

A MeerKAT HI survey of Fornax

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Outline

- Scientific background
- Aim of the survey
- Design of the survey



Galaxy evolution and large-scale structure



Galaxies form over a large range of overdensity on the cosmic web The correspondingly large range of physical conditions generates a coupling between galaxy evolution and the formation of large-scale structure (observationally, morphology-density relation)





Cluster formation

$M=10^{15} M_{SUN}$



IO Mpc

Cluster assembly is an anisotropic process



Tonnesen, Bryan & van Gorkom 2007



Massive stripping of cold gas occurs

Cold gas in clusters (1)

Much of what we know comes from Virgo ($M=5\times10^{14} M_{SUN}$) -a variety of gas-stripping mechanisms, with unclear balance as a function of distance from the cluster centre -very gas-poor early-type galaxies (unlike in groups/field) How does all this depend on environment density?







Cold gas in clusters (2)



Infalling galaxies are clustered in space and velocity



HI survey of Fornax

Why Fornax - low X-ray luminosity (M = 7×10¹³ M_{SUN}) - it's growing now - gas-rich outskirts - nearby (d=20 Mpc)

Why MeerKAT
ideally located (δ=-35 deg)
focus on relatively small field (11 deg²)
deep observation





Science goals

- connection between galaxies falling in the cluster and the neutral cosmic web feeding cluster growth
- physics of the gas-stripping process, separating between tidal and ICM-driven stripping
- gas content of early-type galaxies in clusters down to unprecedented sensitivity
- gas content of dwarf galaxies and transformation from late- to early type
- connection to cosmological and high-resolution simulations tailored to Fornax



Survey design

- 49 pointings on hexagonal grid spacing $FWHM/\sqrt{3}$
- 50 h / pointing (giving σ of 100 h integration)
- total: 2,450 hours, 11 deg² at $\sigma \leq 1.1 \times \sigma_{min}$
- n_{HI}(3σ)=1×10¹⁸ cm⁻² (90 arcsec, 30 km/s) 5×10¹⁸ cm⁻² (30 arcsec, 15 km/s) 4×10¹⁹ cm⁻² (10 arcsec, 10 km/s)
- M_{HI}(3σ)~5×10⁵ M_{SUN}
- ~10 times deeper than WALLABY

Observable for 6 months per year for >5 h night-time: 10x5 h per pointing I st year: full field 5 h per pointing 2nd year: full depth cluster centre 3rd year: full depth infalling group centre



