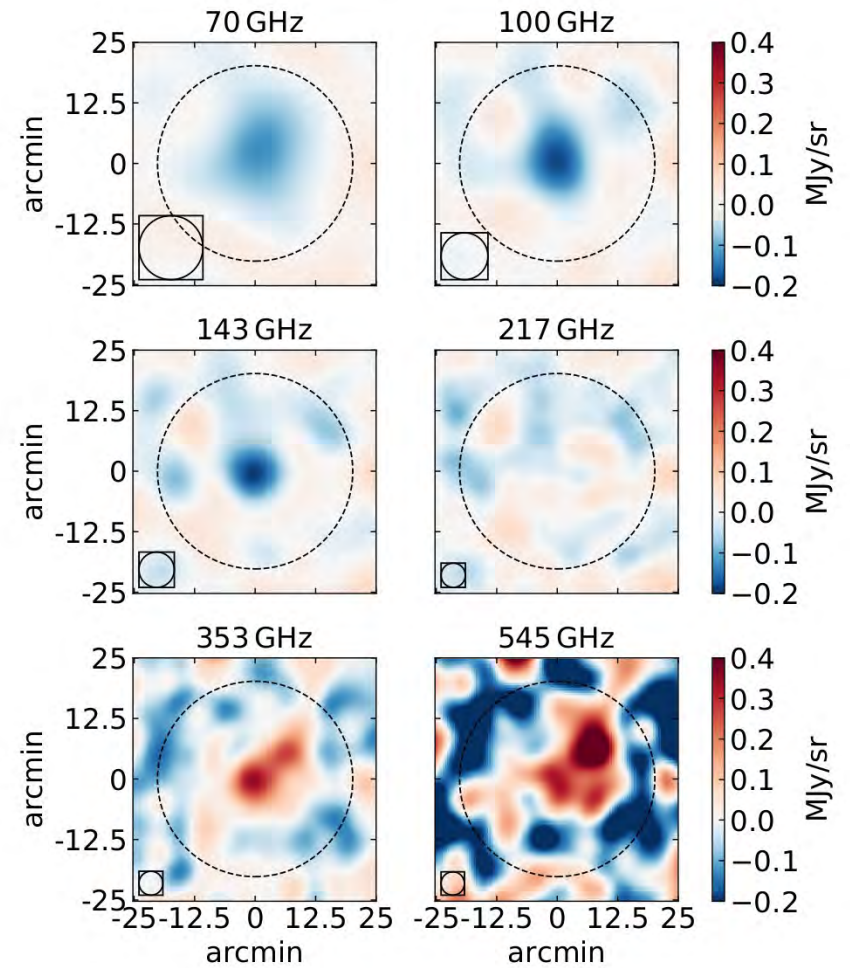
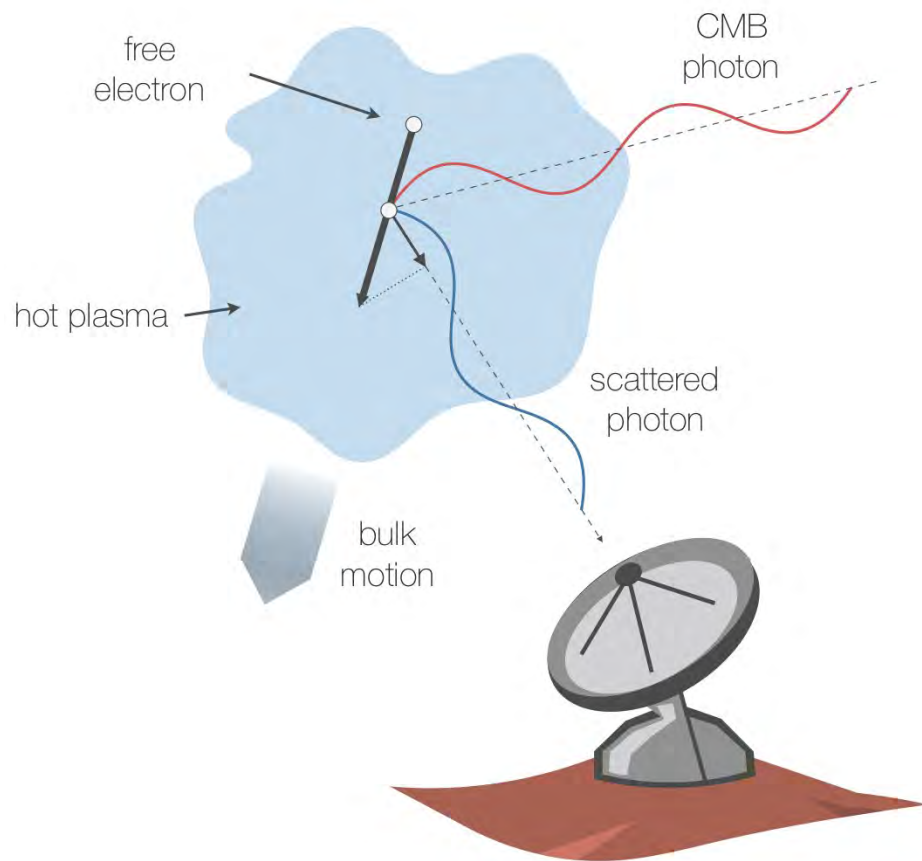


SZ observations of galaxy clusters with CCAT-p
and synergies with eROSITA

Jens Erler, Kaustuv Basu, Maude Charmetant & Frank
Bertoldi (Uni. Bonn)

