

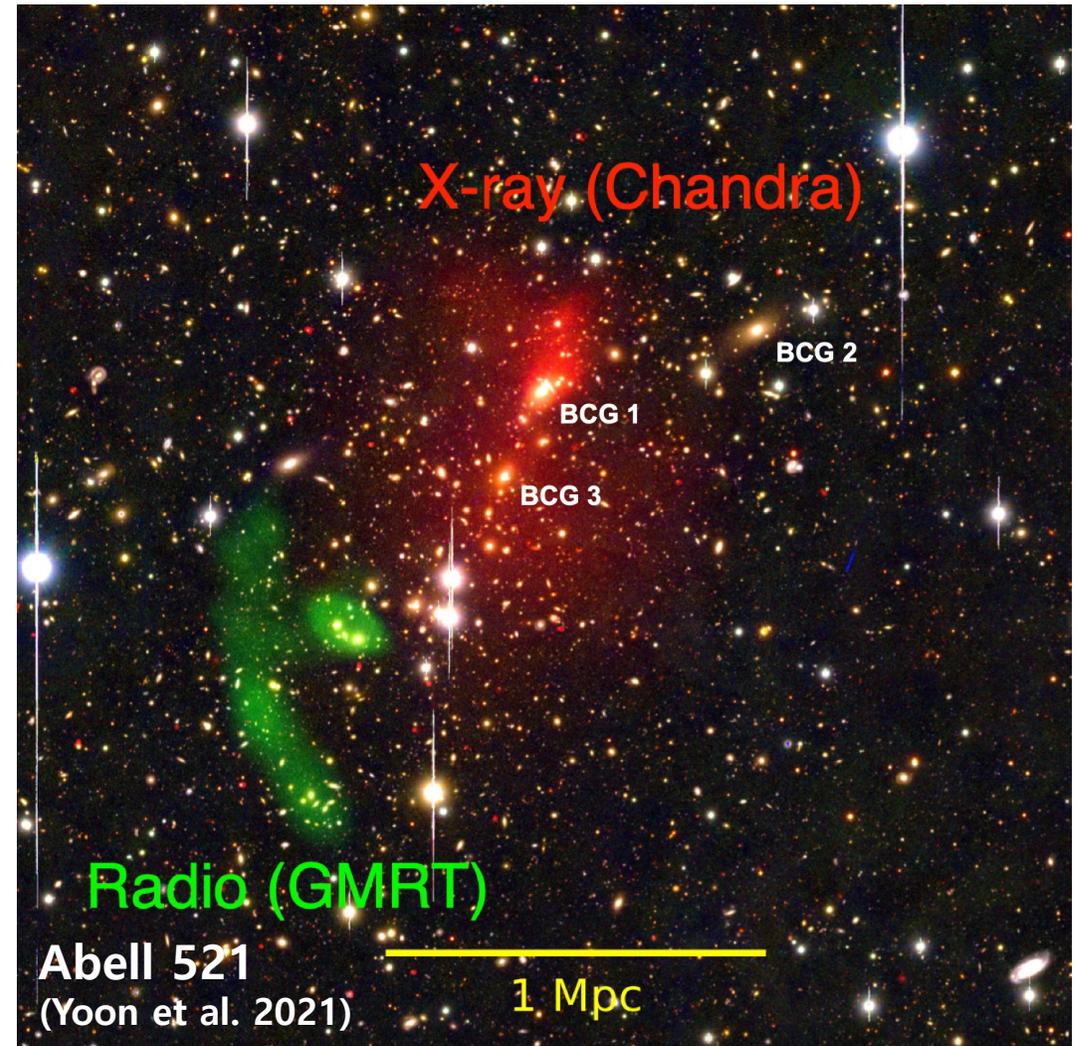
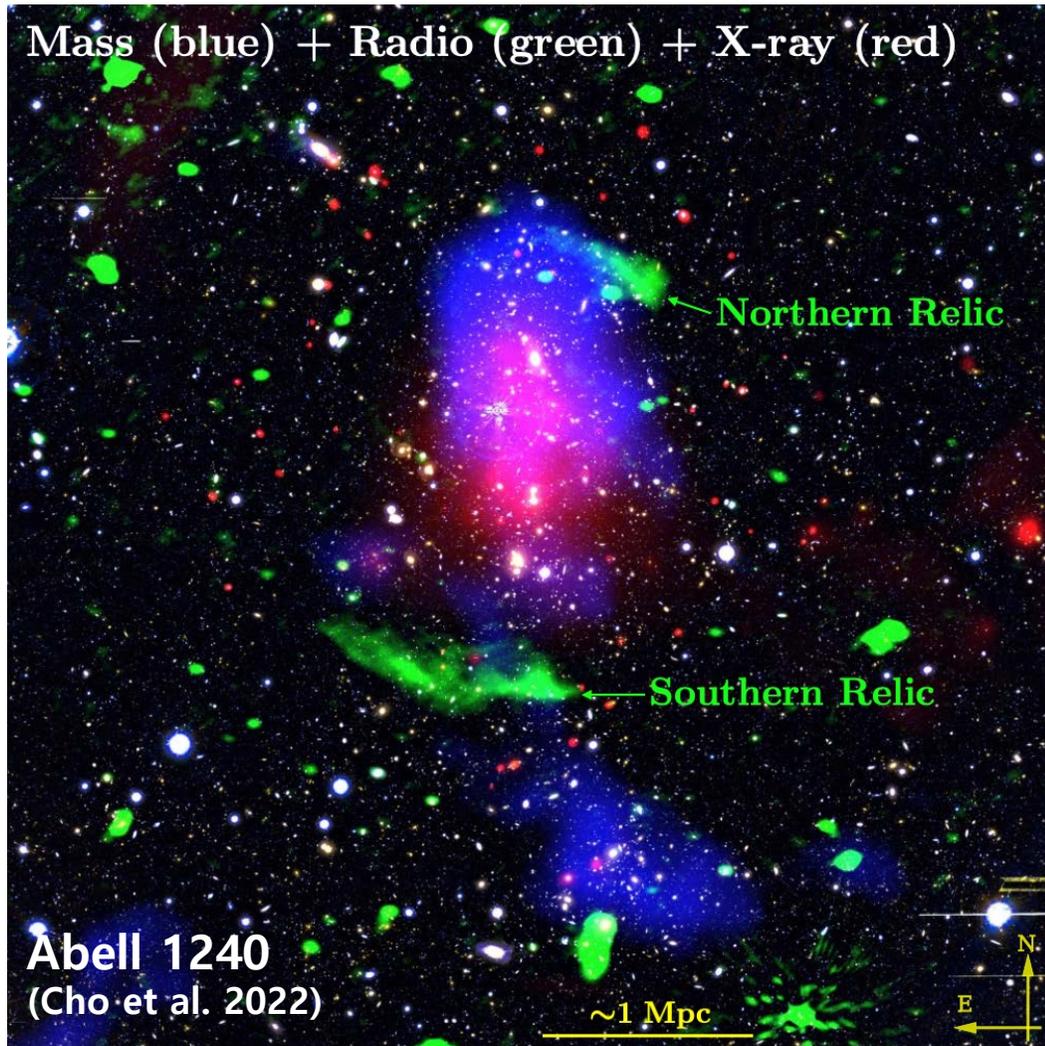


