Hot gas in Spiral Cluster Galaxies

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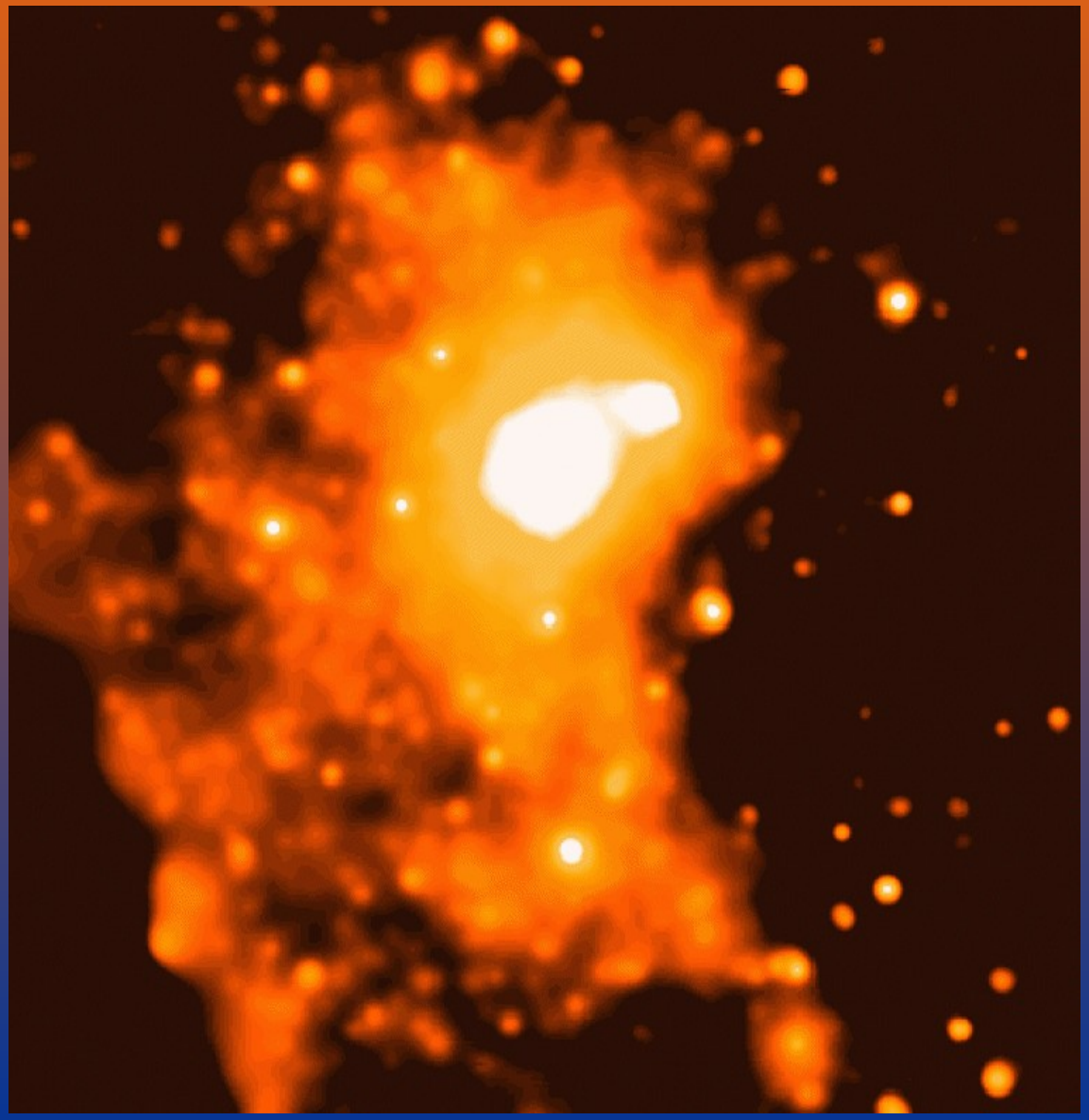
Plan