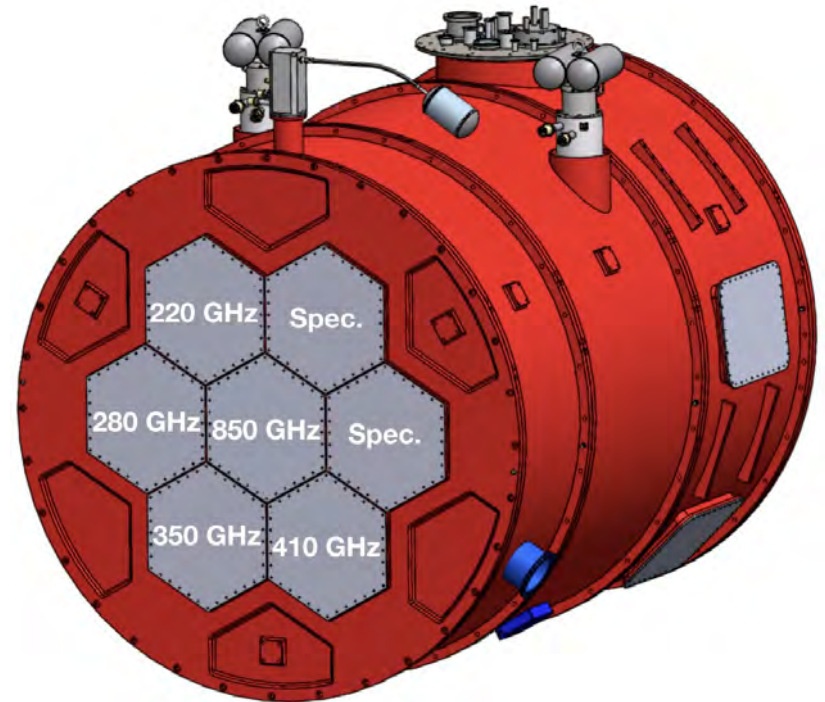
The Sunyaev-Zeldovich effect



Mroczkowski et al. (2019), Erler (2020)

Assumed survey- and instrument-properties

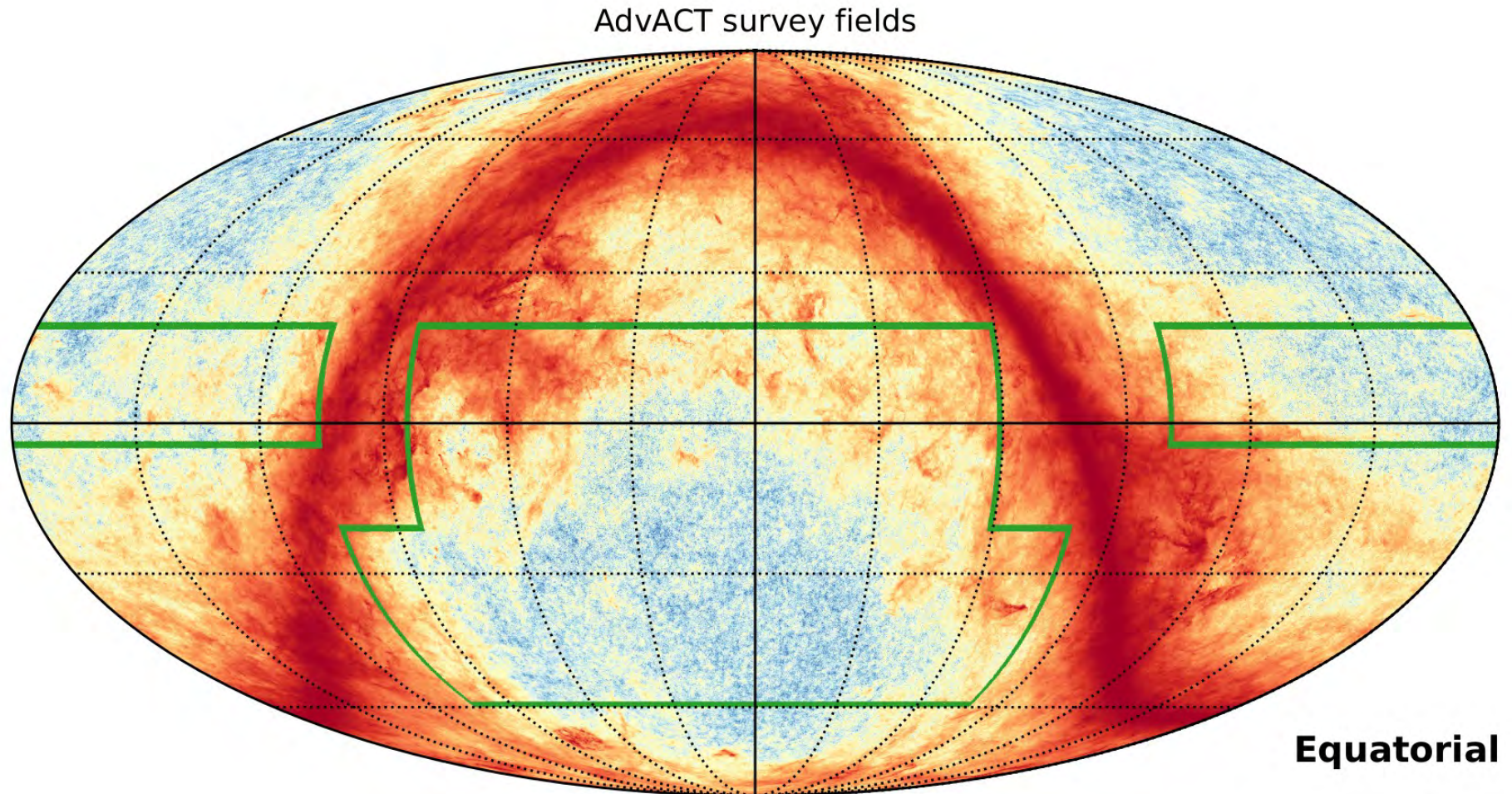
- Assume fully populated Prime-CAM with **5 broad-band tubes** (220, 280, 350, 410 & 850 GHz)
- **15,000 deg², 4000 h** follow-up of Adv. ACT field + **combination with SO data** (baseline sensitivities)
- Sensitivities and noise model taken from Choi et al. (2019)



