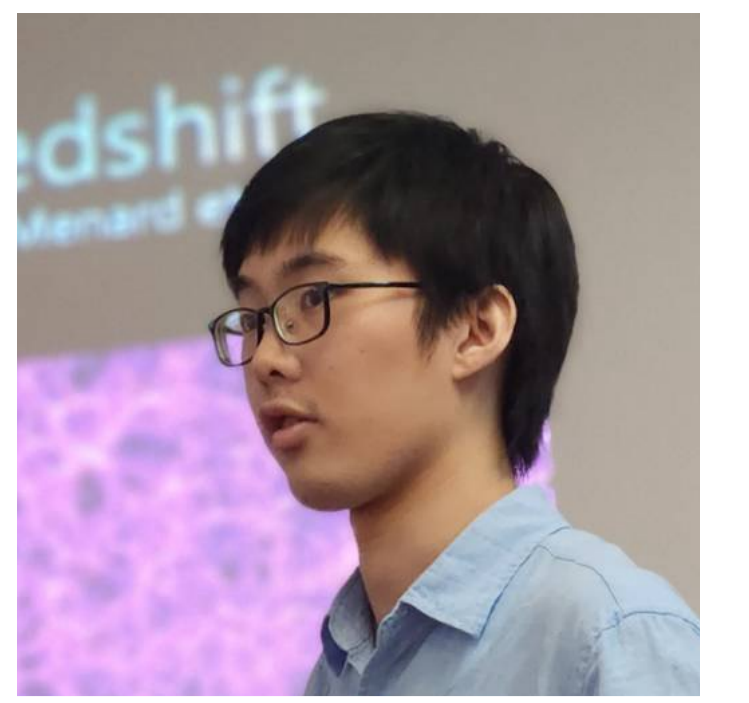




# Cluster Detection from the Foreground-Free

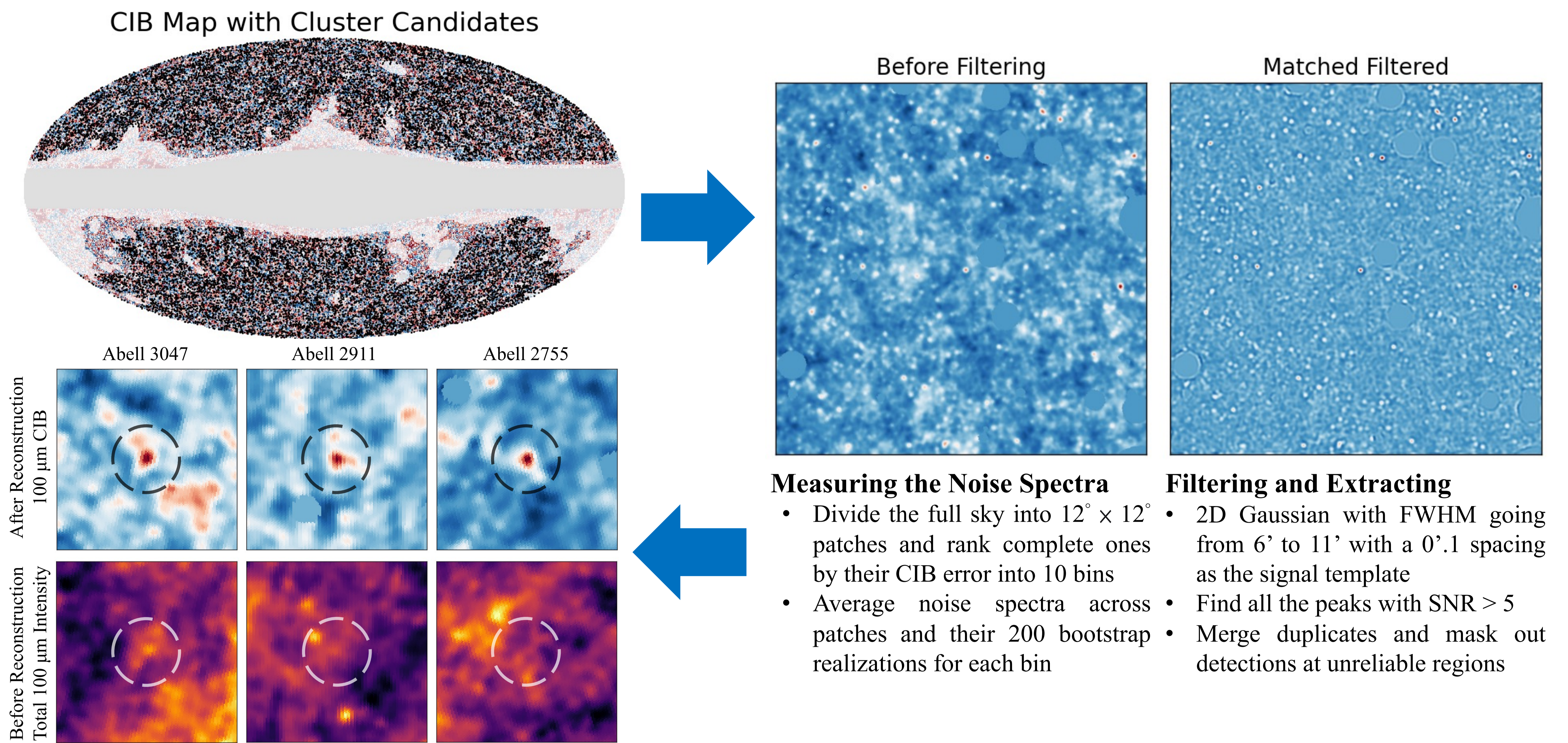
## 100 $\mu\text{m}$ Infrared Background with Matched Filtering