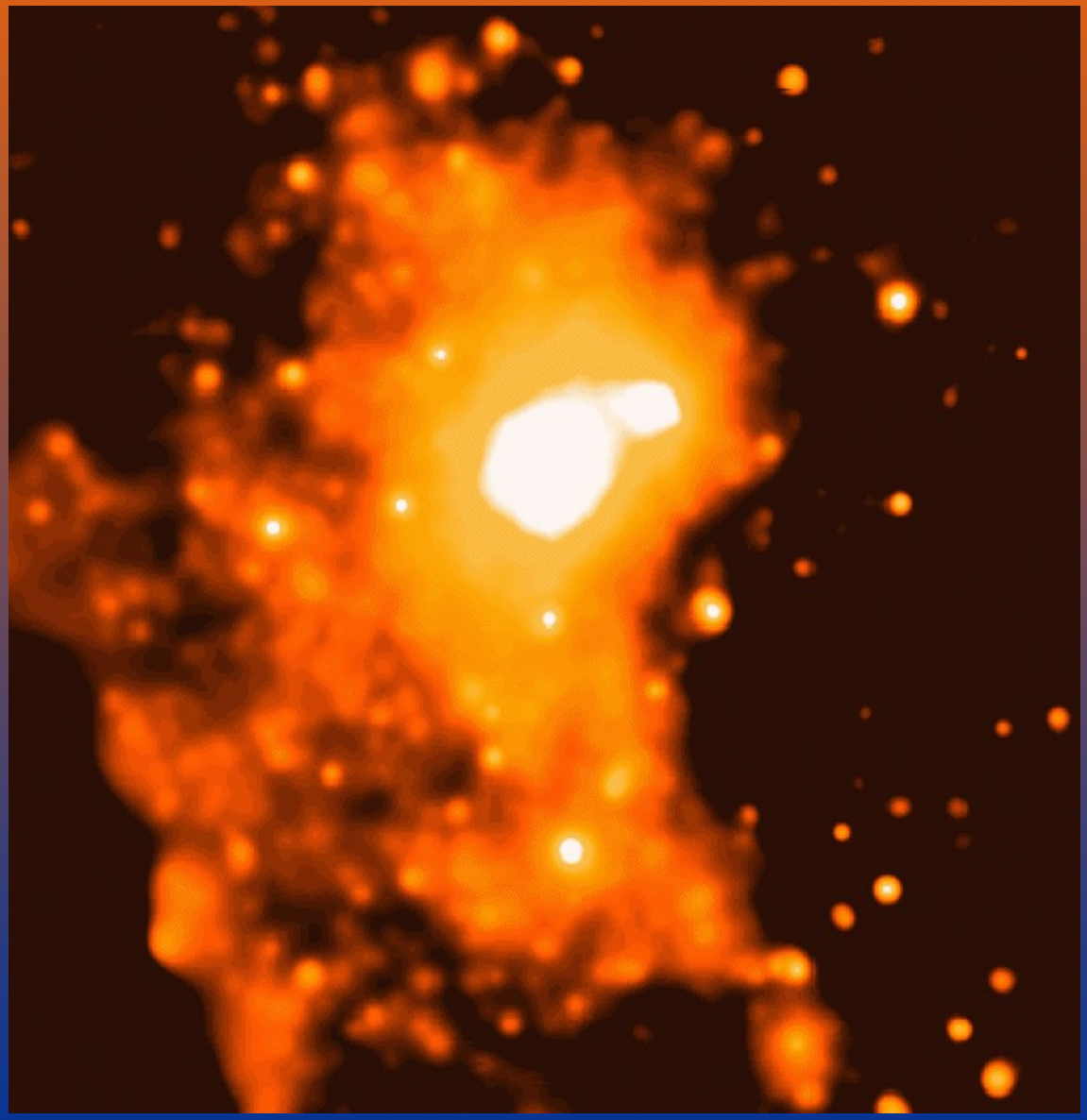
- X-ray extended emission as a very useful tool to study cluster galaxies
- The galaxies
- Results
- What we learn?
- Future aims

