RADIO EMISSION AND POLARIZATION OF GALAXY CLUSTERS WITH THE VLASS

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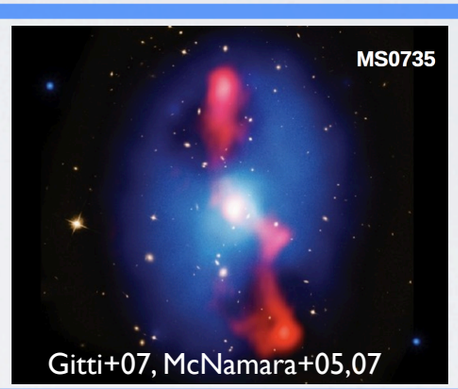
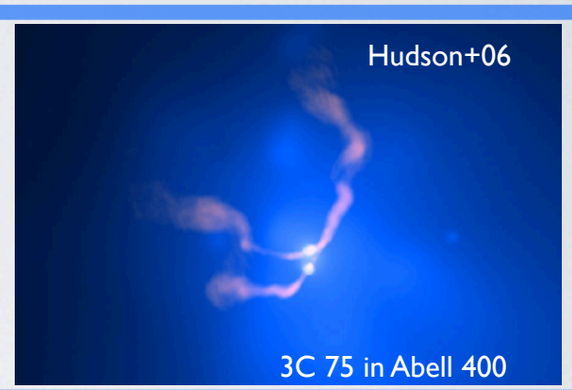
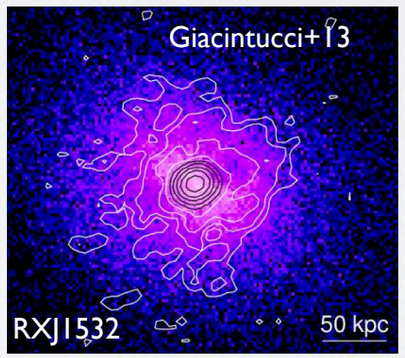
The VLASS could provide a major contribution in three key areas:

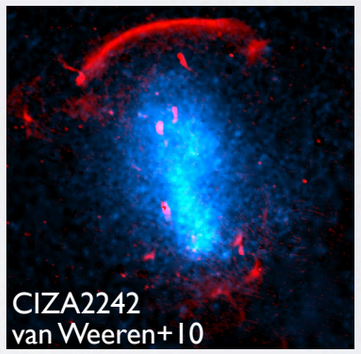
1. The AGN population in galaxy clusters and the impact of AGN feedback on the intra-cluster medium (ICM)
   - Trace ICM weather with NATs and WATs
   - AGN-ICM feedback

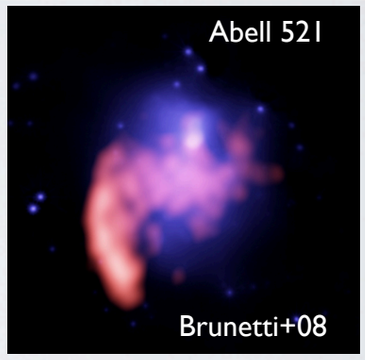




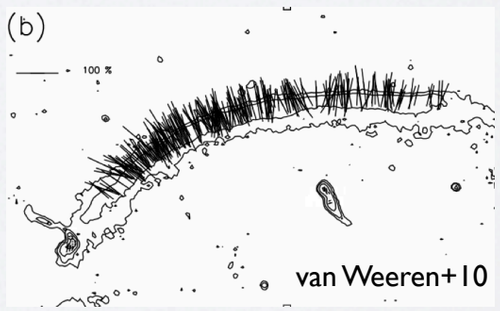
2. The origin and evolution of diffuse cluster radio sources
   - physics of shocks in clusters and filaments, turbulence and particle acceleration
   - probe galaxy cluster growth via mergers

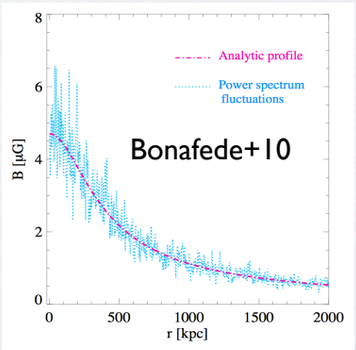


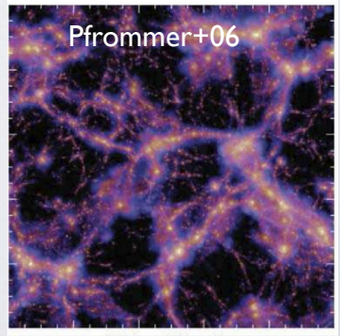




3. The origin and role of magnetic fields in the turbulent environs of the ICM and in large scale structures
   - Determine ICM B-field strength and topology
   - WHIM detection and B-fields







Frequency bands and configurations

Cluster Weather (NAT/WAT samples):

- ICM weather and turbulence
- Detect elusive accretion shocks
- New way to find clusters and groups

- few-arcsec resolution
- wide survey area
- frequencies: S-band (or below)
- polarization

AGN Feedback:

- kinetic energy injection into ICM
- provide timescales via spectral ageing

- few-arcsec resolution
- wide survey area
- frequencies (L/S/C-band)
- polarization

Diffuse cluster emission & particle acceleration:

- ~10^2 new relics, halos and minihalos
- diffuse emission as function of redshift/cluster properties
- integrated spectra (to constrain acceleration physics)

- high surface brightness sensitivity (large angular scales)
- frequencies: S-band (or below)
- polarization

- Polarization and WHIM
  - determine ICM B-field topology/strength
  - detection of WHIM, cosmic web

- polarization
- wide survey area
- frequencies: S/L-band

Spatial scales involved

Feature	Scale (kpc)	$\theta(z = 0.1)$ (")	$\theta(z = 0.2)$ (")	$\theta(z = 0.3)$ (")	$\theta(z = 0.5)$ (")
AGN Jets	10–100	5.4–54	3.0–30	2.2–22	1.6–16
WATs/NATs	10–100	5.4–54	3.0–30	2.2–22	1.6–16
Relics	10–1000	5.4–540	3.0–300	2.2–220	1.6–160
Minihalos	50–300	27–162	15–90	11–66	8.2–49
Halos	1000-1500	540–810	300–450	220–340	160–250
Bridges/Filament	>1500	>810	>450	>340	>250

Configurations & Frequencies

Band (Freq.)	Config.	LAS "	Resolution "	Confusion (μJy)
P (230–470 MHz)	A	155	5.6	–
P (230–470 MHz)	**B**	**515**	**18.5**	**39**
P (230–470 MHz)	C	4150	60	390
L (1–2 GHz)	B	120	4.3	–
L (1–2 GHz)	**C**	**970**	**14**	**10.72**
L (1–2 GHz)	D	970	46	107.2
S (2–4 GHz)	B	58	2.1	–
S (2–4 GHz)	C	490	7.0	1.37
S (2–4 GHz)	**D**	**490**	**23**	**13.7**
C (4–8 GHz)	B	29	1.0	–
C (4–8 GHz)	C	240	3.5	0.21
C (4–8 GHz)	D	240	12	2.11