林子任 Yu-Ren Lin (ASIAA, NTU), 江奕寬 Yi-Kuan Chiang (ASIAA)

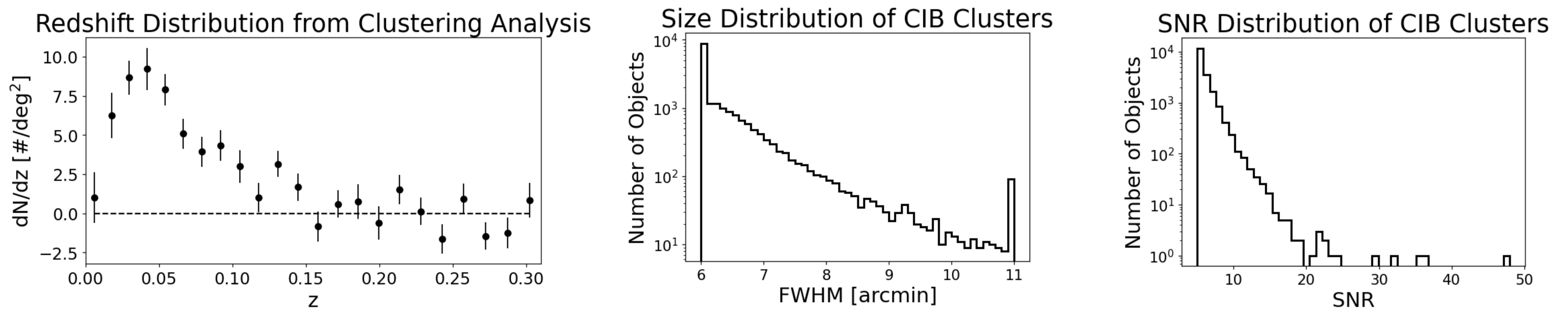


**Importance of Cluster Finding:** Galaxy clusters are the largest gravitationally bound structures, residing at the nodes of the cosmic web. They provide key insights into galaxy formation and constraint to the underlying cosmology. Across all areas of cluster science, robust cluster finding is fundamental, yet current methods, based on optical, X-ray, and Sunyaev–Zel'dovich (SZ) observations, each exhibit distinct selection effects.

**New Method: CIB Peaks** We present a new method based on the reconstructed 100  $\mu\text{m}$  cosmic infrared background (CIB) map (Chiang 2023). We apply a matched filter to identify overdensities in the CIB. The full-sky and foreground-free map traces the extragalactic component in the SFD dust map (Schlegel+98) using 600 million WISE galaxies as templates.