X-ray studies



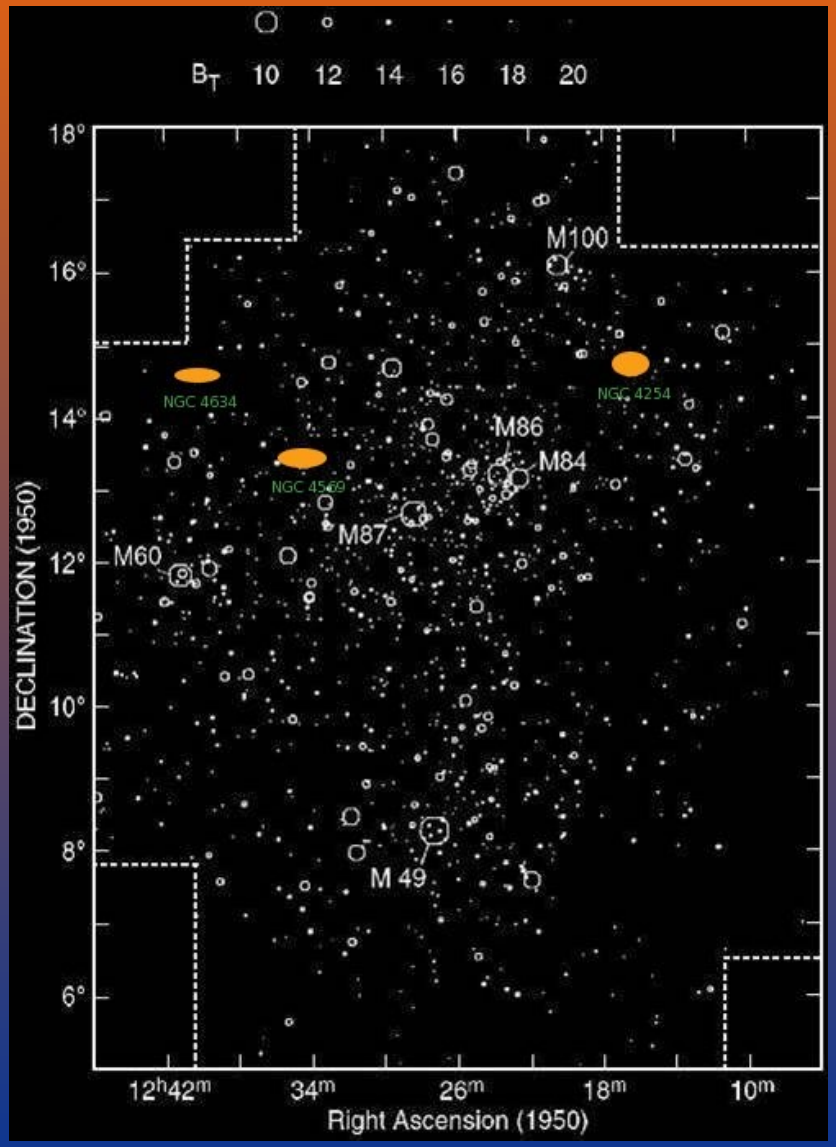
- Soft X-ray emission traces hot gas → extended emission helps to examine past or present perturbations of the hot ICM, via spatial and spectral analysis

X-ray studies



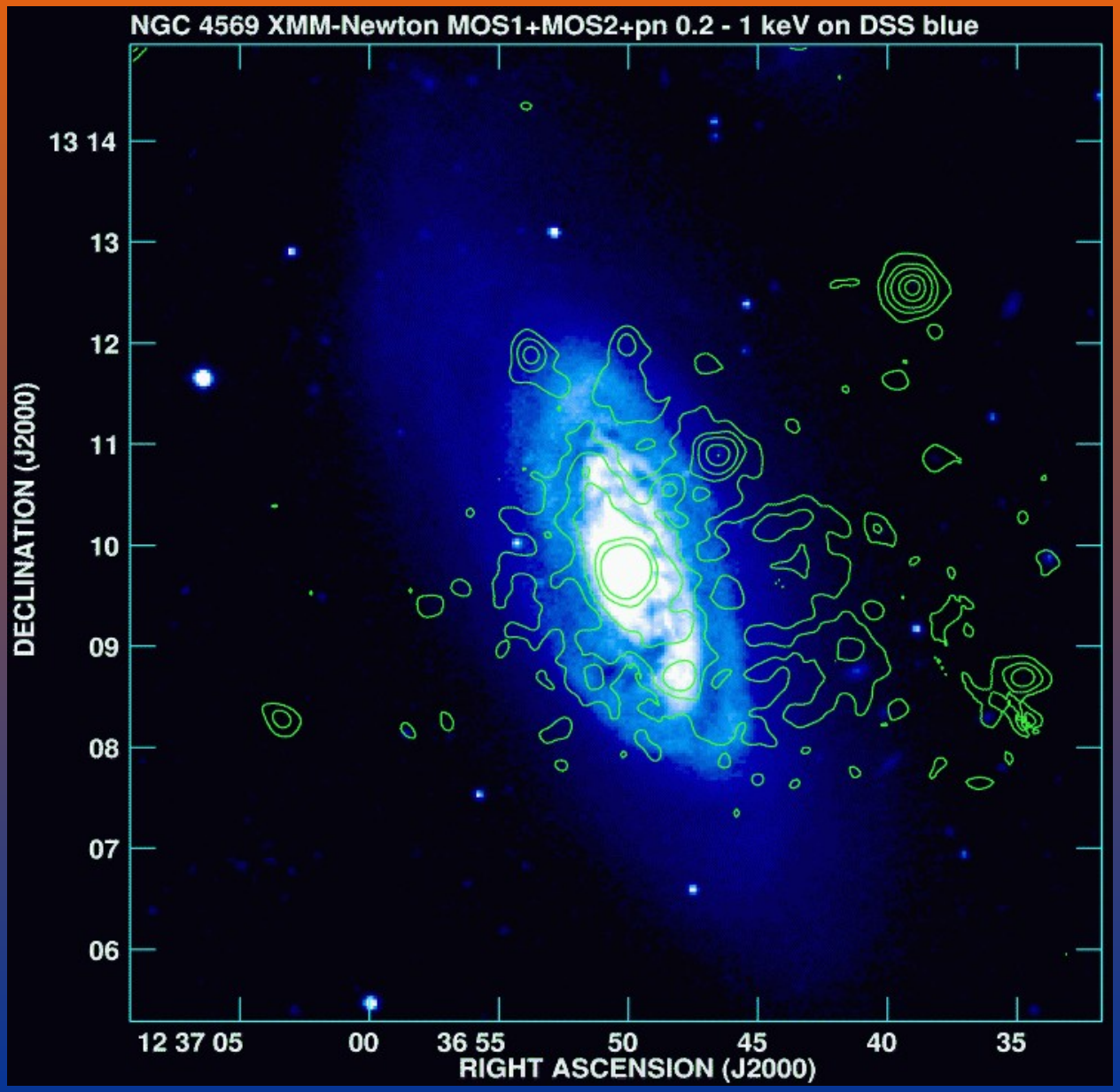
- Combined with radio polarimetry X-ray studies may provide clues to a specific evolutionary path of a galaxy in a cluster

