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Surveying in the SZ: Selection function issues

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The selection function : a crucial tool for SZ science

$$\chi(z, M) = \frac{\text{Number of recovered clusters}}{\text{True number of clusters}}$$

If you don't know χ ,
don't expect to do science !

χ depends not only on

the survey properties

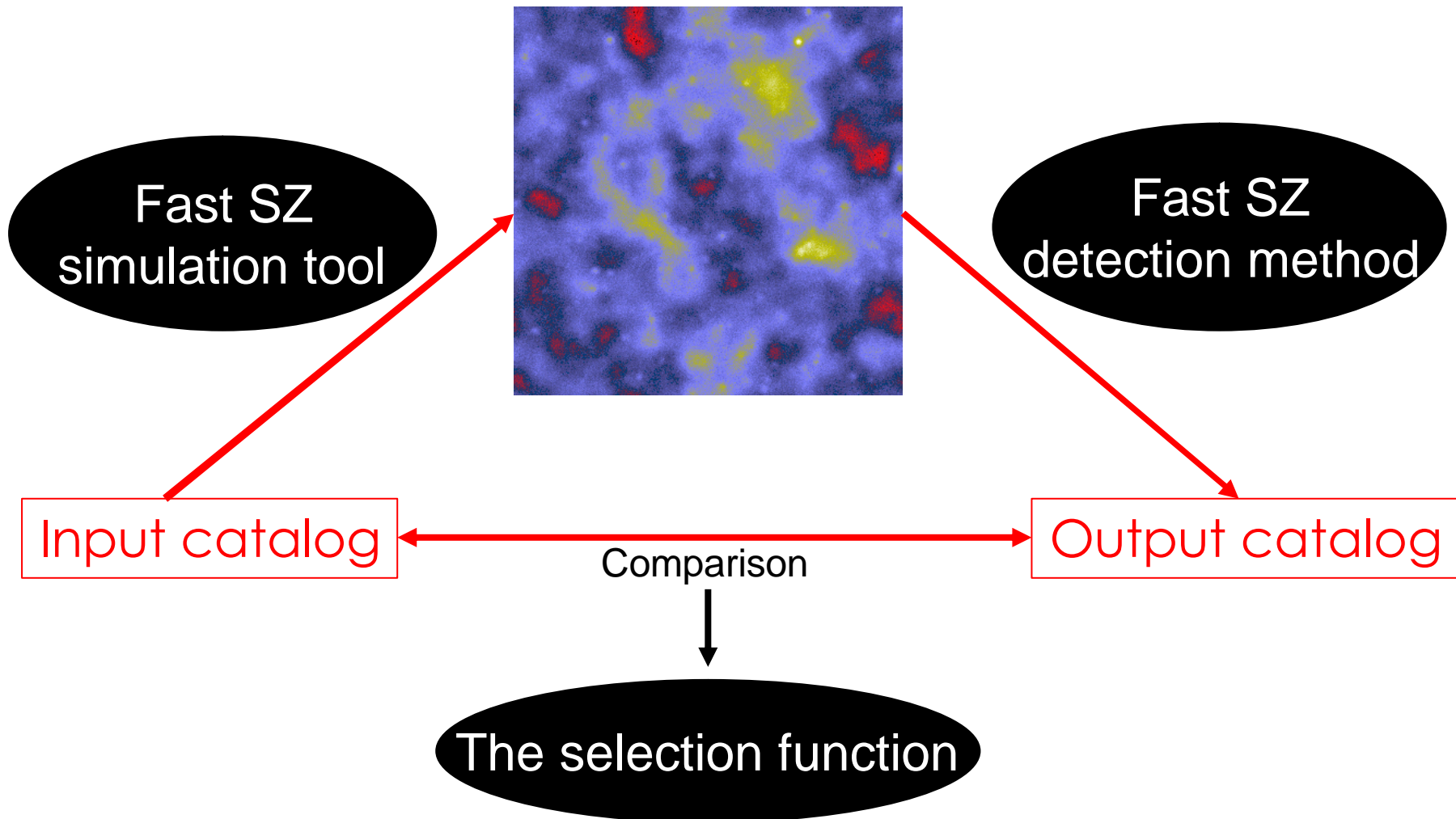
(beam fwhm, instrumental noise level, frequencies, etc.)