6th ICM theory & computation workshop

Redistribution of AGN jet tails in merging cluster: Example of Abell 514

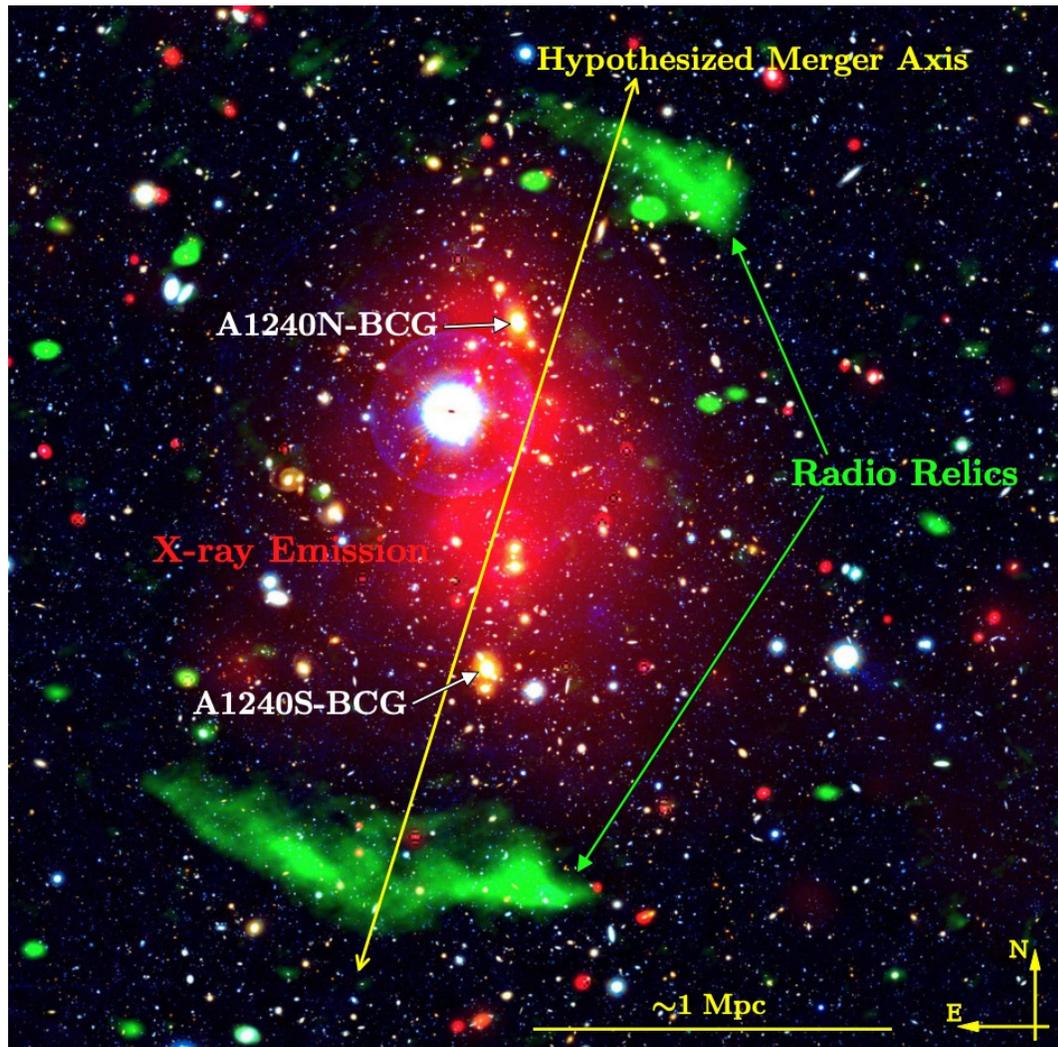
Wonki Lee (Yonsei/CfA)

With John ZuHone (CfA), M. James Jee (Yonsei)



Merging clusters

Multi-wavelength
Observations (WL, X-ray, Radio)