The galaxies



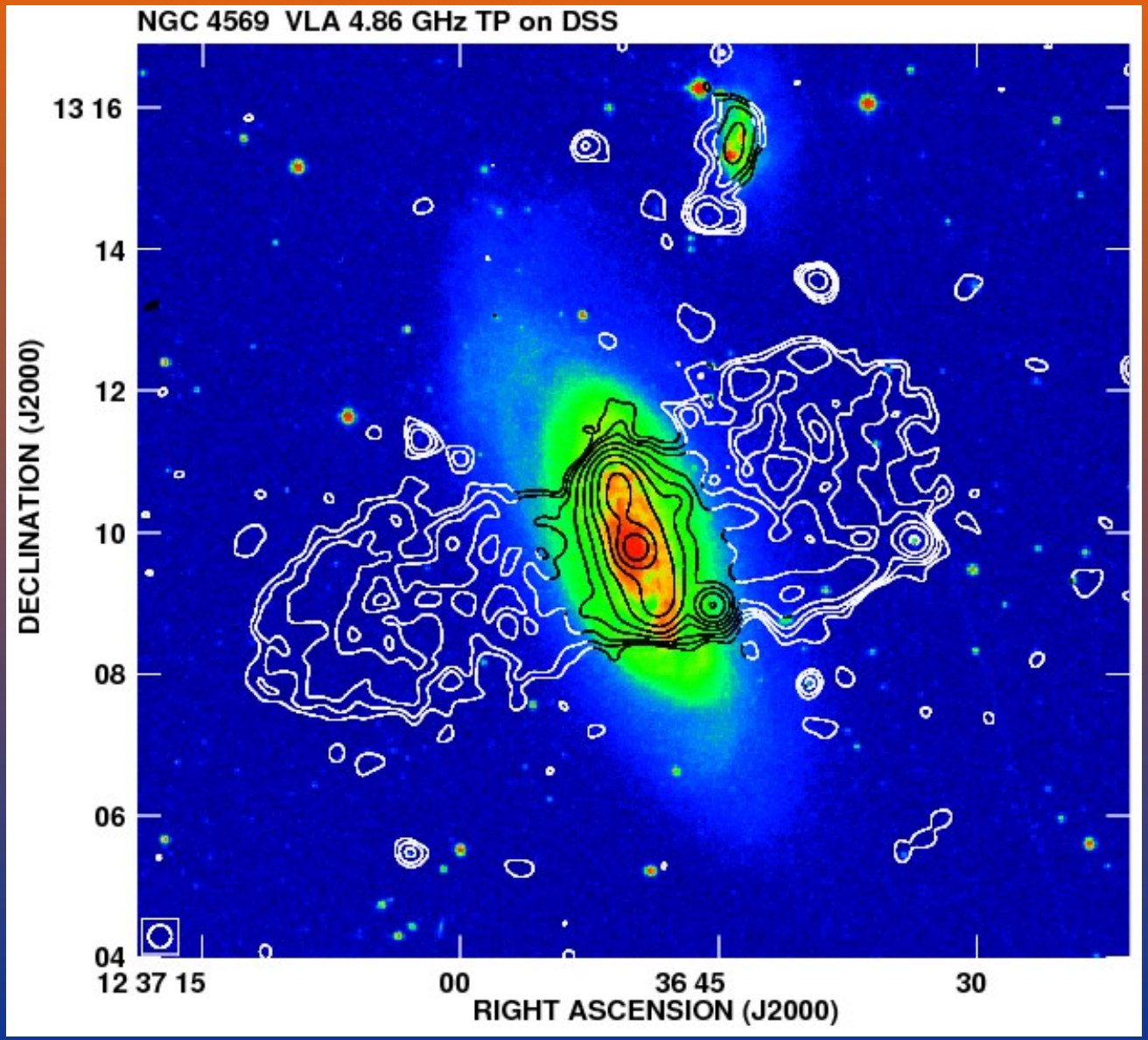
- In different parts of the cluster
- For NGC 4254 and NGC 4569 interesting radio data (for NGC 4634 coming soon!)
- Good candidates to study in X-rays

