

The Arcminute MicroKelvin Imager (AMI)

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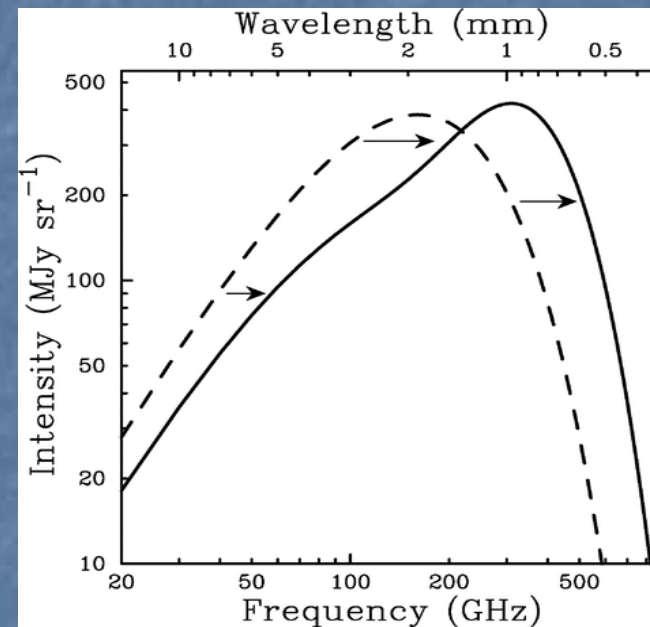
Caltech:

Jean-Paul Kneib

The (thermal) SZ Effect.



- Inverse Compton scattering of CMB photons by the hot intracluster gas
- Independent of redshift.