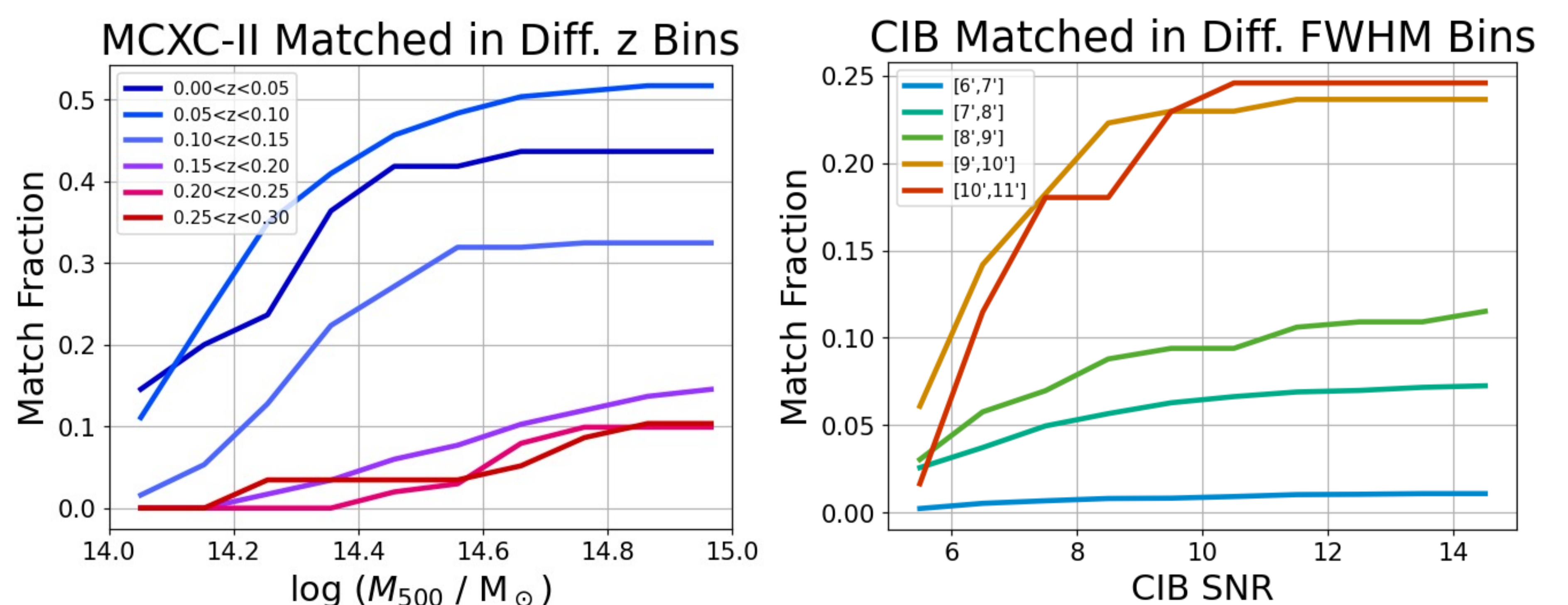
**Properties of the Catalog:** Our CIB cluster candidate catalog contains 18,000 sources across 24,000  $\text{deg}^2$  of sky. Clustering redshift analysis supports the detections trace real structures at  $z \sim 0.05$ .



**Comparison:** We crossmatch CIB clusters with the X-ray catalog MCXC-II (Sadibekova+24), finding  $>300$  matches.

*Left Panel:* cumulative match fraction of MCXC-II clusters vs.  $M_{500}$  in different  $z$  bins

*Right Panel:* cumulative match fraction of CIB clusters vs. SNR in different FWHM bins



**Future Outlook:** With its near full-sky coverage, this new cluster catalog enables large-sample studies for cosmology and the identification of some of the most massive clusters in the observable universe. The far-infrared selection also provides a unique handle on dust in nearby clusters. Although the present analysis primarily probes nearby clusters, the reconstruction and filtering framework is general and can be extended to cluster searches over a broad range of redshifts.