Results – NGC 4569



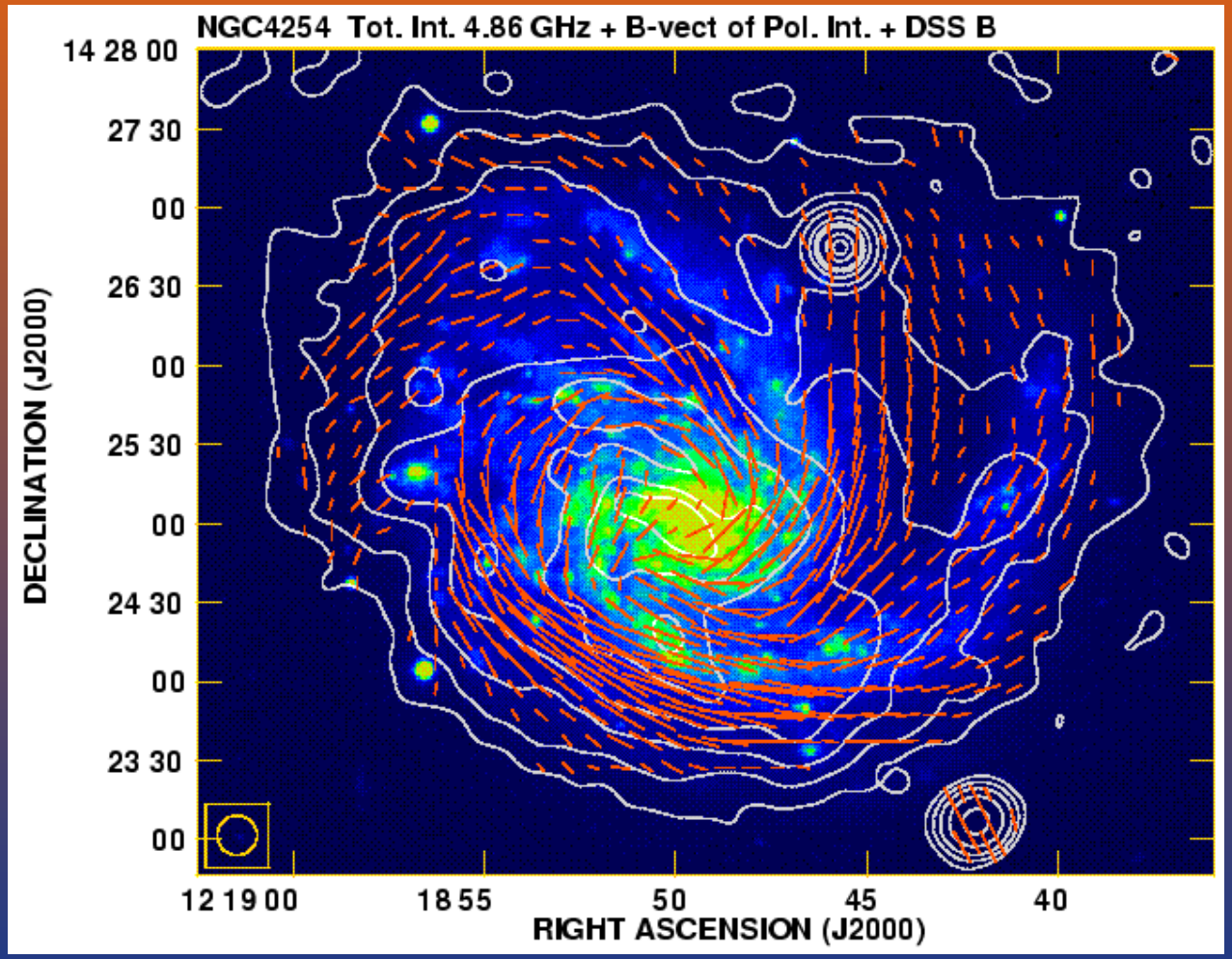
- NGC 4569 (M90) with giant radio lobes in an otherwise normal spiral
- Extended X-ray emission suggestive for hot gas outflows
- Probable nuclear starburst in the past
- Chyzy et al. 2006, A&A, 447, 465 and 2008, A&A, submitted