For low frequencies ($\ll 217$ GHz) decrement $\propto \int n_e T_e dl$

Current Ryle Telescope



5 13-m antennas

0.35 GHz
bandwidth @ 15
GHz

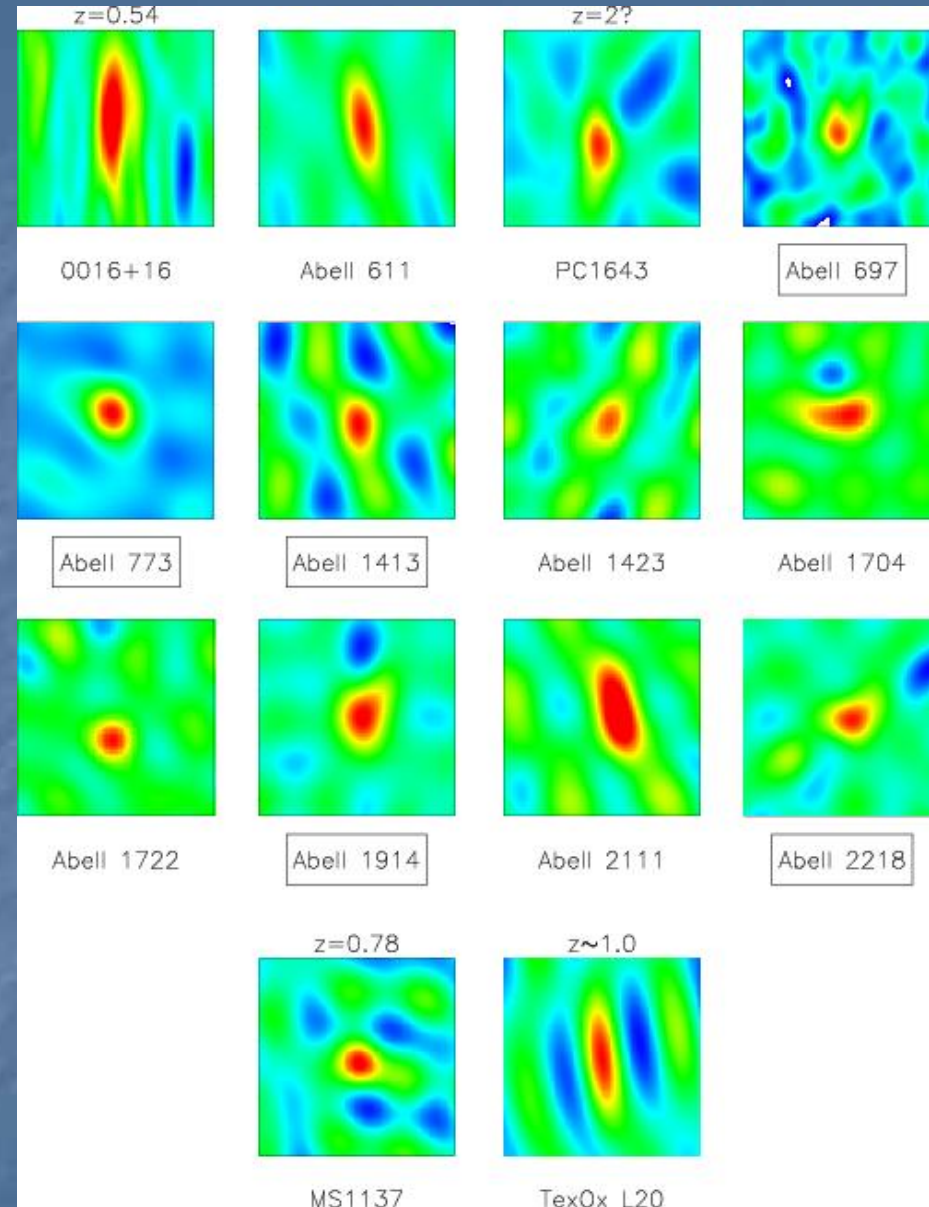
$T_{\text{sys}} = 55 \text{ K}$

Only east-west

Minimum baseline
of 650λ

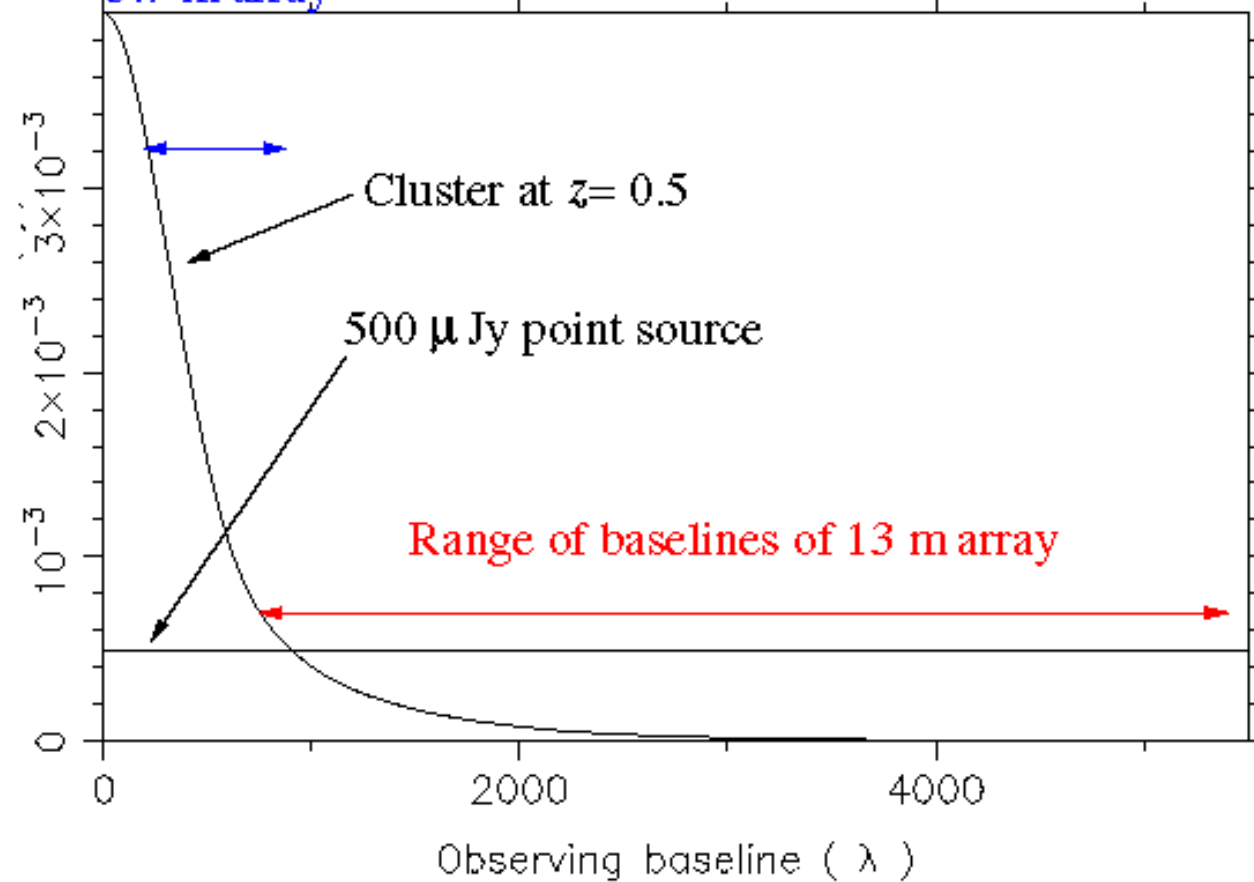
Pointed observations of clusters have been routine for many years by various groups.

A survey would be impossible in a reasonable time...



Range of baselines of

3.7 m array



- With a range of baselines, can separate out confusing radio sources and SZ signal.

So we are building...

- An array of small dishes mainly for SZ detection
- An array of large dishes mainly for point source removal



10 3.7-m antennas

6 GHz bandwidth
@ 15 GHz

$T_{\text{sys}} = 25 \text{ K}$

2-d array

Minimum baseline
of 180λ



"After Phase 3"