Broadband channels wide survey (15,000 deg²; 4,000 hours)

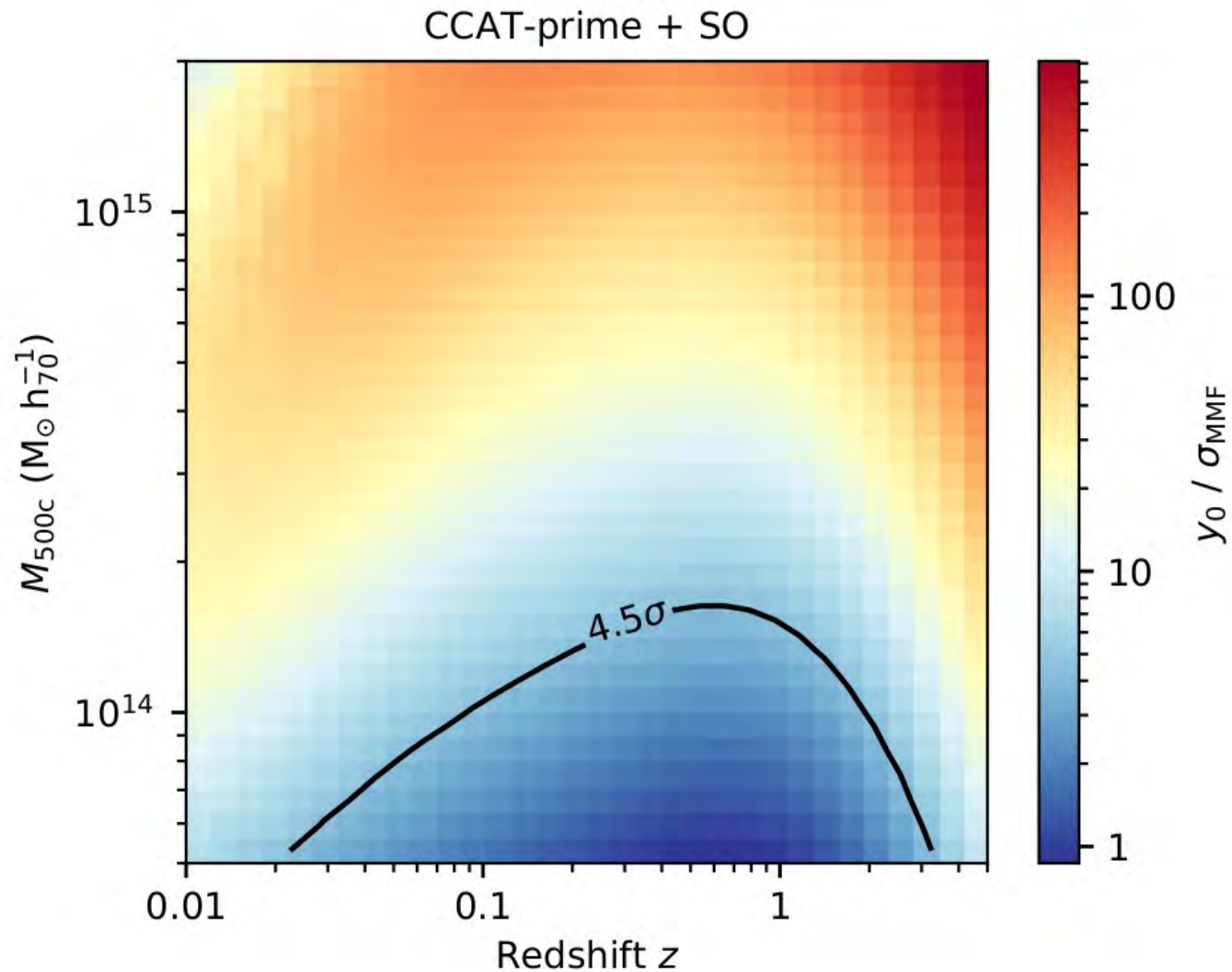
ν GHz	$\Delta\nu$ GHz	Resolution arcsec	NEI Jy sr ⁻¹ √s	Sensitivity μK-arcmin	NET μK√s	N_{white} μK ²	N_{red} μK ²
220	56	57	3,700	15	7.6	1.8×10^{-5}	1.6×10^{-2}
280	60	45	6,100	27	14	6.4×10^{-5}	1.1×10^{-1}
350	35	35	16,500	105	54	9.3×10^{-4}	2.7×10^0
410	30	30	39,400	372	192	1.2×10^{-2}	1.7×10^1
850	97	14	6.0×10^7 †	5.7×10^5	3.0×10^5	2.8×10^4	6.1×10^6