but also on

the detection method

The estimation of the selection function

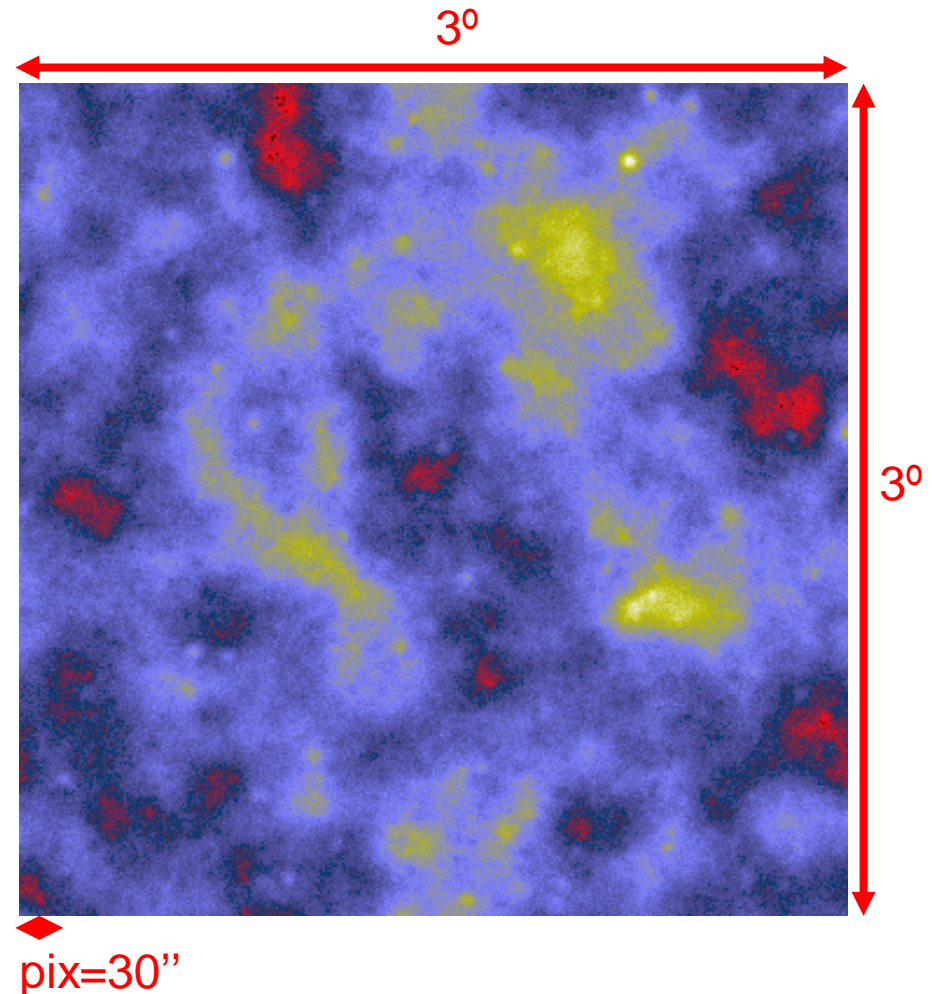
A Monte Carlo triangle



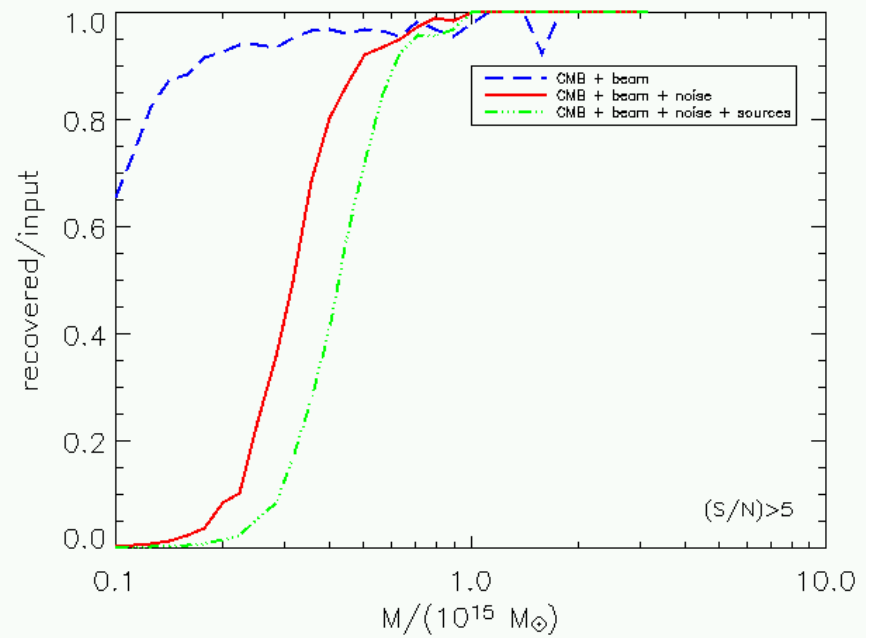