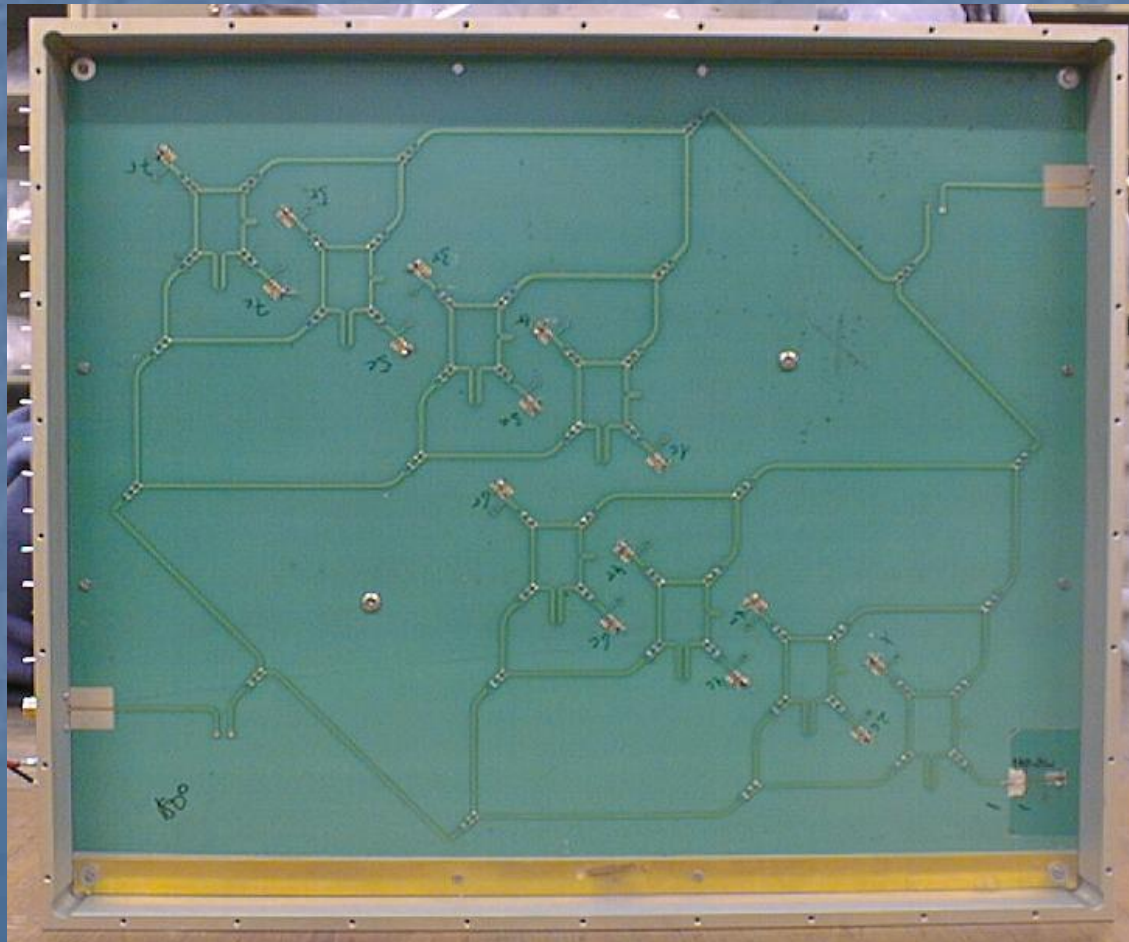
8 13-m antennas

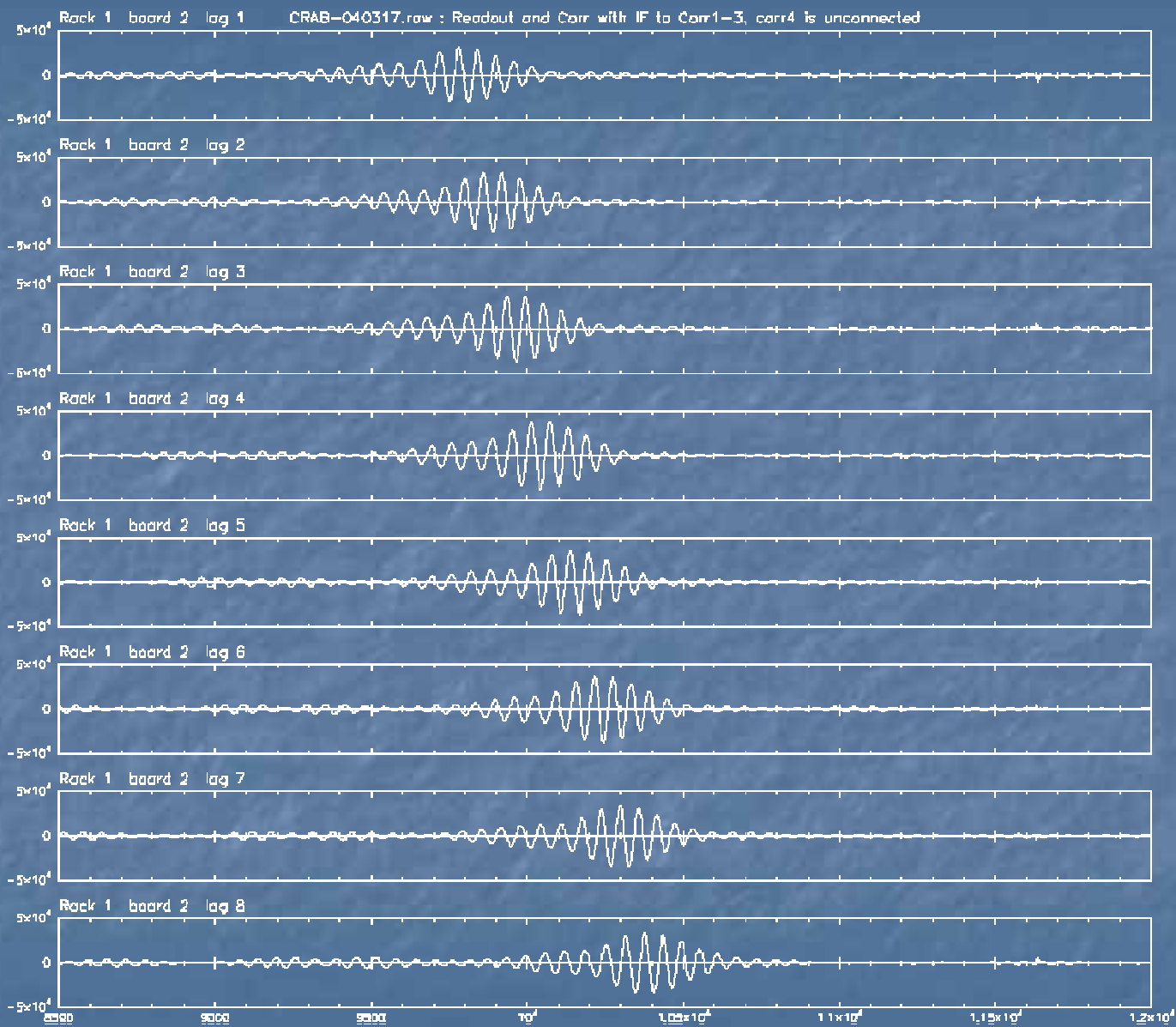
6 GHz bandwidth
@ 15 GHz

T_{sys} approx 30 K

2-d array

Correlator splits the signals into 16 channels with differing time delays. A Fourier transform across the lags then gives 8 frequency channels with amplitude and phase...





Time scales

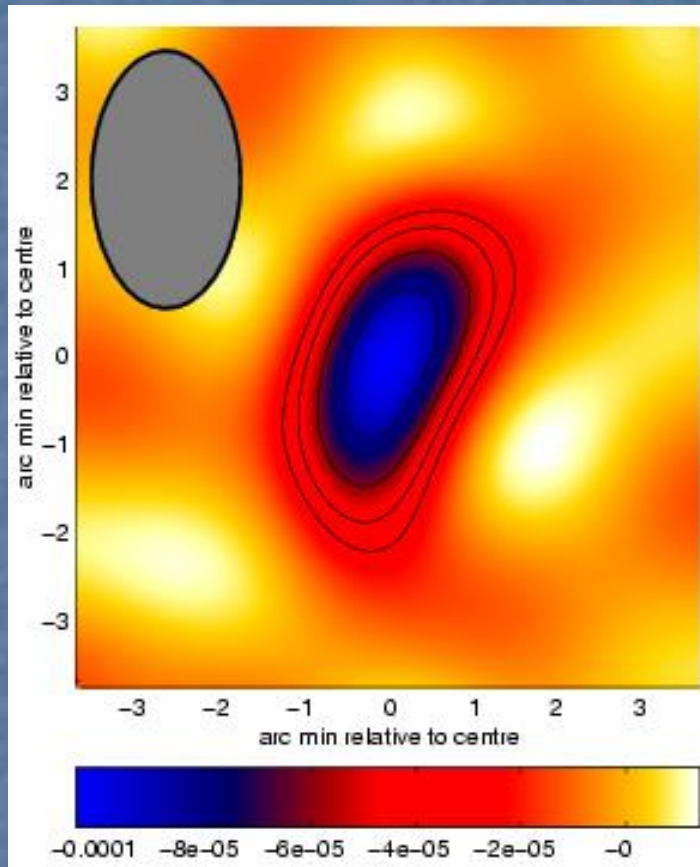