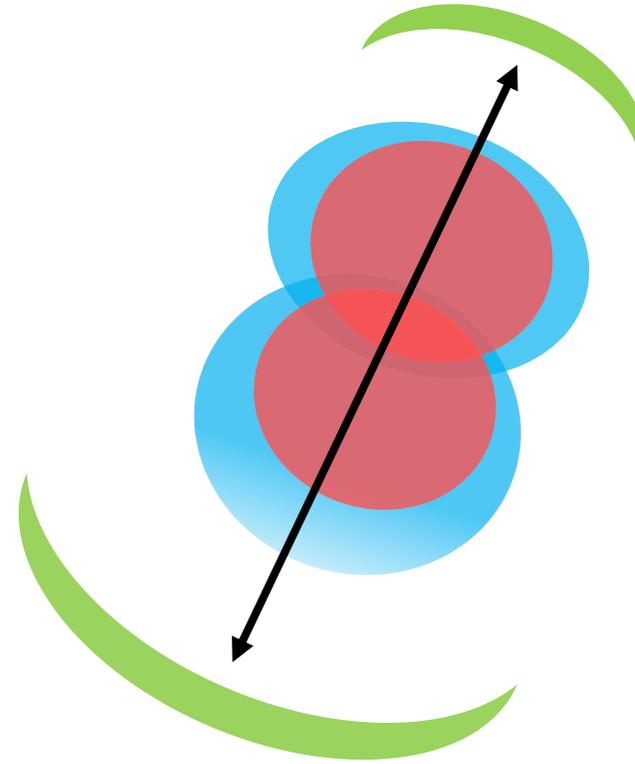
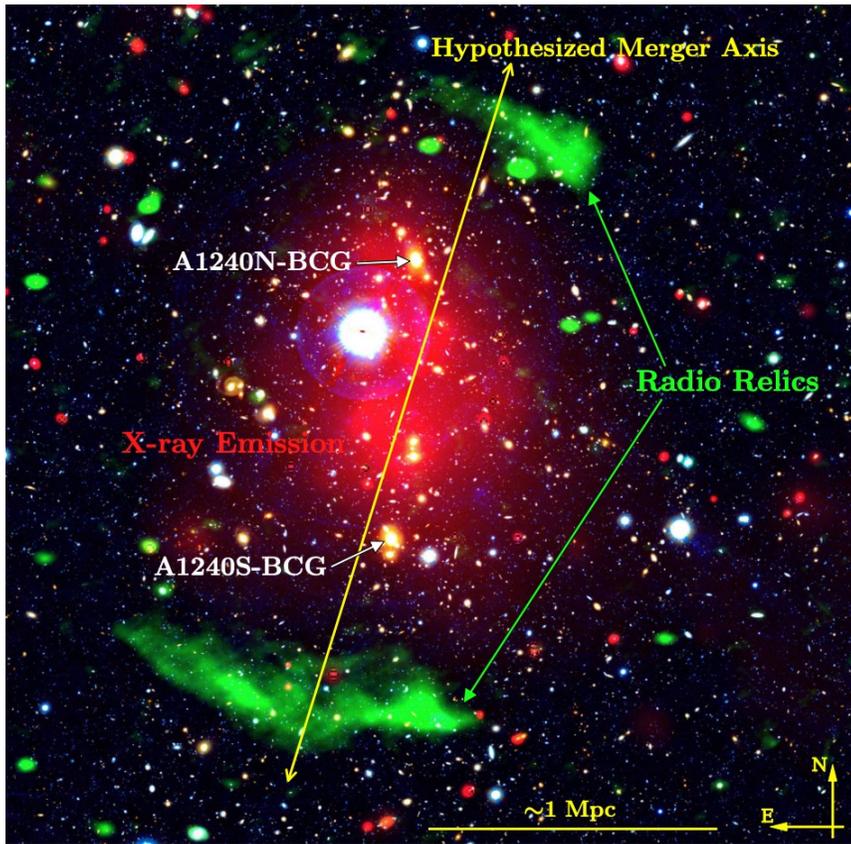