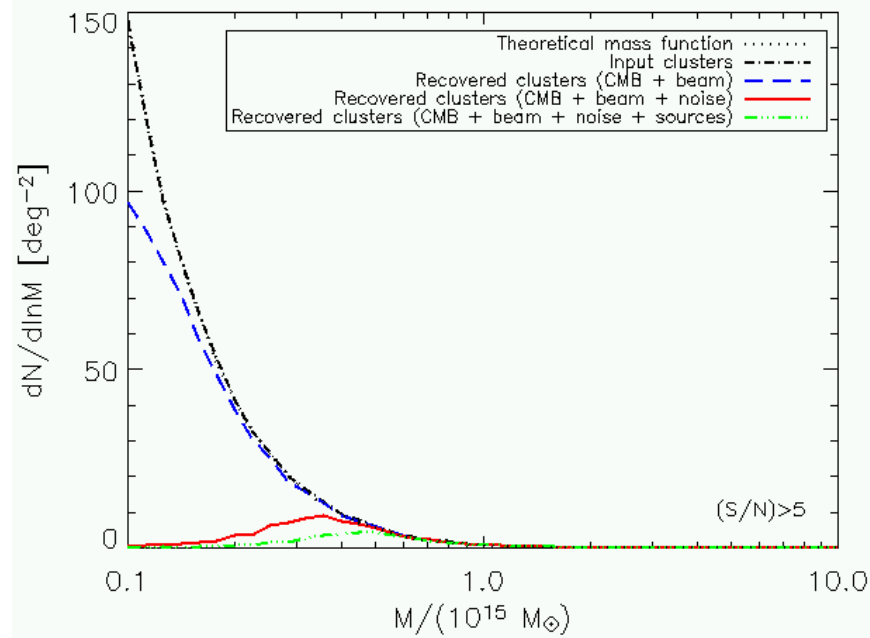
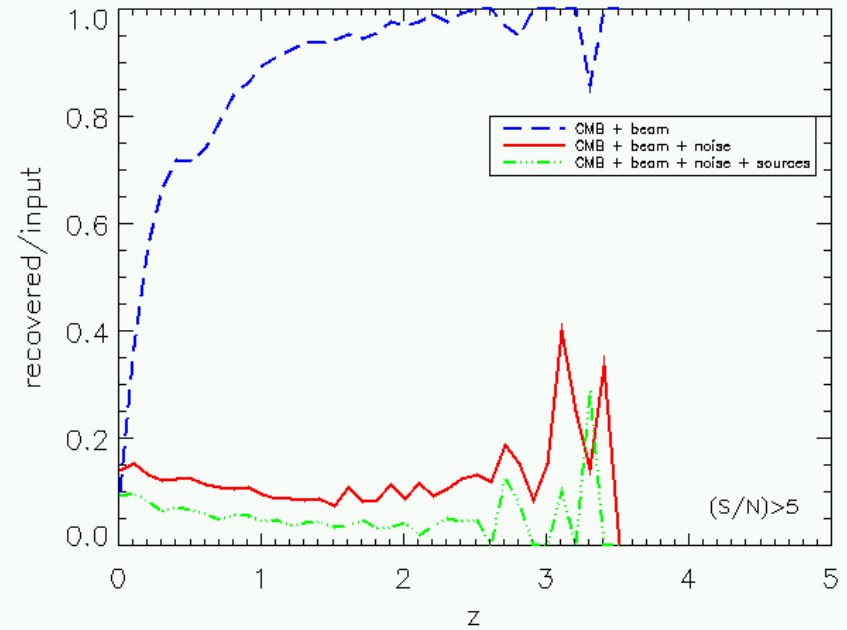
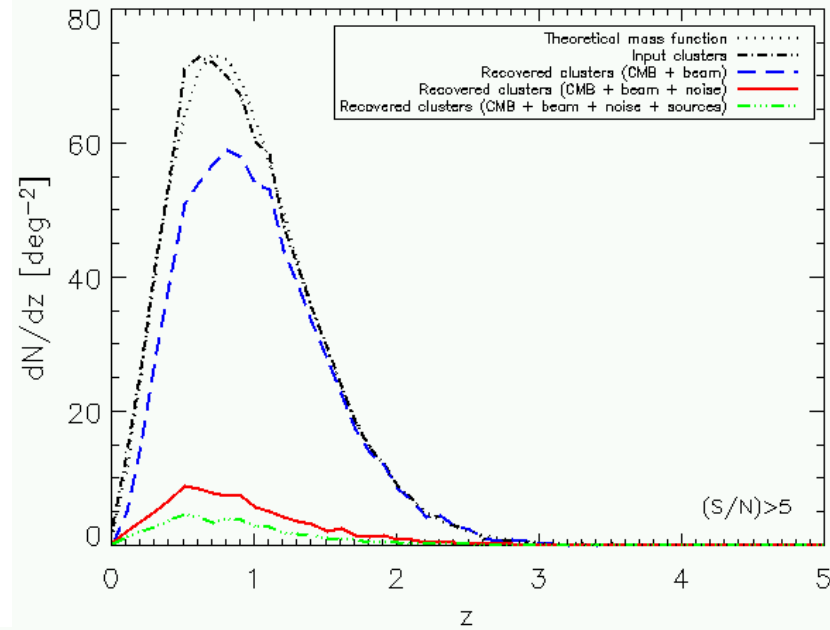
A concrete example of a selection function