Small array:

- 1 baseline currently being commissioned.
- 5 aerials (10 baselines) within 2 months
- 10 aerials (45 baselines) observing late summer this year

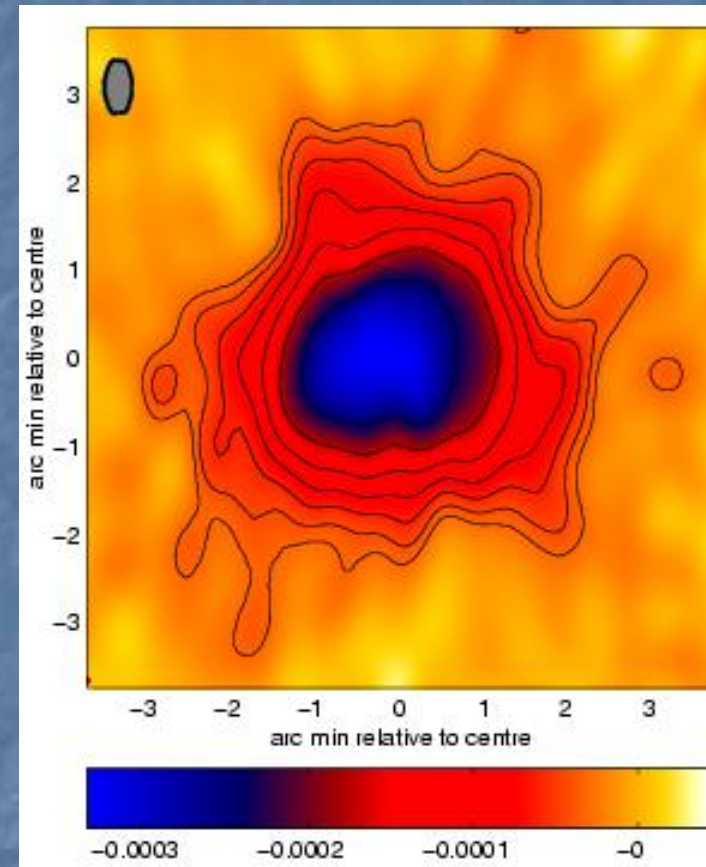
Large array:

- Broadbanding Q3 & Q4 2004
- Moving 3 aerials Q3 2004
- All 8 aerials observing Q1 2005

Improvement for pointed observations...