Results – NGC 4569



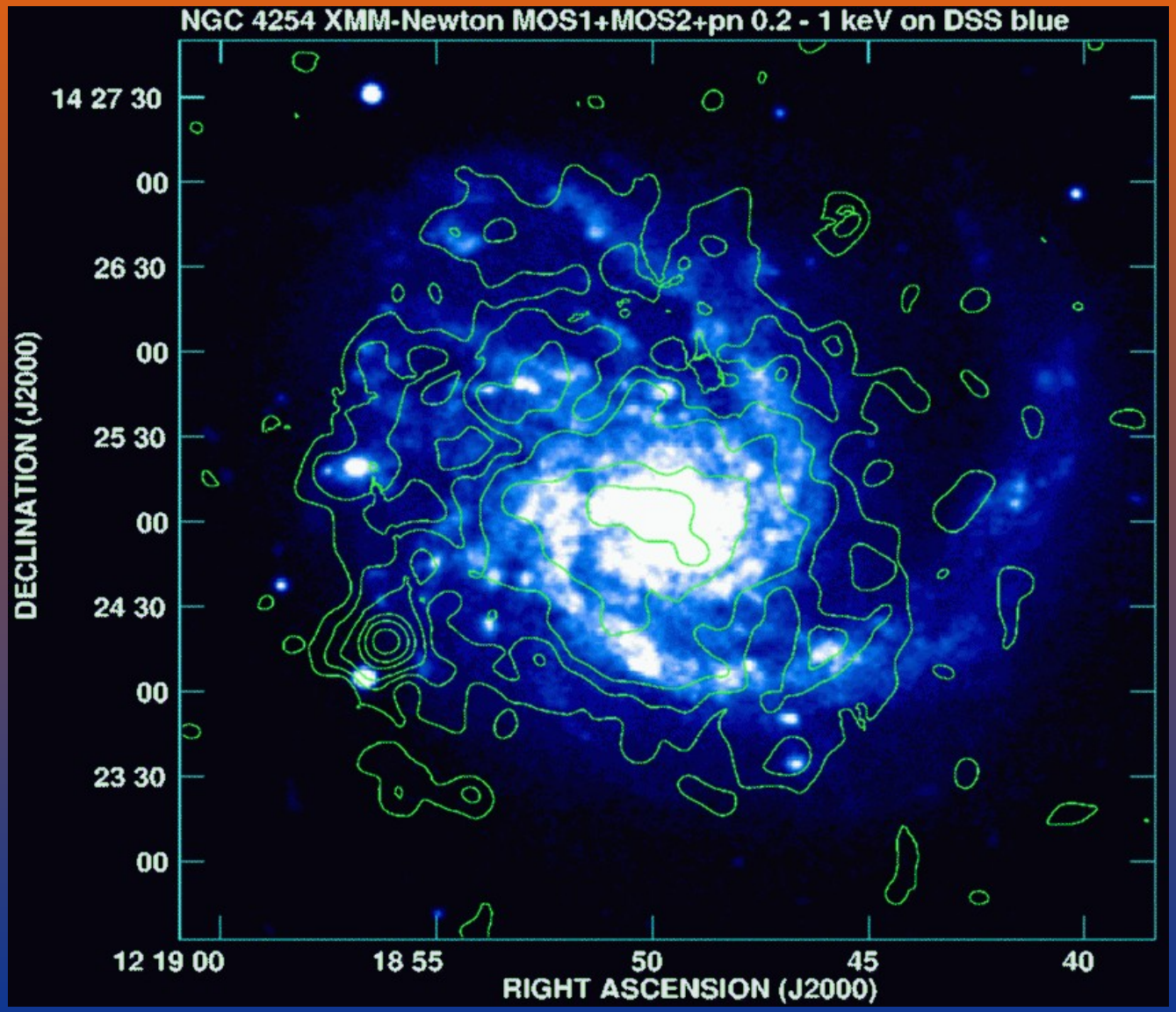
- The polarized spur is much hotter than the lobes
- kT_{eff}(spur) = 0.42 keV (-0.11, 0.24)
- kT_{eff}(lobe) = 0.18 keV (-0.03, 0.02)
- Hot component twice as hot in the western lobe than eastern

