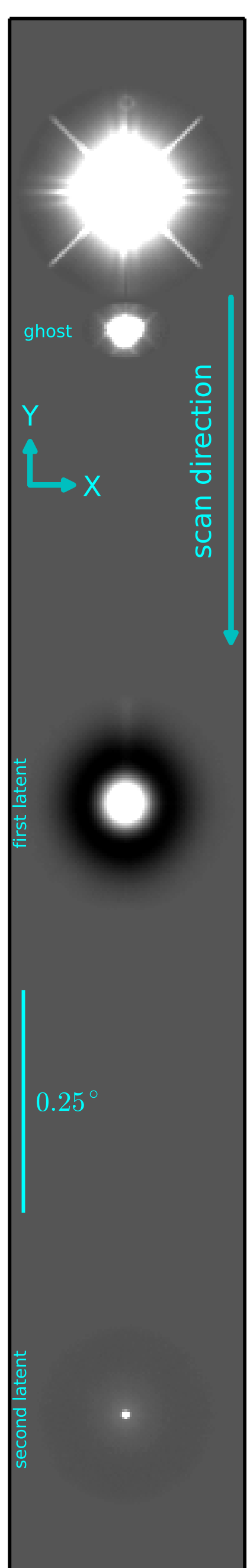


## Results: *Planck* Dust Model

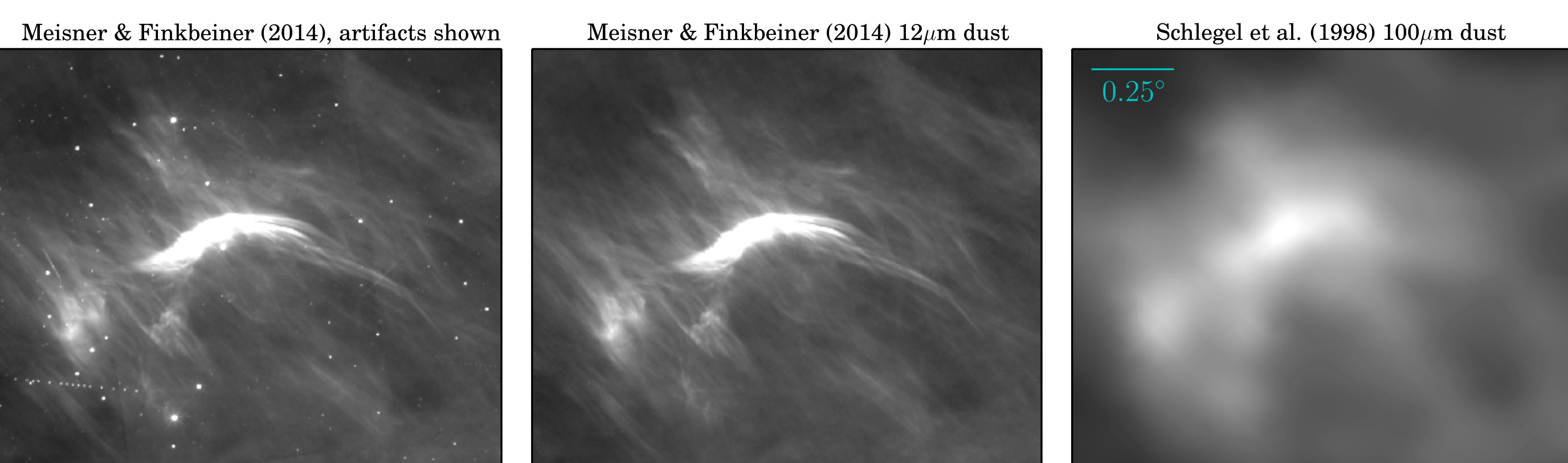
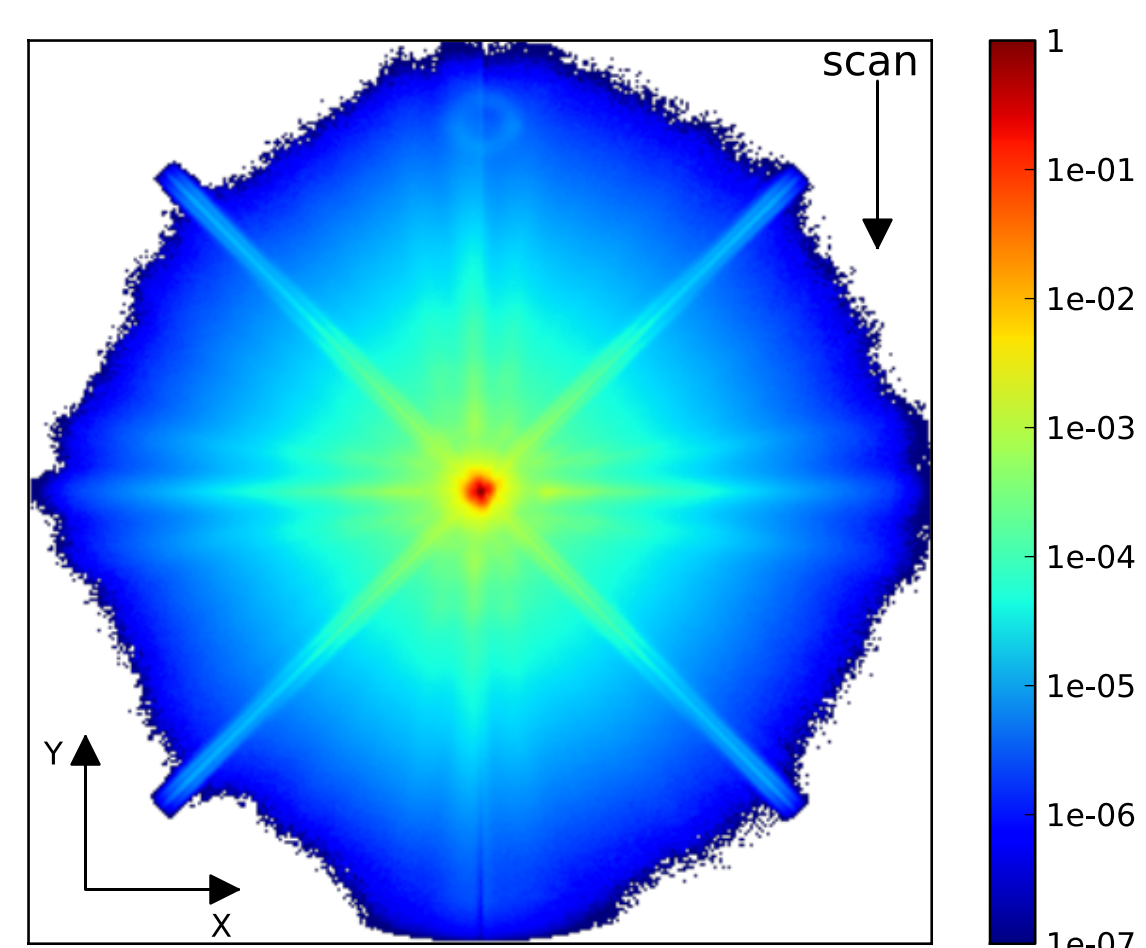