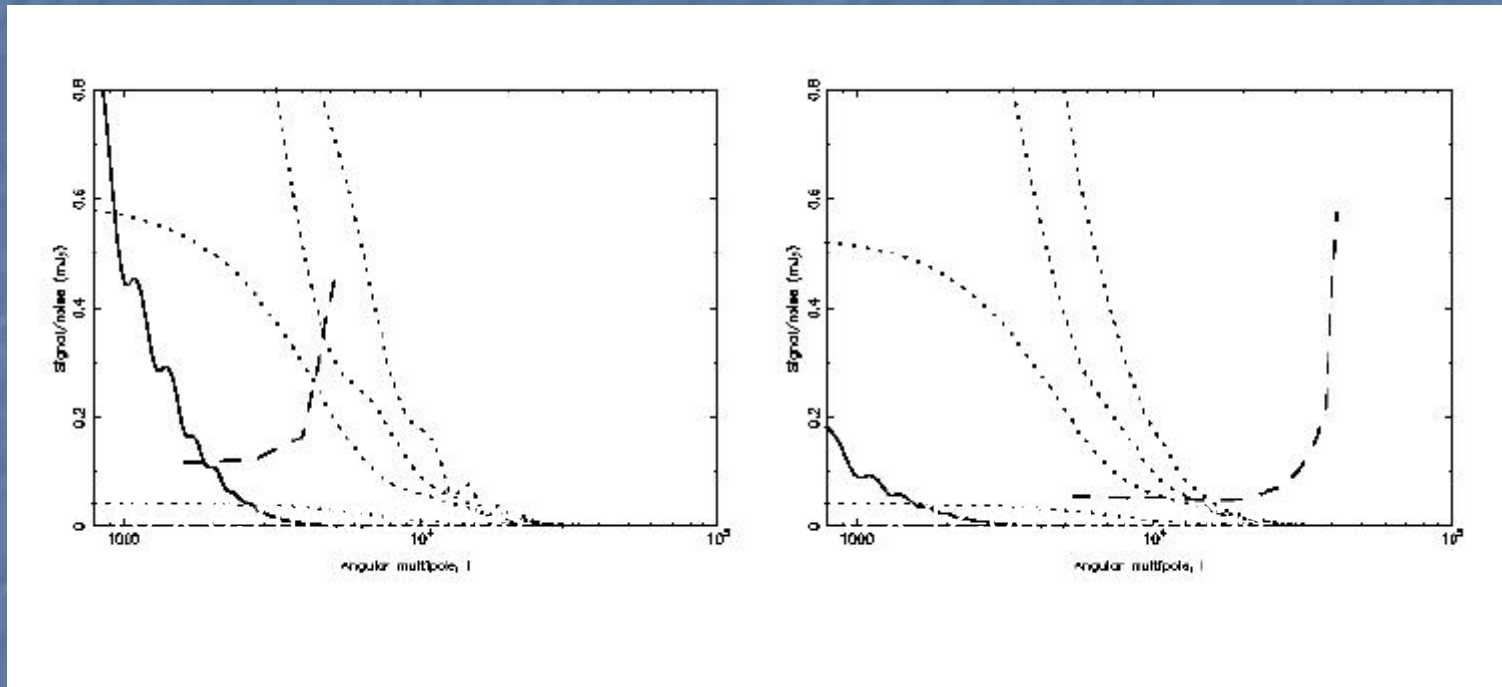


“Current” Ryle observation of Abell 1914; 2 week integration time.