SO + CCAT-p follow-up of the Adv. ACT field



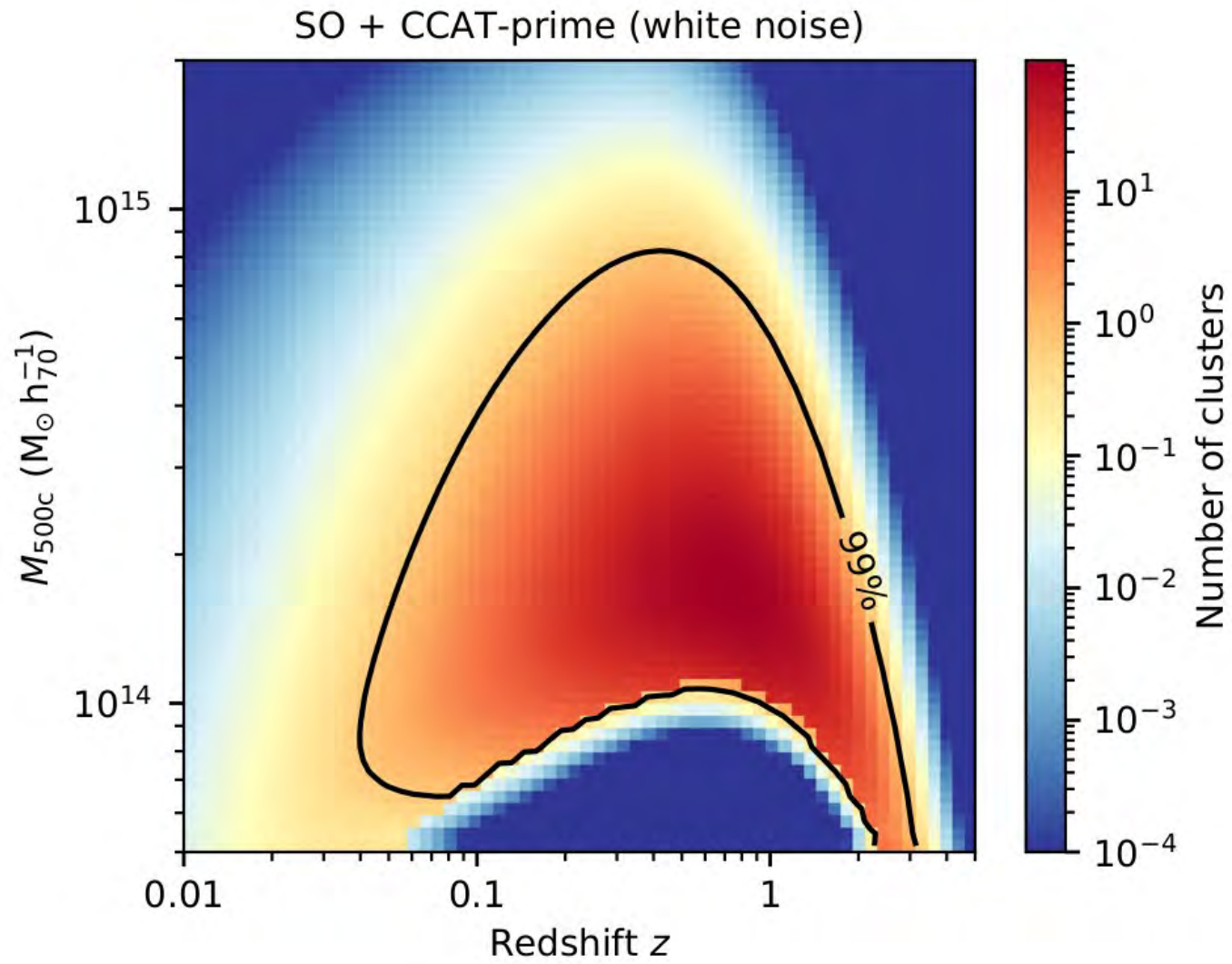
Erlar et al. (in prep.)