Radio relics

- Outskirt
 - Tangential elongation
 - Aligned B-field
- = Merger shocks

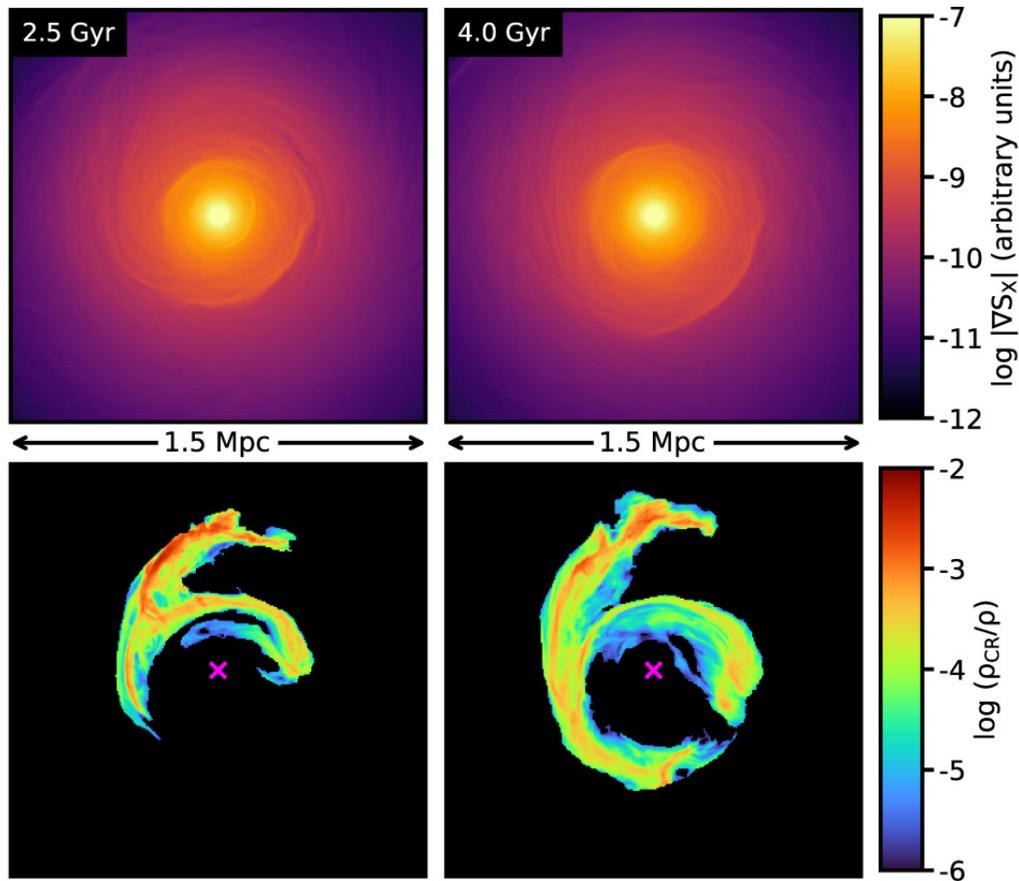
Radio relics

Cluster-scale
Diffuse radio emission



Radio relics & Cluster mergers

- **Mergers→Relic** : Testbed for plasma acceleration model
- **Relic→Mergers** : Tracer of merger shock, reconstruction of merger history