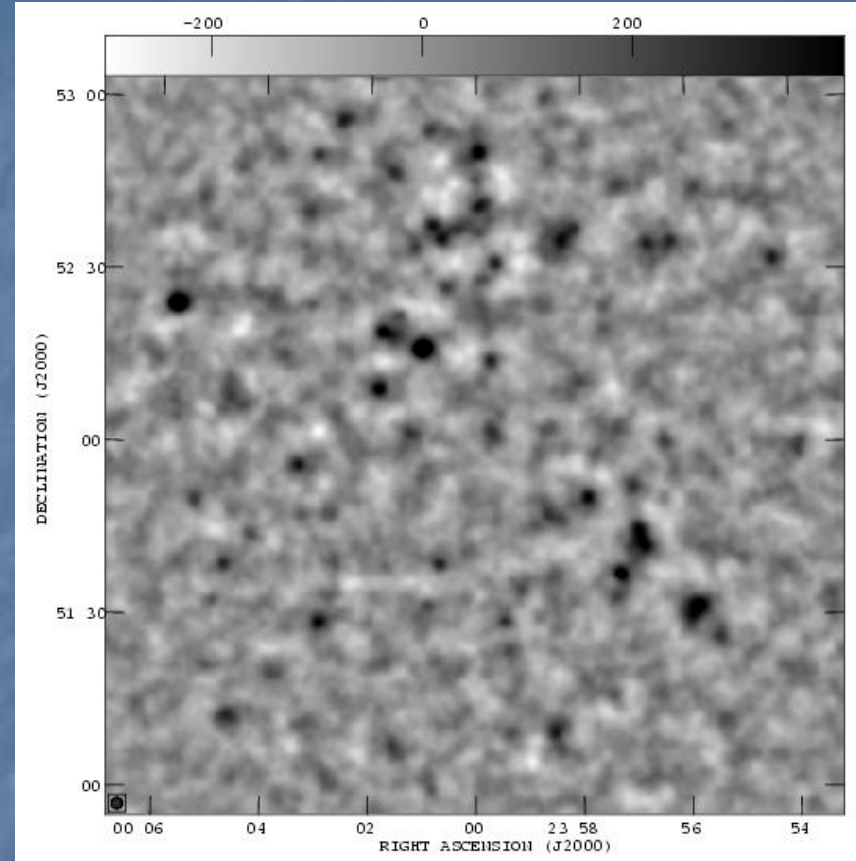
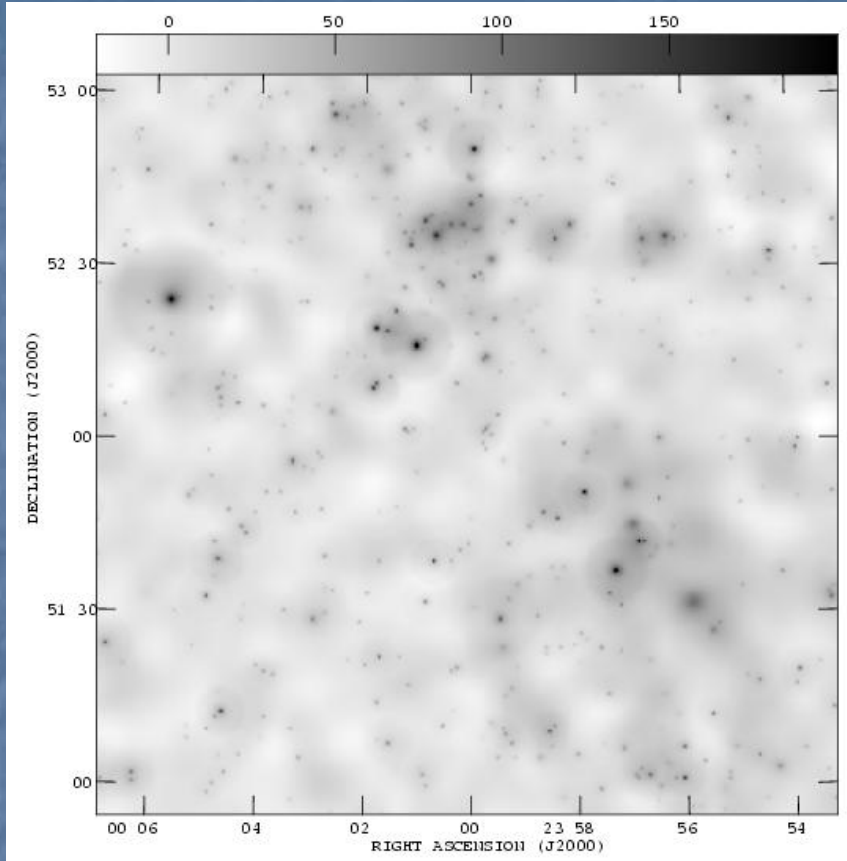
Simulated AMI observation of the same cluster with 12 hour integration.

Survey sensitivities



Sensitivity for 6 months on 4 sq deg

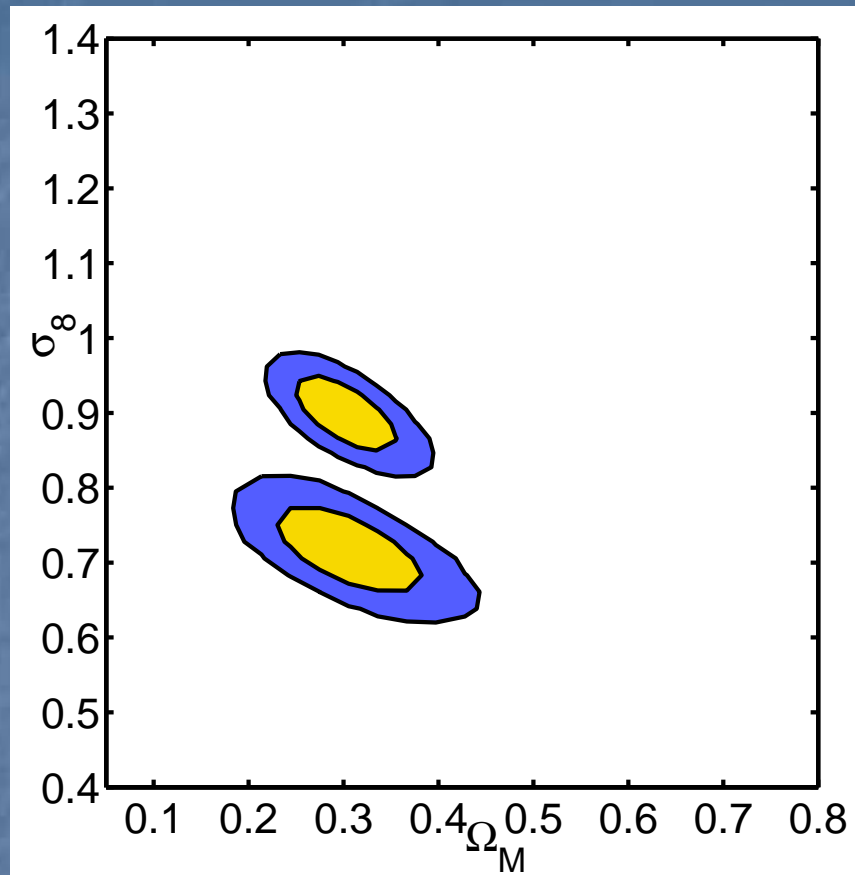
Clusters of 5.2, 3.2, 1.7, 0.3 x 10¹⁴ M_{solar}