Results – NGC 4254



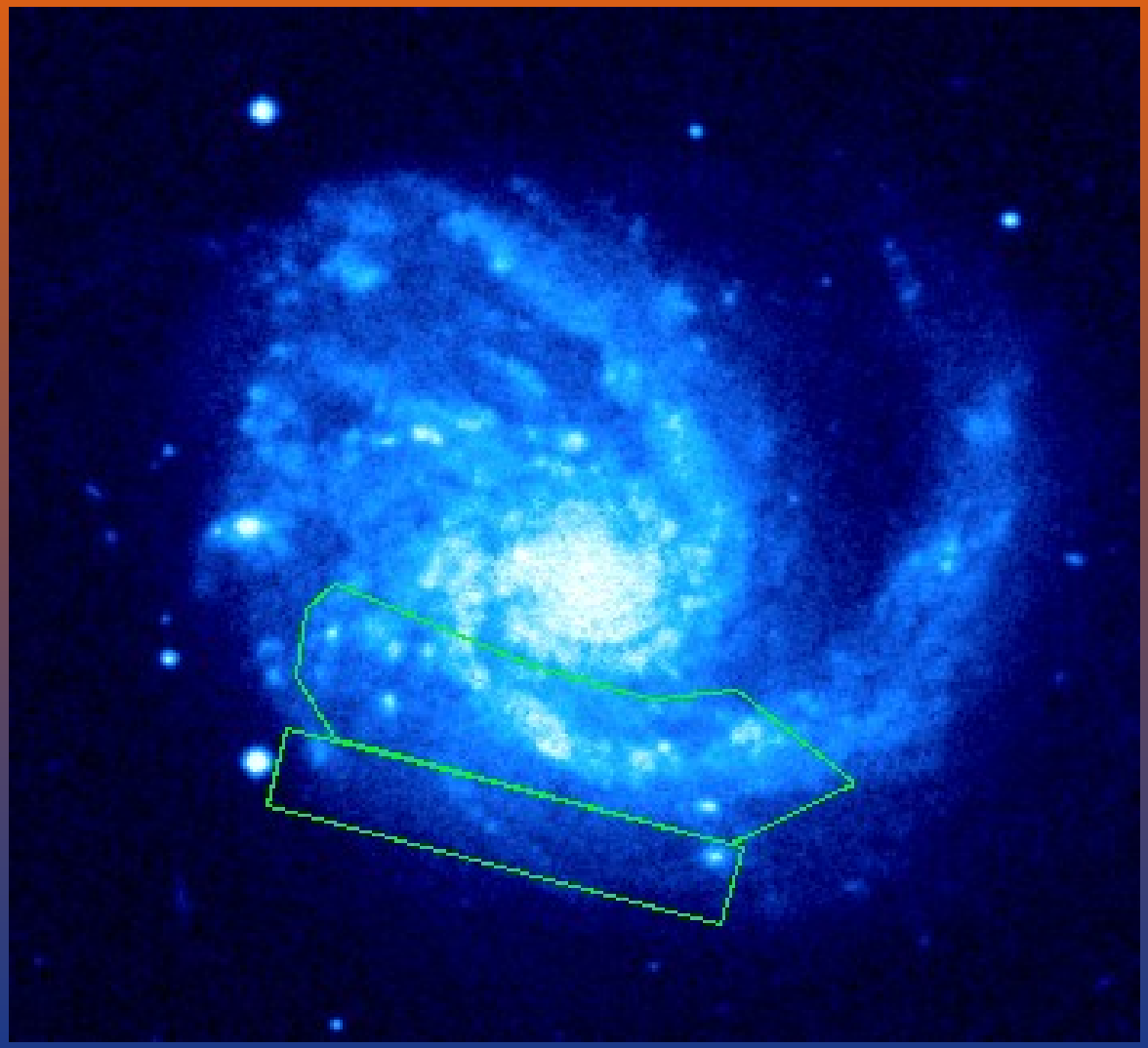
- Perturbed galaxy
- What is the origin of the polarized ridge?
- Tidal or ram pressure?
- Chyzy, 2008, A&A, 482, 755