Estimate tSZ SNR using matched multifiltering



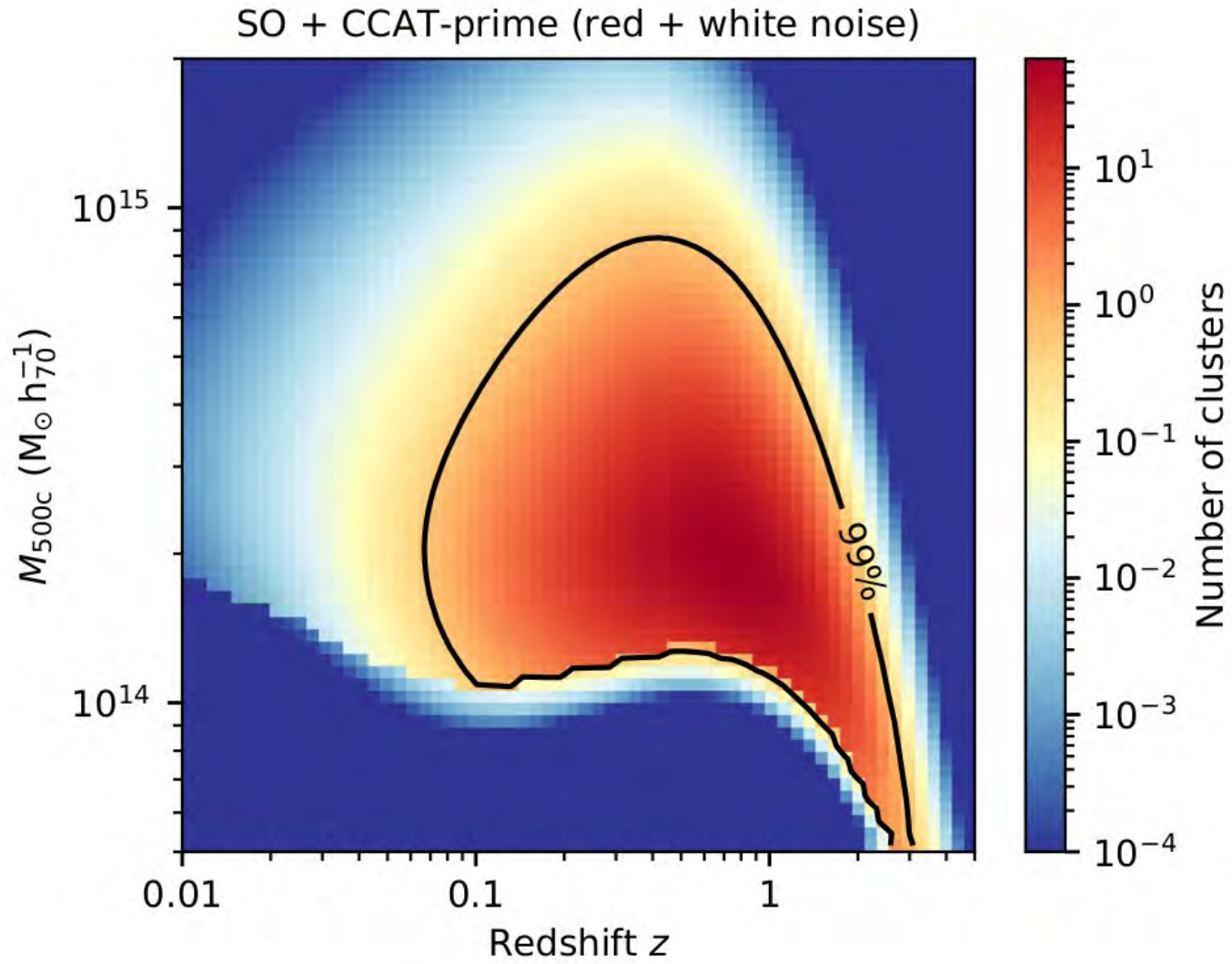
Erl er et al. (in prep.)

Expected CCAT-p + SO cluster sample



Erlar et al. (in prep.)