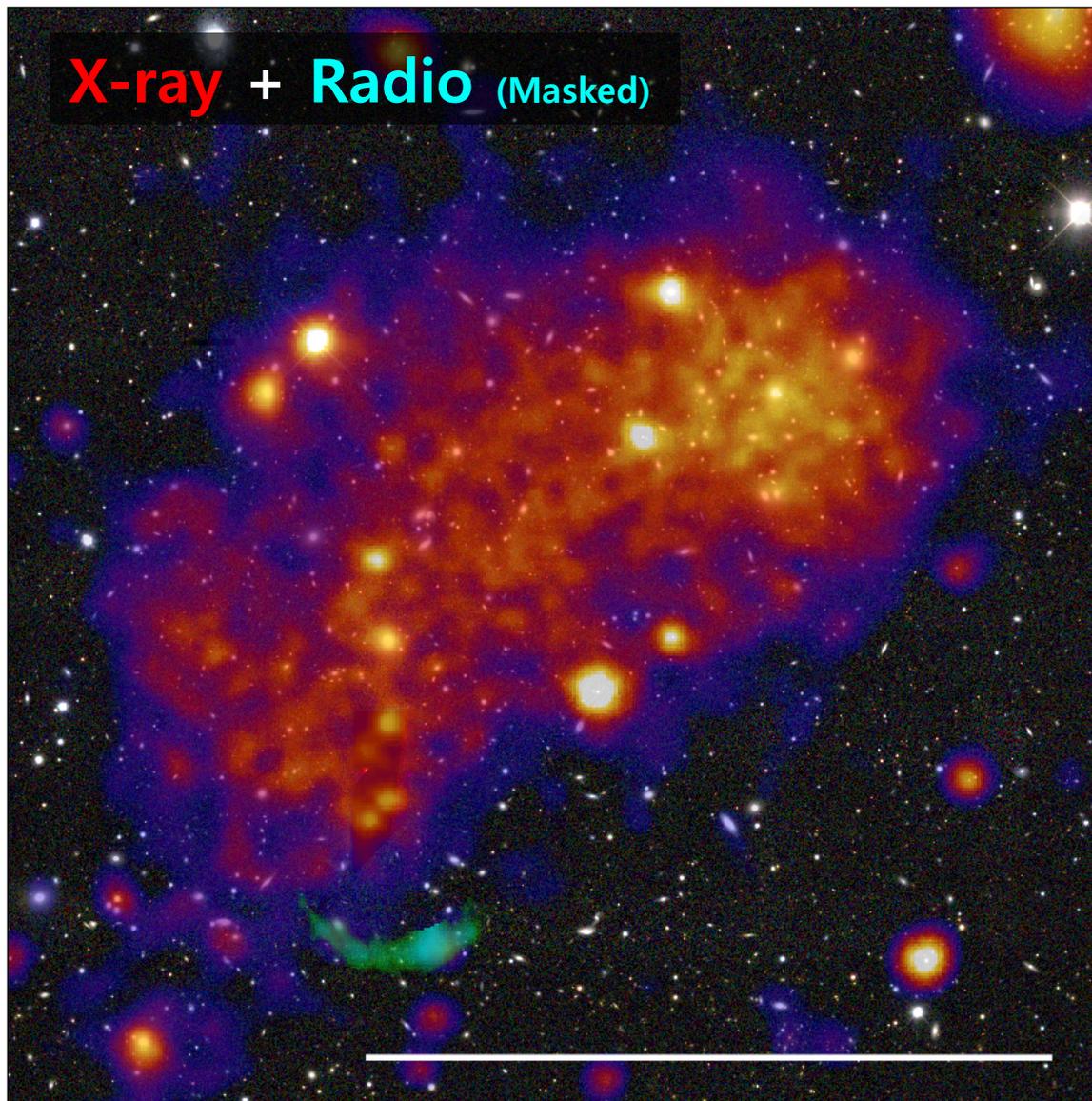


John's Monday talk, ZuHone et al. 2021

- ✓ Outskirt
- ✓ Tangential elongation
- ✓ Aligned B-field

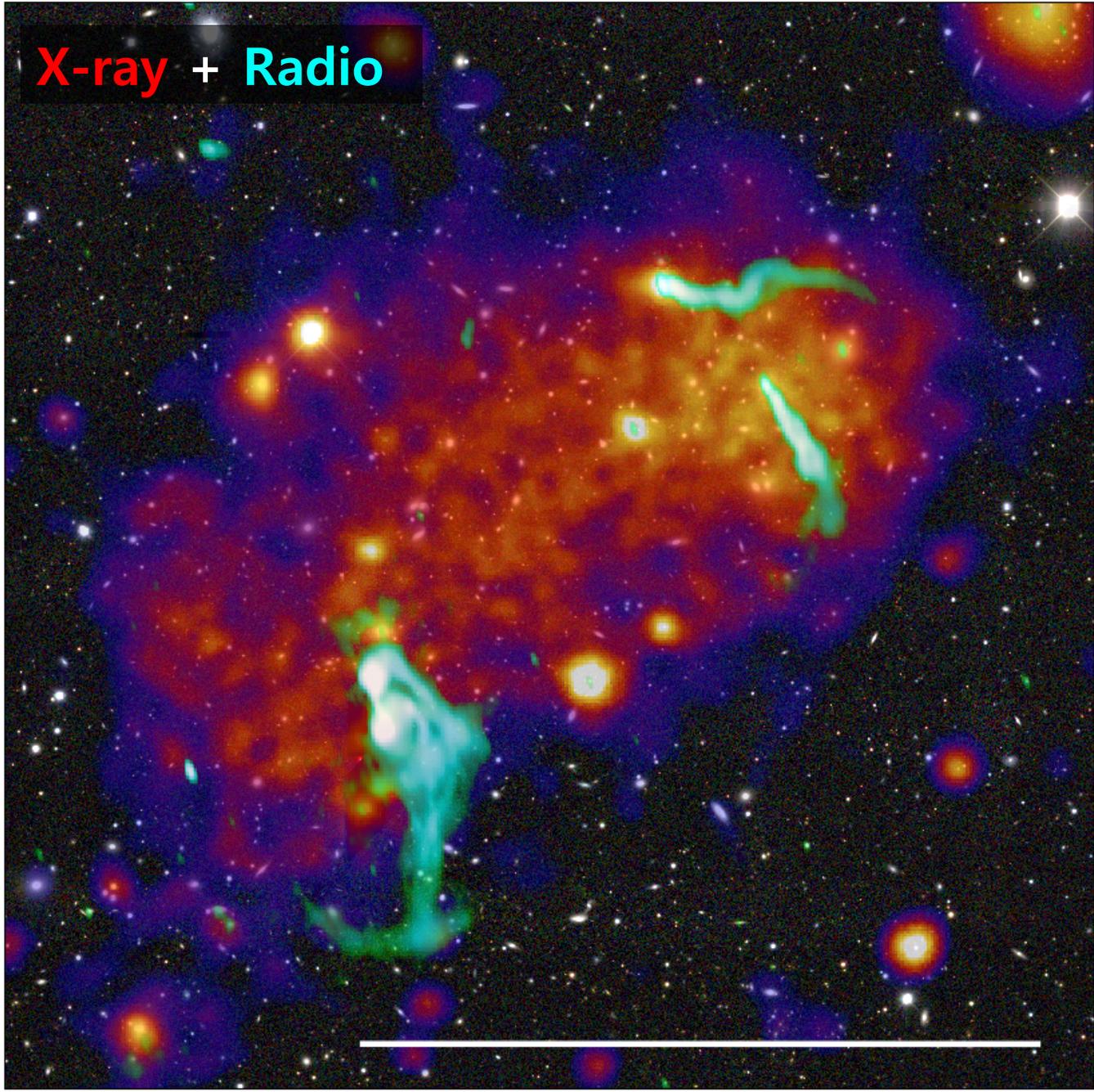
Redistributed AGN jets?