50 simulations

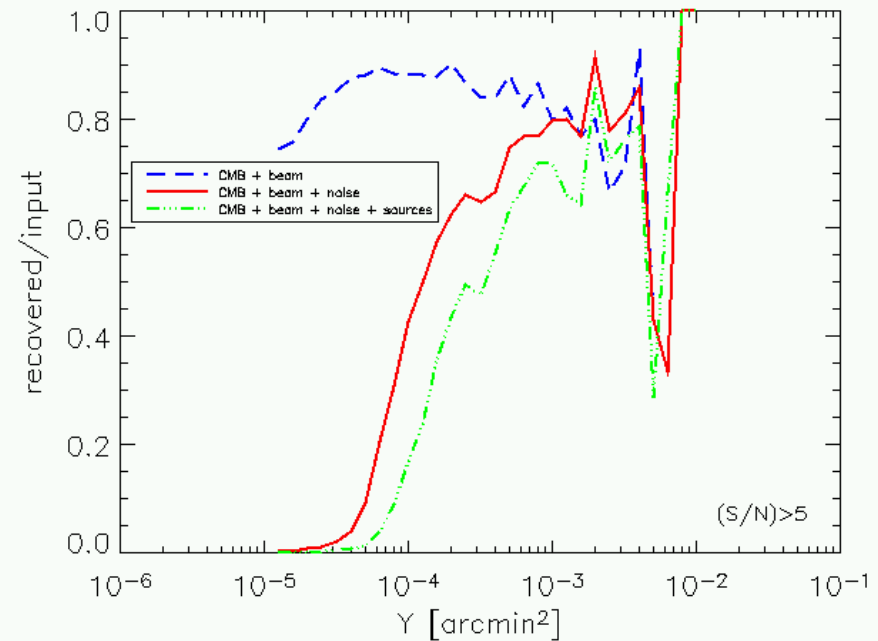
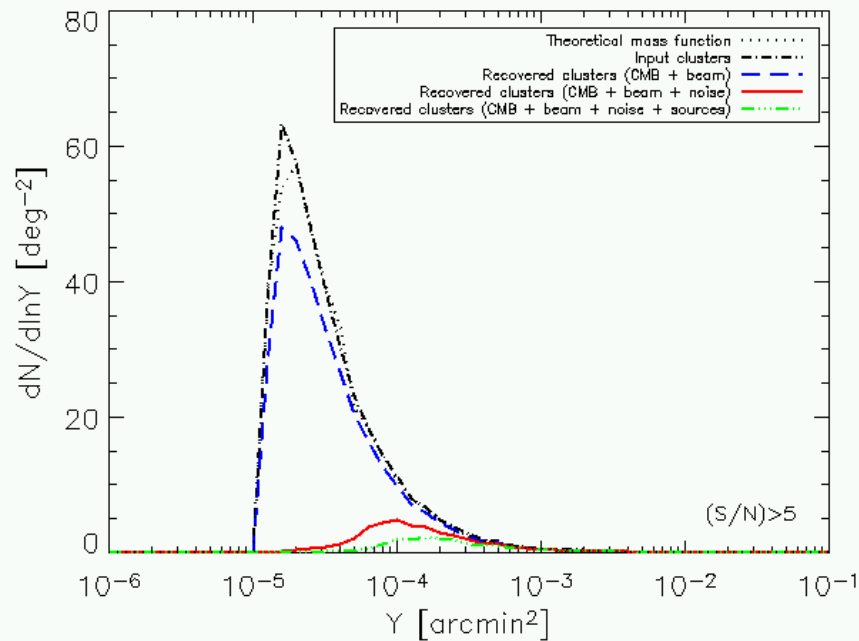
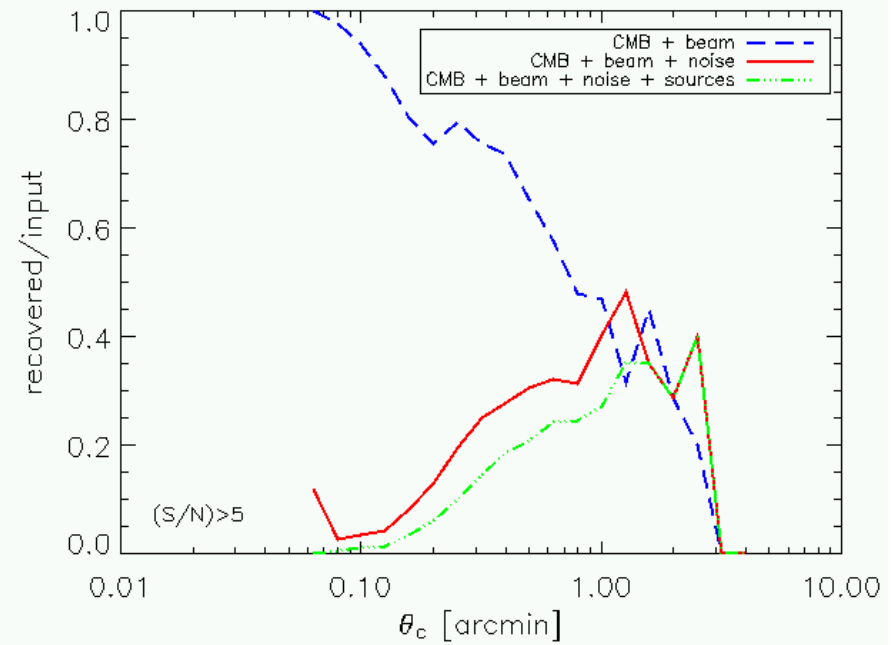
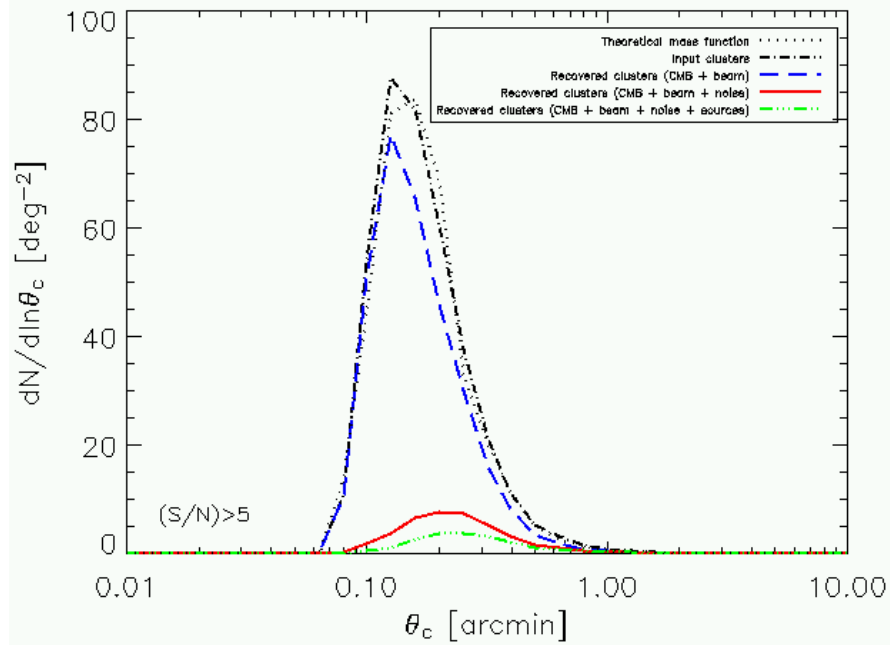
- Primordial CMB anisotropies
- Beam (fwhm=2 arcmin)
- Instrumental white noise ($\Delta T/T=20 \mu\text{K}/\text{pix}$)
- Radio sources ($S<0.1\text{mJy}$)
- Single frequency ($\nu=15 \text{GHz}$)
- Cosmology : ΛCDM