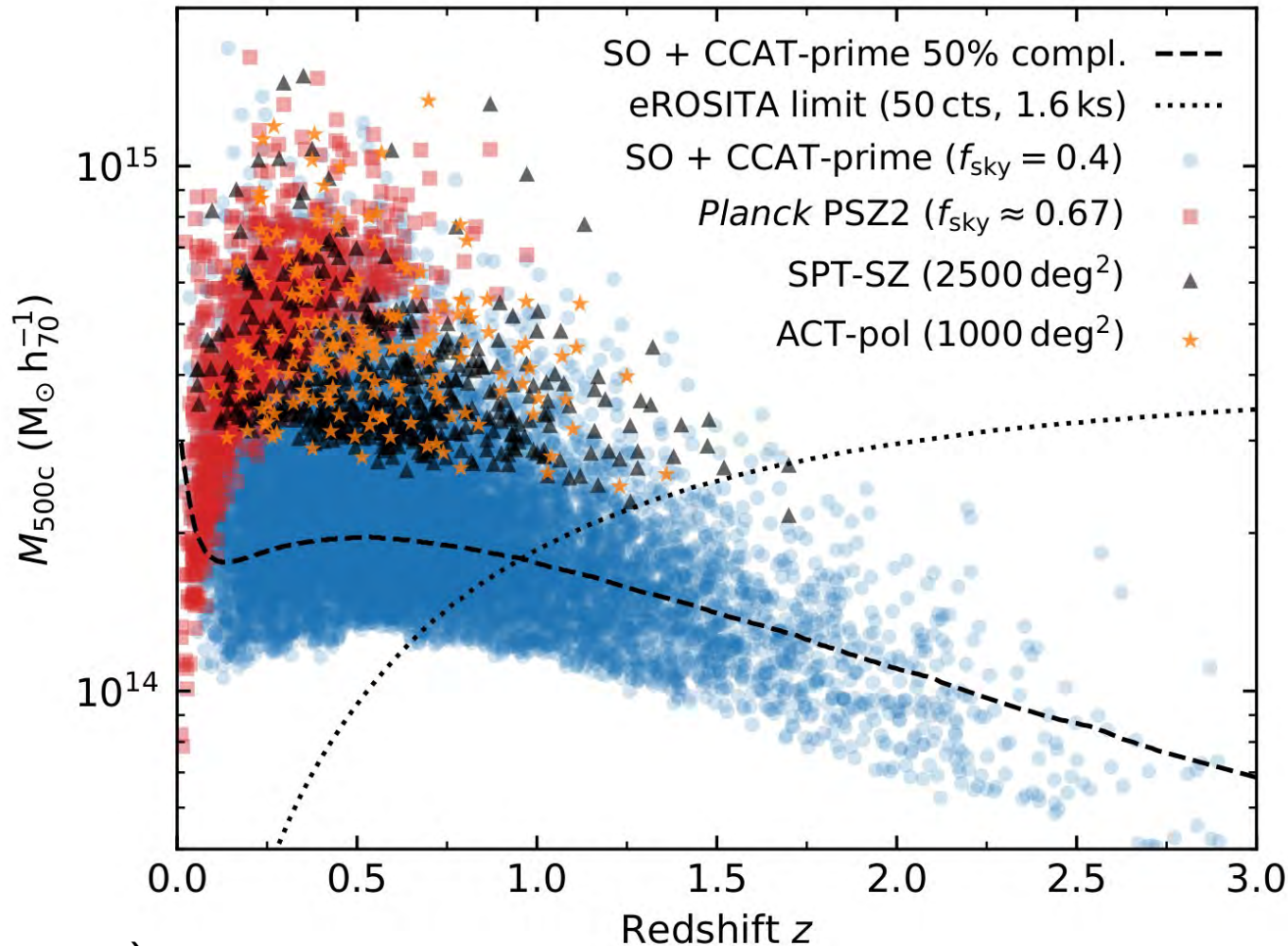
Expected CCAT-p + SO cluster sample



Erlar et al. (in prep.)

Expected CCAT-p + SO cluster sample

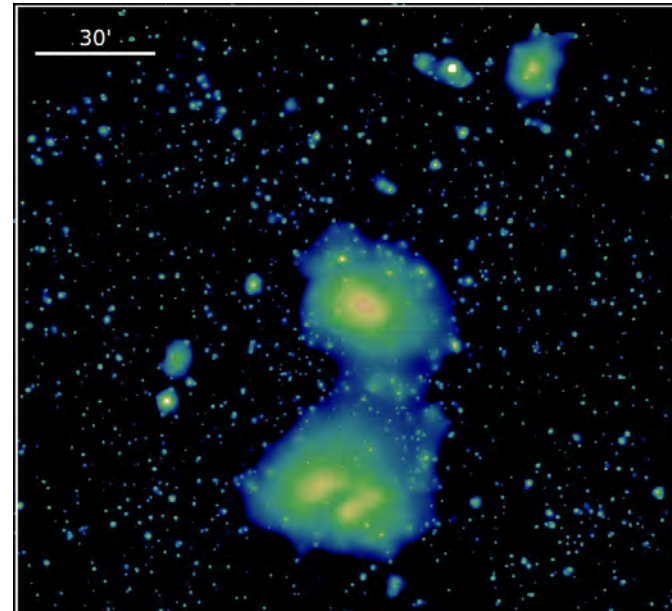
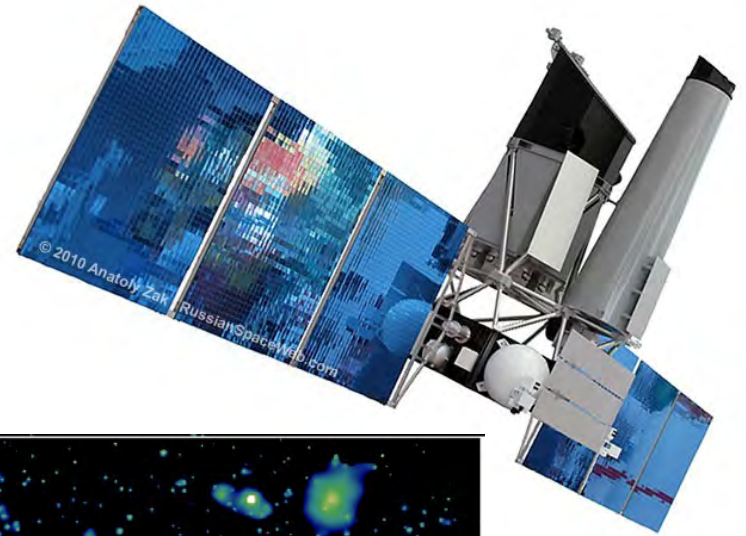
We expect CCAT-p and the SO to detect 12,000 clusters within 15,000 deg²



Erlar et al. (in prep.)