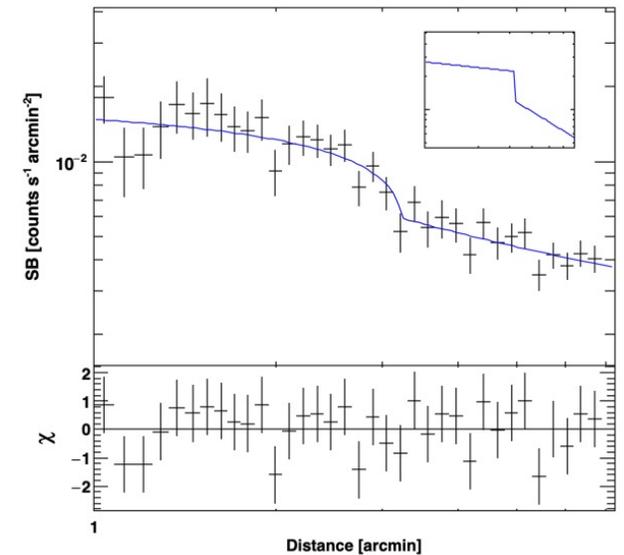
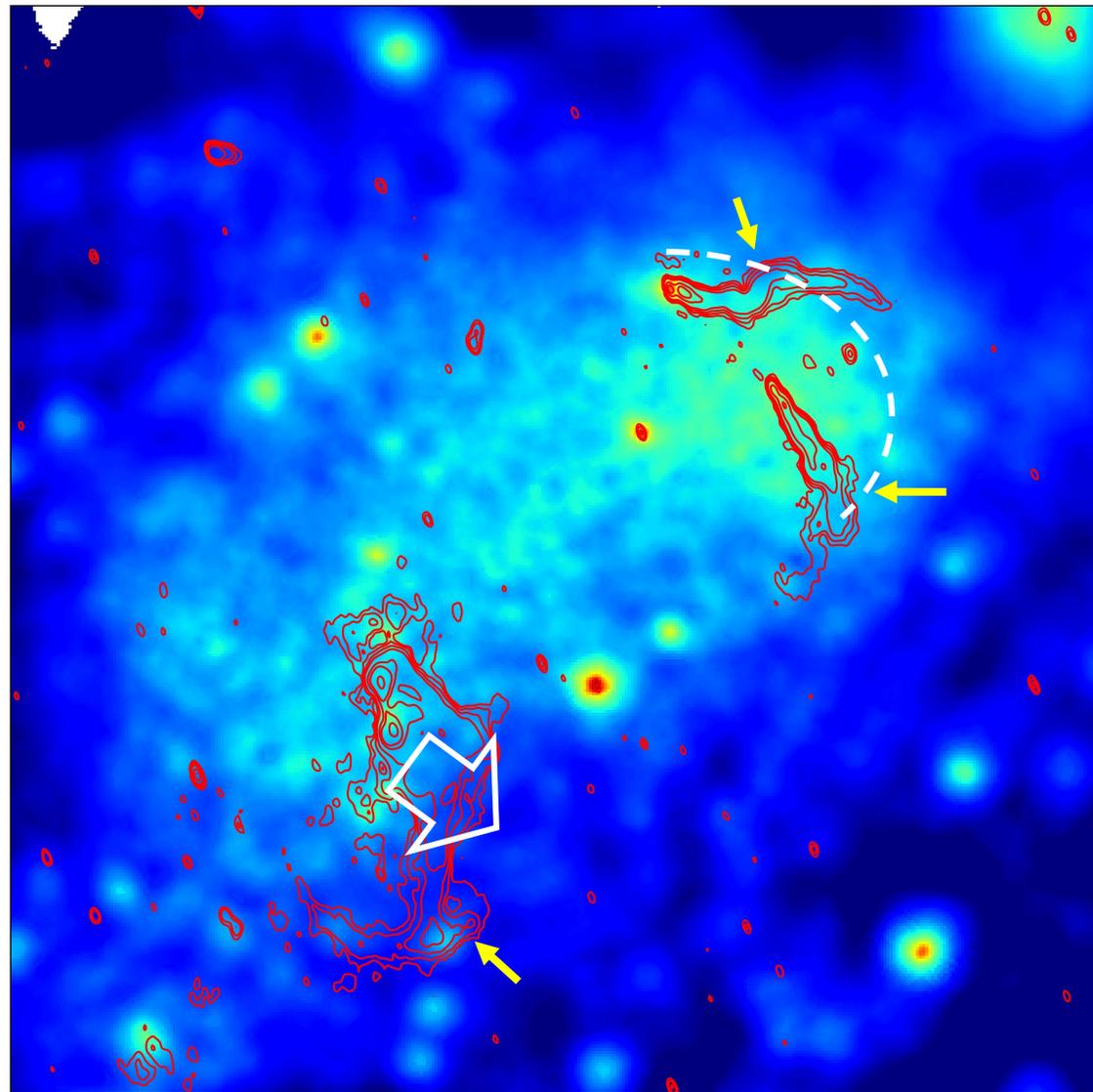
- Redistribution of AGN jet tails by ICM bulk motions
- Is there any observed examples?