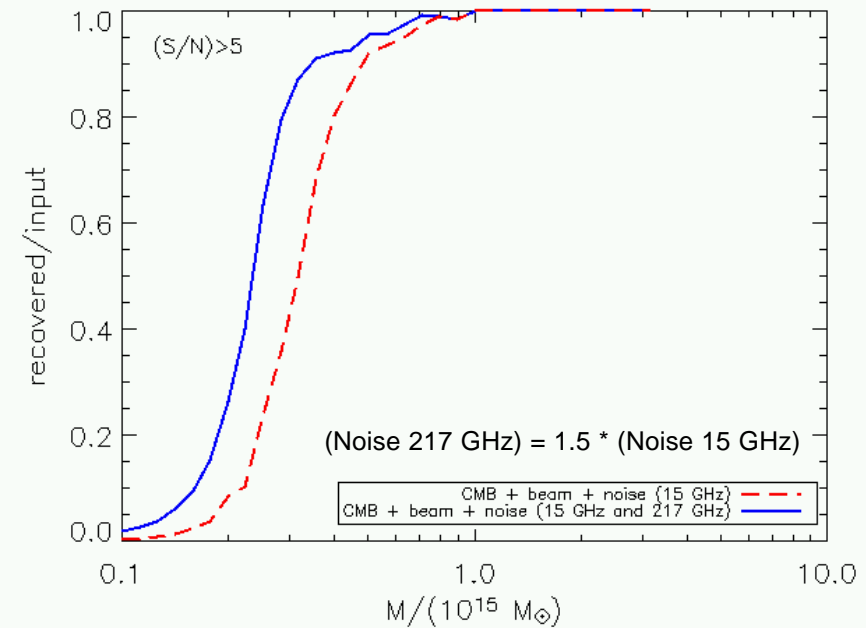
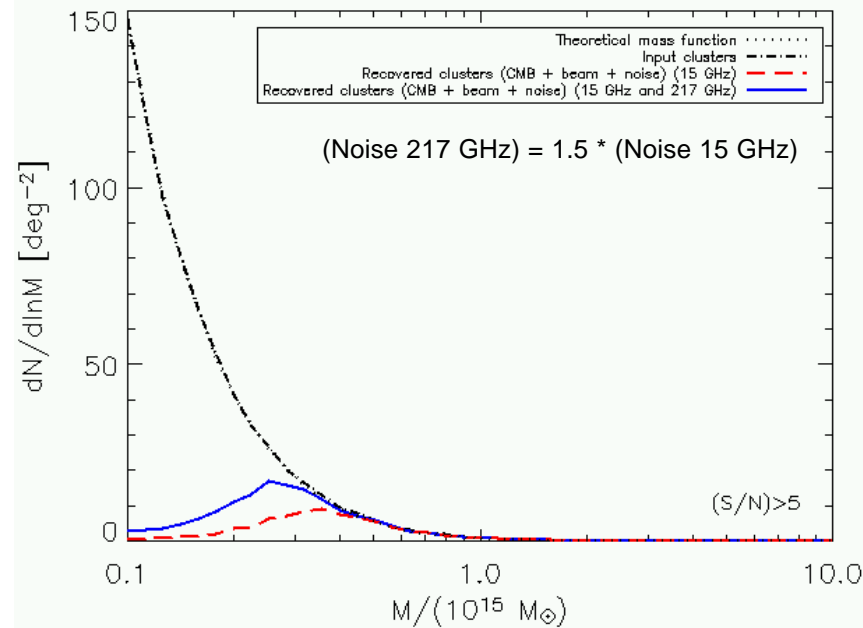
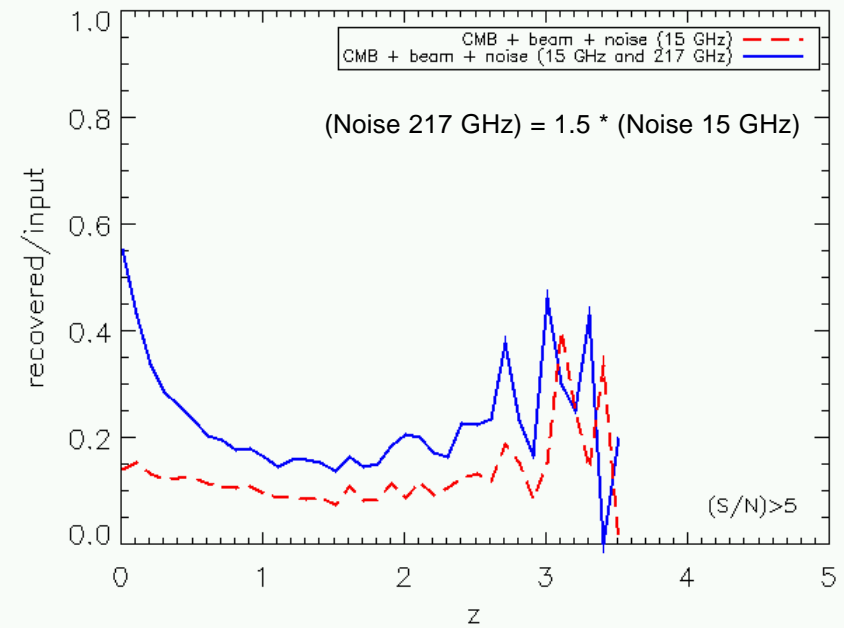
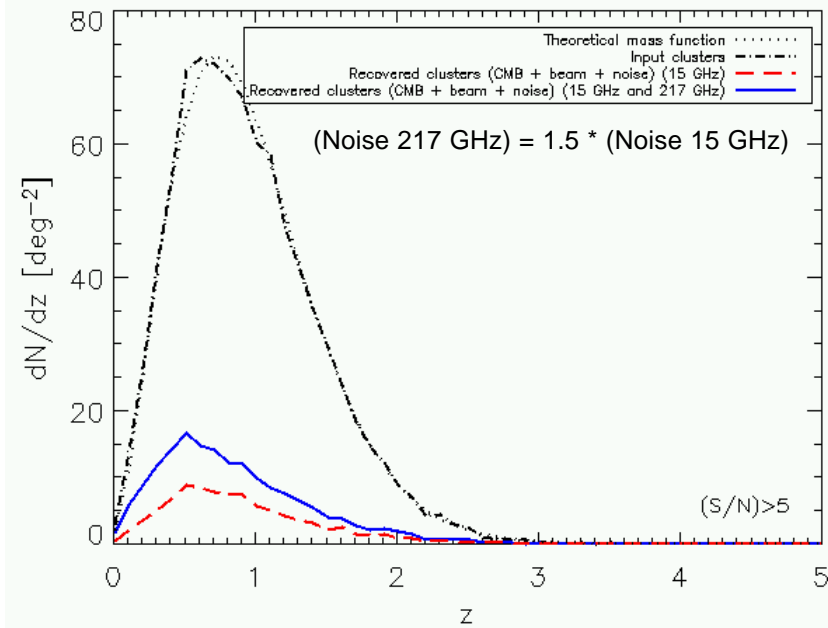
Completeness vs. (z,M)



Completeness vs. (θ_c, Y)



Multifrequency vs. monofrequency observations



Conclusion

- Selection function is crucial for SZ science
- Selection function depends on many parameters (importance of fast Monte Carlo simulations)
- Monofrequency observations are significantly confused by primordial CMB fluctuations