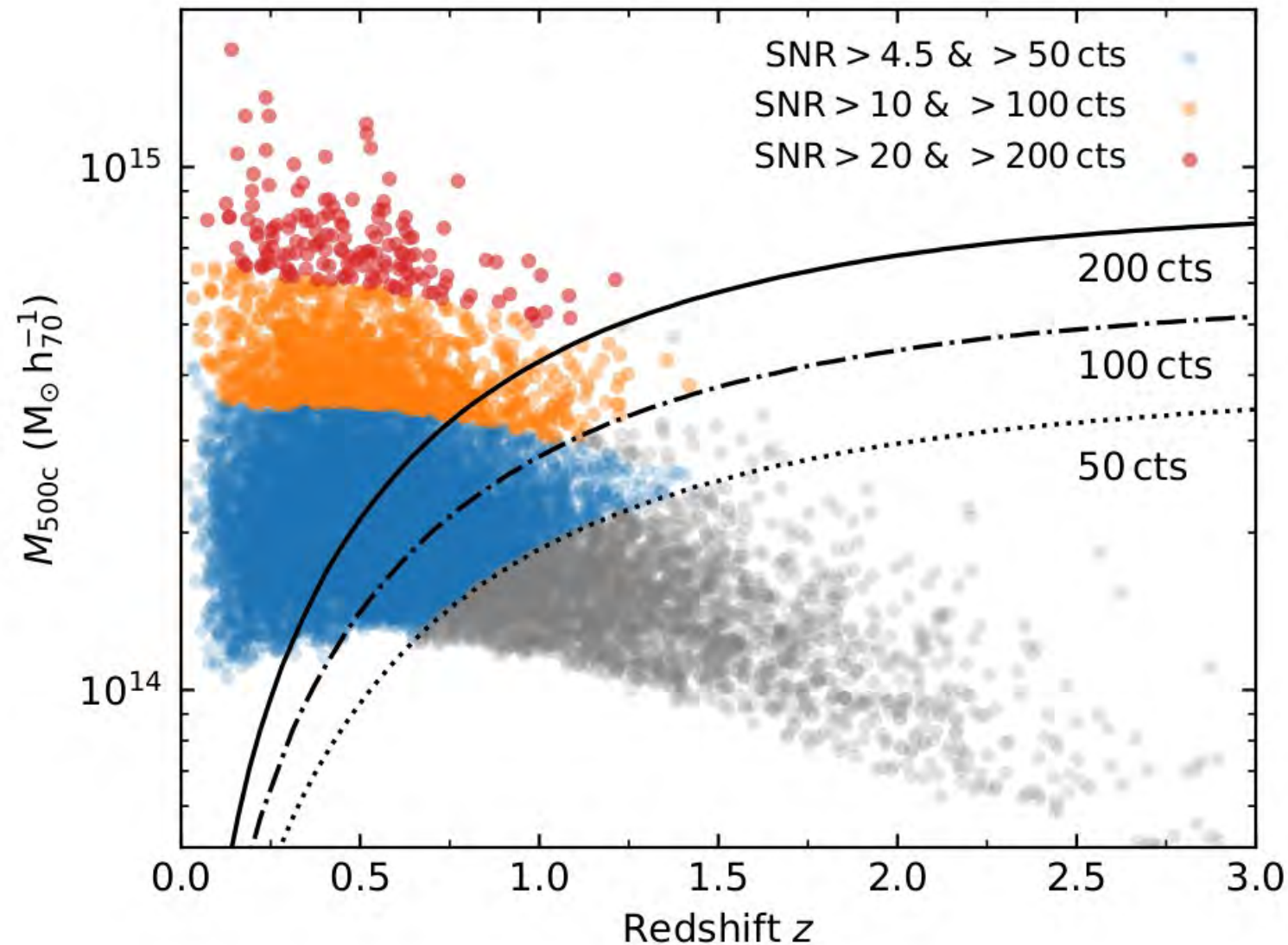
The eROSITA X-ray all-sky survey

- German X-ray survey telescope onboard German-Russian Spektr-RG mission
- Launched to L₂ in July 2019, now performing **multi-year all-sky X-ray survey**
- Projected to **detect X-ray emission of ~100,000 galaxy clusters**
- Excellent first light data quality



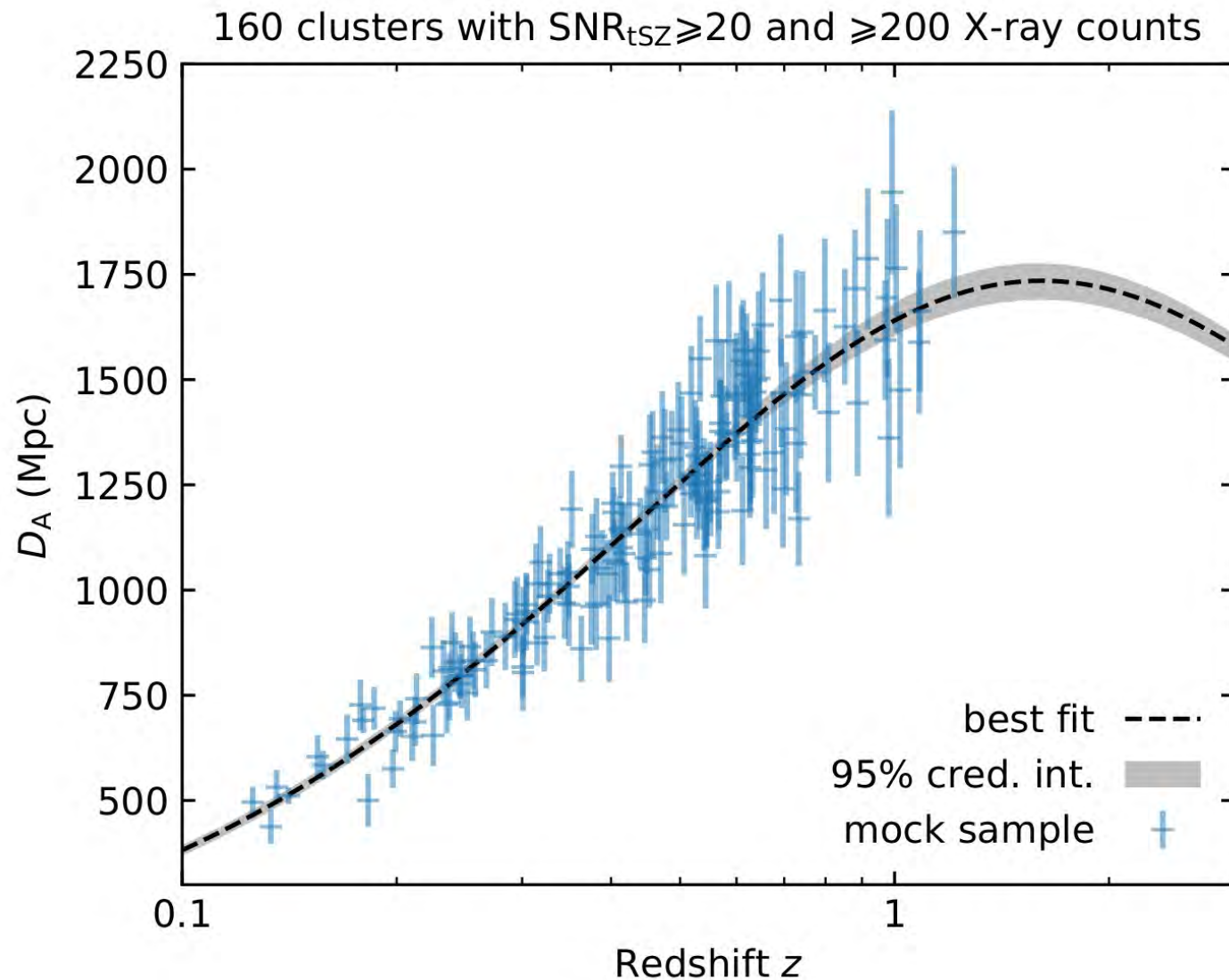
Reiprich et al. (2019)