Relic or AGN

X-ray + Radio





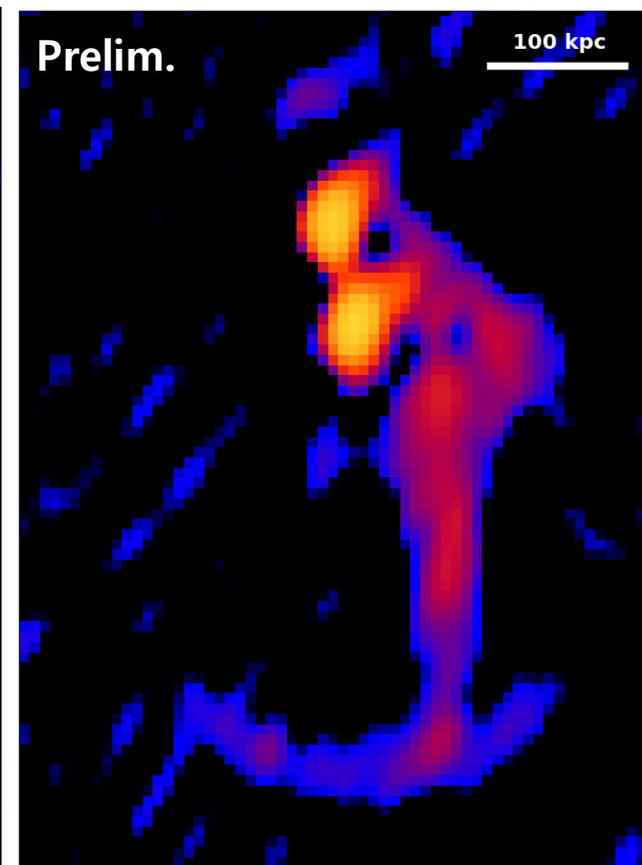
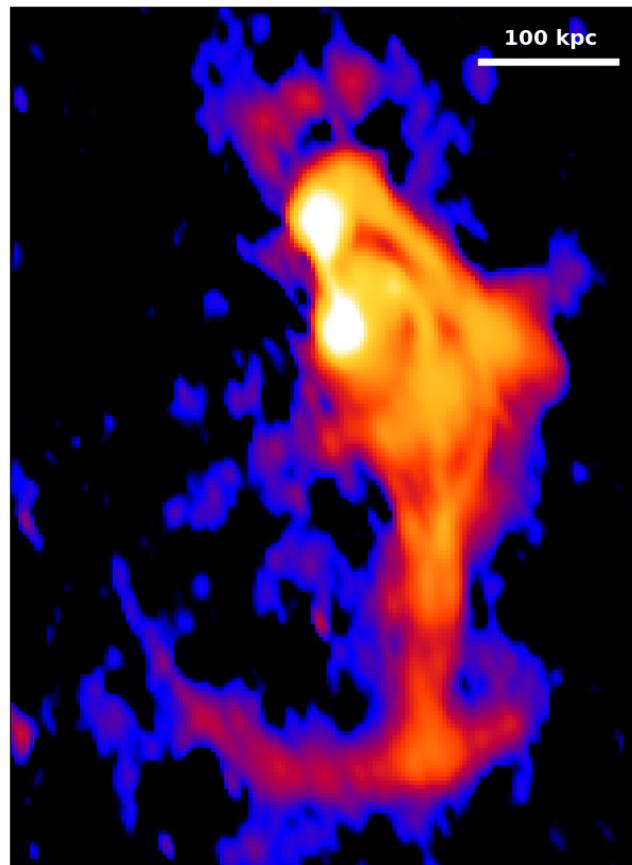
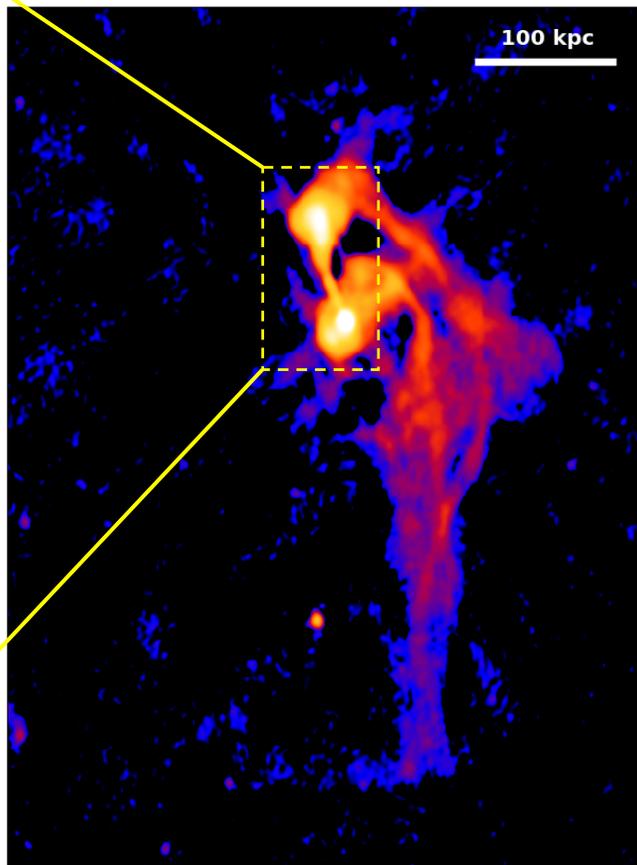
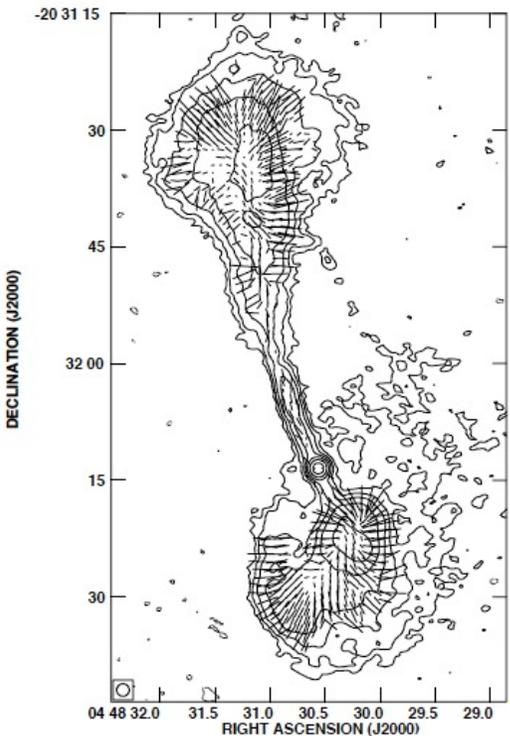
Abell 514 Merging cluster ($z=0.07$)
+ Bent AGN jet tails