Results – NGC 4254



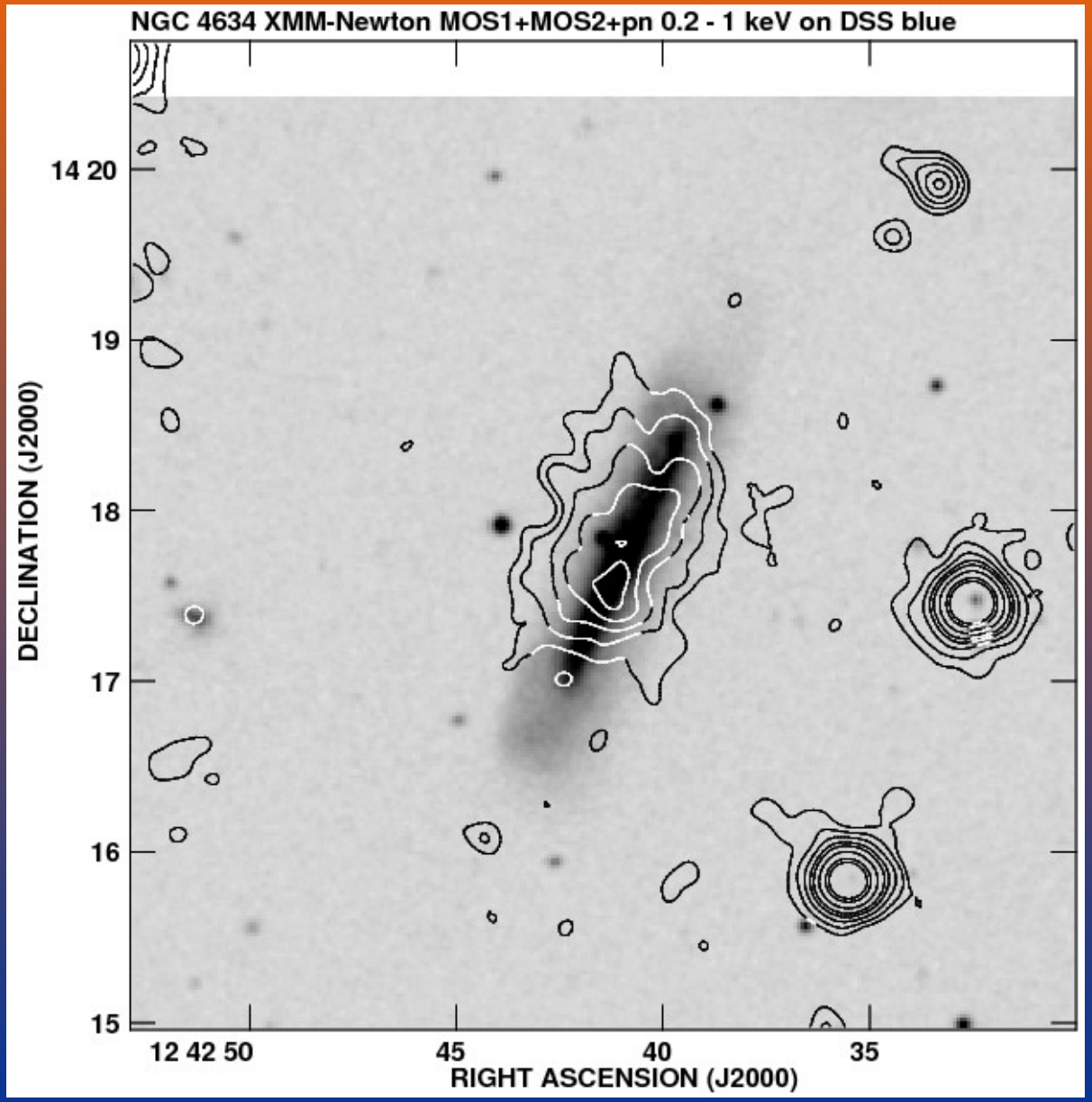
- Extended X-ray emission
- Any hints in the spectral analysis?

Results – NGC 4254



- Most likely tidal!
- In the ridge T_{eff} = 0.37 keV (-0.06, 0.08) what is similar to other arms
- Outer region has even lower temperature of only T = 0.14 keV (-0.03, 0.05)

Results – NGC 4634



- NGC 4634 - an edge-on galaxy with an extended X-ray halo
- Observed by Tuellman et al. (2006) – 33 ks
- Our observations extend this by 69 ks
- spectral analysis under construction

What we learn?

- Examining with X-ray compression regions visible in radio polarized intensity can help to distinguish between ram pressure and tidal scenarios
- Radio outflows seem to be accompanied (to some extent) by X-ray ones
- X-ray extended emission is extremely useful in determining evolutionary path of a cluster galaxy

Future aims

- Obtain X-ray observations of as many as possible of our target galaxies; search for spatial & spectral signatures of interactions in the hot gas

- Compare the results with the radio polarimetry data for better understanding of the past and the future of cluster galaxies