Building future SZ + X-ray common samples



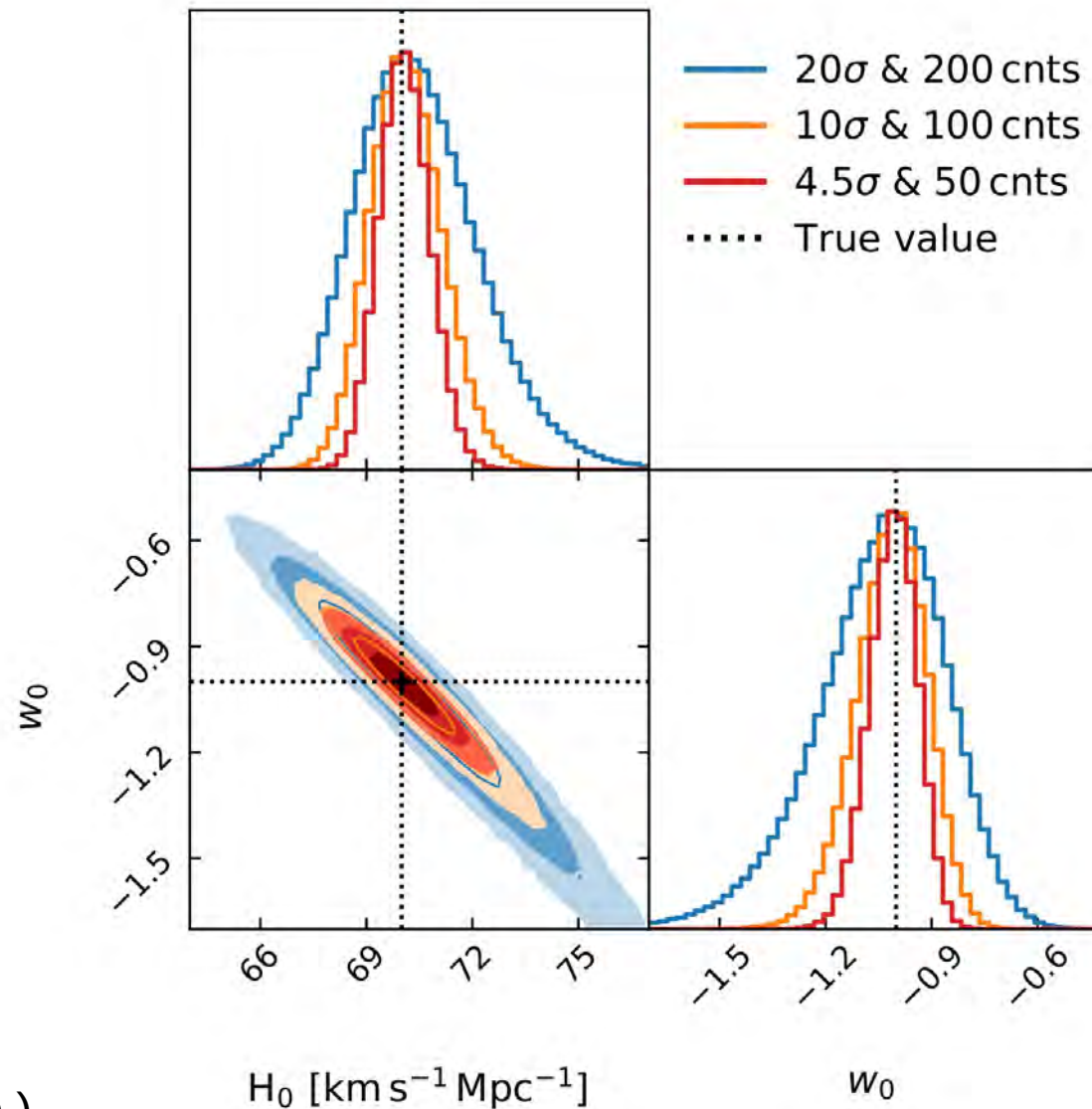
Erl er et al. (in prep.)

Measuring D_A with SZ and X-ray observations



Erl er et al. (in prep.)

Constraining H_0 and w_0 using D_A



Erlar et al. (in prep.)

CCAT-prime SZ cluster science summary

- In combination with SO or Adv. ACT CCAT-prime is expected to detect $\sim 12,000$ clusters, many of which lie beyond $z = 1$
- CCAT-prime's sub-mm coverage allows studies of the spectral shape of the SZ effect and provides a handle on potential cluster FIR emission
- In addition to other cosmological studies, the combination of CCAT-prime and eROSITA offers competitive constraints on cosmological parameters via measurements of D_A