Input: Virgo cluster positions with scaled beta model clusters + CMB

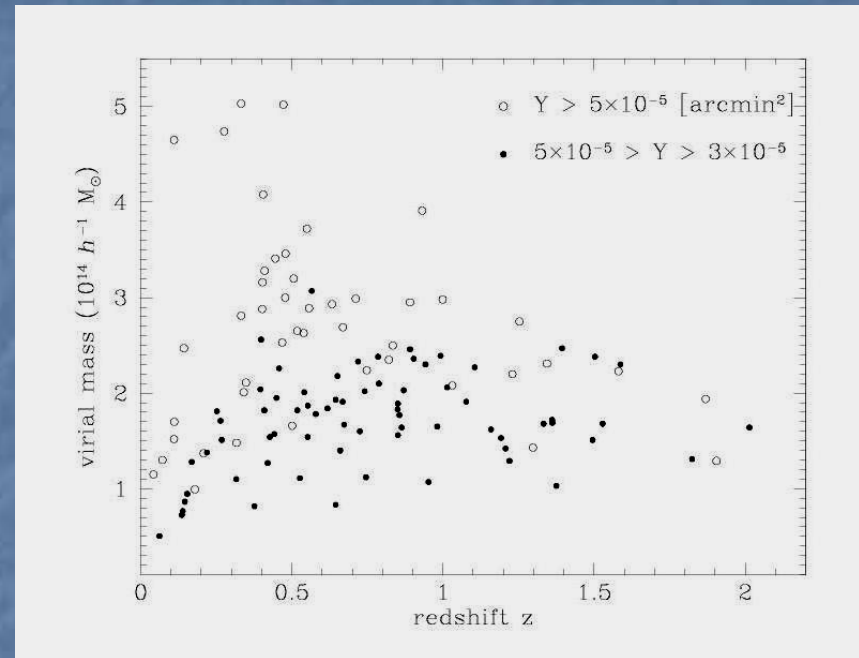
Output: 6 months survey, 2 arcmin resolution over 4 sq deg.

~70 clusters detected.



Constraints (two different input models!) after a 6 month survey.

(Weller, Battye & Kneissl 2002)



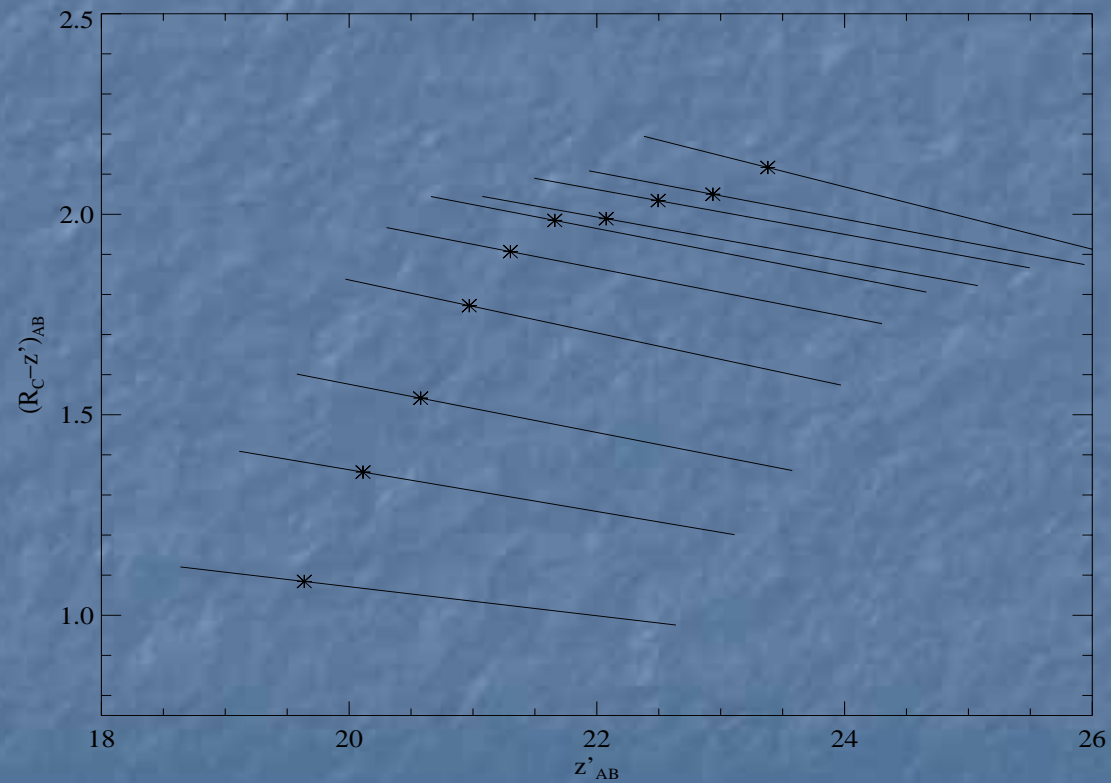
AMI survey mass limit (i.e. redshift independent!)