We have applied the Finkbeiner et al. (1999) two-component thermal dust emission model to the 100-3000 GHz dust spectrum composed of *Planck*, *IRAS* and *DIRBE* data. As a result, we have obtained full-sky maps of dust temperature and optical depth, both at 6.1' resolution. Our *Planck*-based temperature correction represents a factor of  $\sim 10\times$  enhancement in angular resolution relative to *DIRBE*-based dust temperature maps e.g. Schlegel et al. (1998).

## WISE Processing



An important step in isolating *WISE* 12 micron dust emission is subtracting point sources and related artifacts. We built a highly detailed model of the W3 PSF core and wings (bottom), as well as the extended imprint of bright sources (left), which includes an optical "ghost" image and multiple persistence effects dubbed "latents". Making use of the All-Sky source catalog, we then subtracted our model for every point source and its related defects at the single-exposure level. In all, we performed roughly half a billion such point source subtractions.



A  $1.5^\circ \times 1.5^\circ$  region illustrating our custom-written software pipeline's removal of small-scale dust contaminants such as compact sources, bright source optical and electronic artifacts, solar system objects and satellite streaks. The enhanced resolution provided by *WISE* reveals a wealth of filamentary structure which is wholly unresolved at 6.1' FWHM in the far-infrared.

## Future Work

- Optimally combine *WISE*, *Planck* full-sky dust maps to form a high-resolution extinction hybrid
- Quantify benefits of enhanced-resolution foreground emission and extinction predictions
- Address cosmic infrared background contamination

## Acknowledgments

We thank the *WISE* and *Planck* collaborations for publicly releasing their awesome data sets!

## Related Publications

Meisner & Finkbeiner (2014), *ApJ*, 781, 5  
Meisner & Finkbeiner (2015), *ApJ*, 798, 88

## Data Release Websites



[wise.skymaps.info](http://wise.skymaps.info)

[planck.skymaps.info](http://planck.skymaps.info)