Ref. Govoni et al. 2001

uGMRT 650 MHz

uGMRT 400 MHz

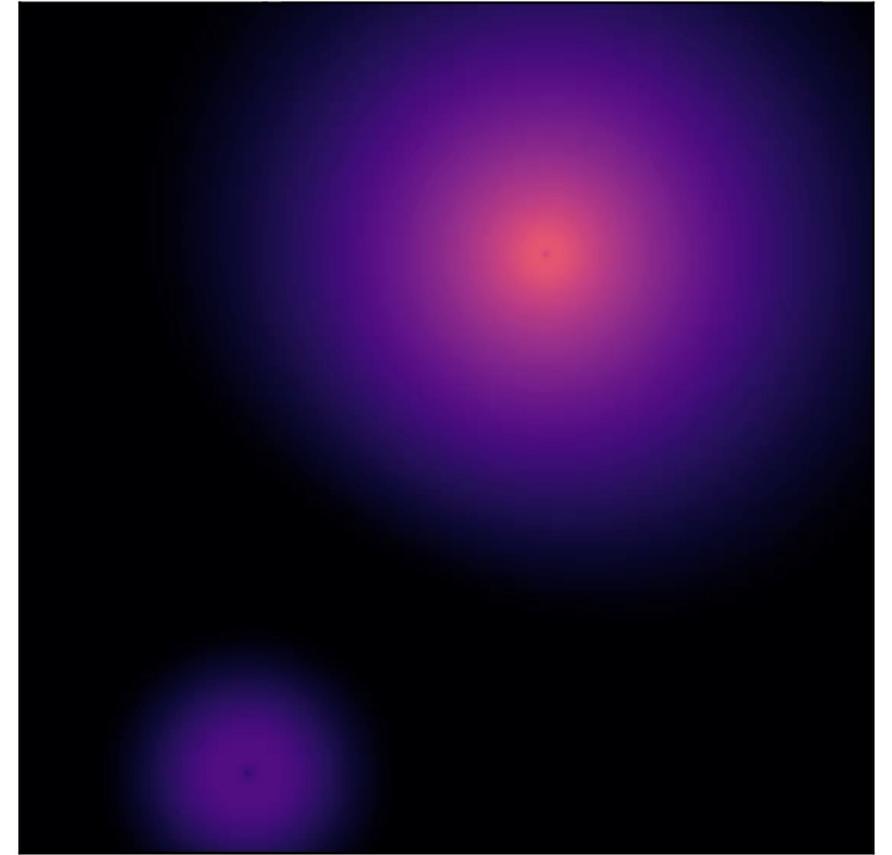
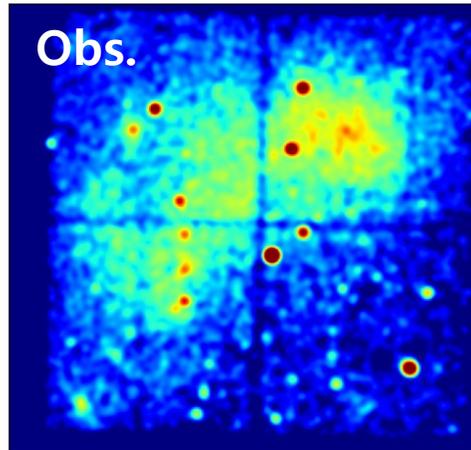
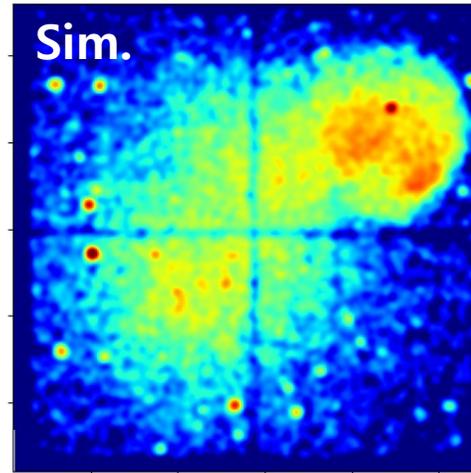
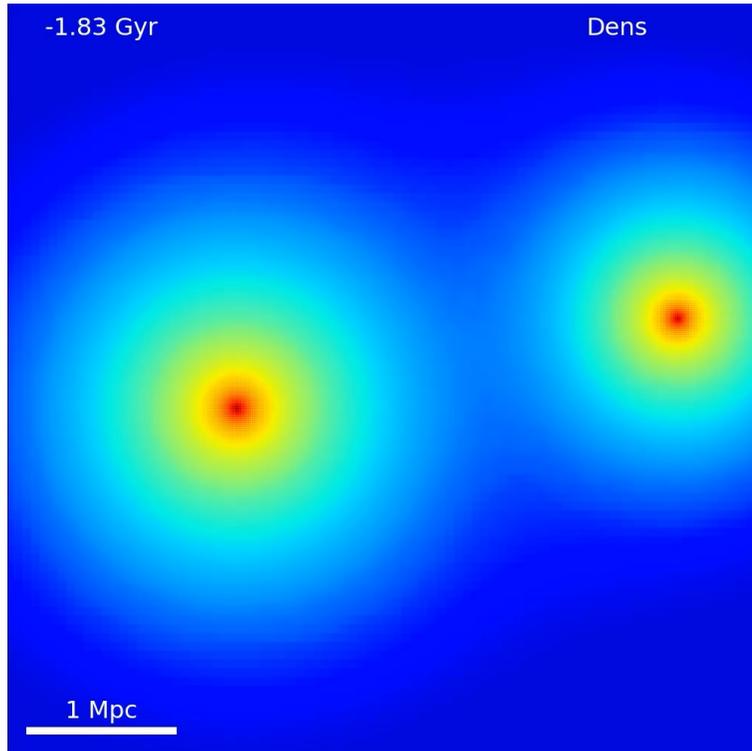
uGMRT 180 MHz



Southern jet

FR II galaxy
+ Bridge + Spur

- Bridge (north-south): Two jet tails, largest linear size ~ 400 kpc, Width ~ 10 kpc
- Spur (west-east): Largest linear size ~ 250 kpc, Only visible at low frequency



Simulation

Idealized collision with a CR cloud

- Reconstruct merger history: Evaluation with X-ray morphology, Collision ~ 2 & $1 \times 10^{14} M_{\odot}$
- Single injection of CR cloud: Tangential alignment, Possibly aligned with merger shock

Summary

Observation

- Discovery of three bent AGN jet tails in Abell 514
- Hint of X-ray discontinuities when the AGN jet tail bent
- Tangential redistribution of AGN jet at periphery

Simulations

- Expected mass of colliders $\sim 2 \text{ \& } 1 \times 10^{14} M_{\odot}$
- Tangential redistribution of CR from point source
- Will be accelerated by merger shocks during the secondary passage
- How many similar cases will there be?