(Kneissl et al 2001)

Optical follow-up

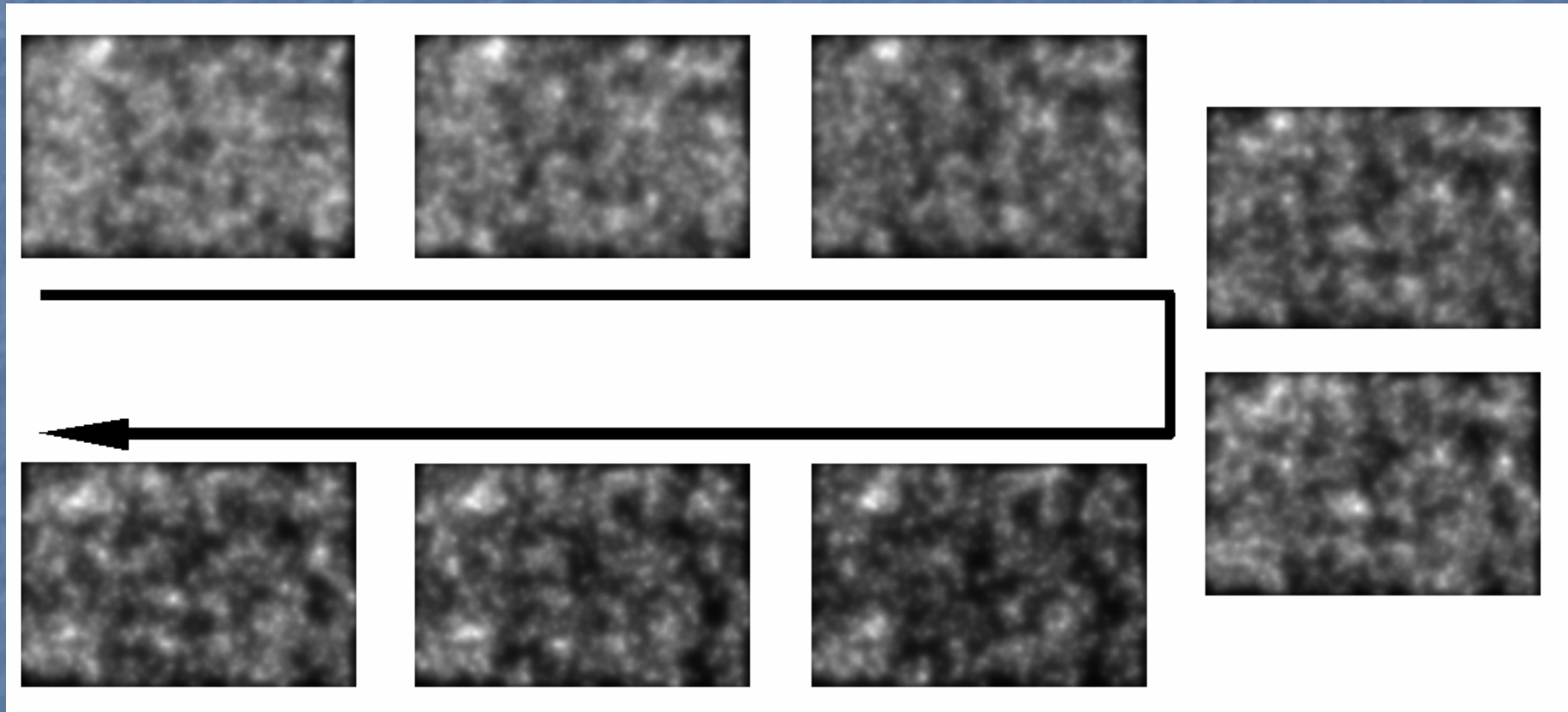
- Need to get redshifts; hence optical work.
- Already have 8 fields with the CFH12k and MegaCam instruments.
- Two colour; R and z'
- All in the 9C survey area (see Liz Waldram's and Jon Zwart's posters)

Using the colour magnitude relation to detect clusters.



(Yee, Gladders, 2001)

Preliminary density slices...



Produced by Patrick Hudelot (Toulouse)

Conclusions

- AMI construction and commissioning is going well.
- Science observations with both arrays in Q1 2005.
- Blind SZ survey will get, amongst other things, good σ_8 constraints, and a mass-selected catalogue of clusters.
- Have, and are reducing, optical data.