

Diffuse radio emission in the Corona Borealis supercluster field

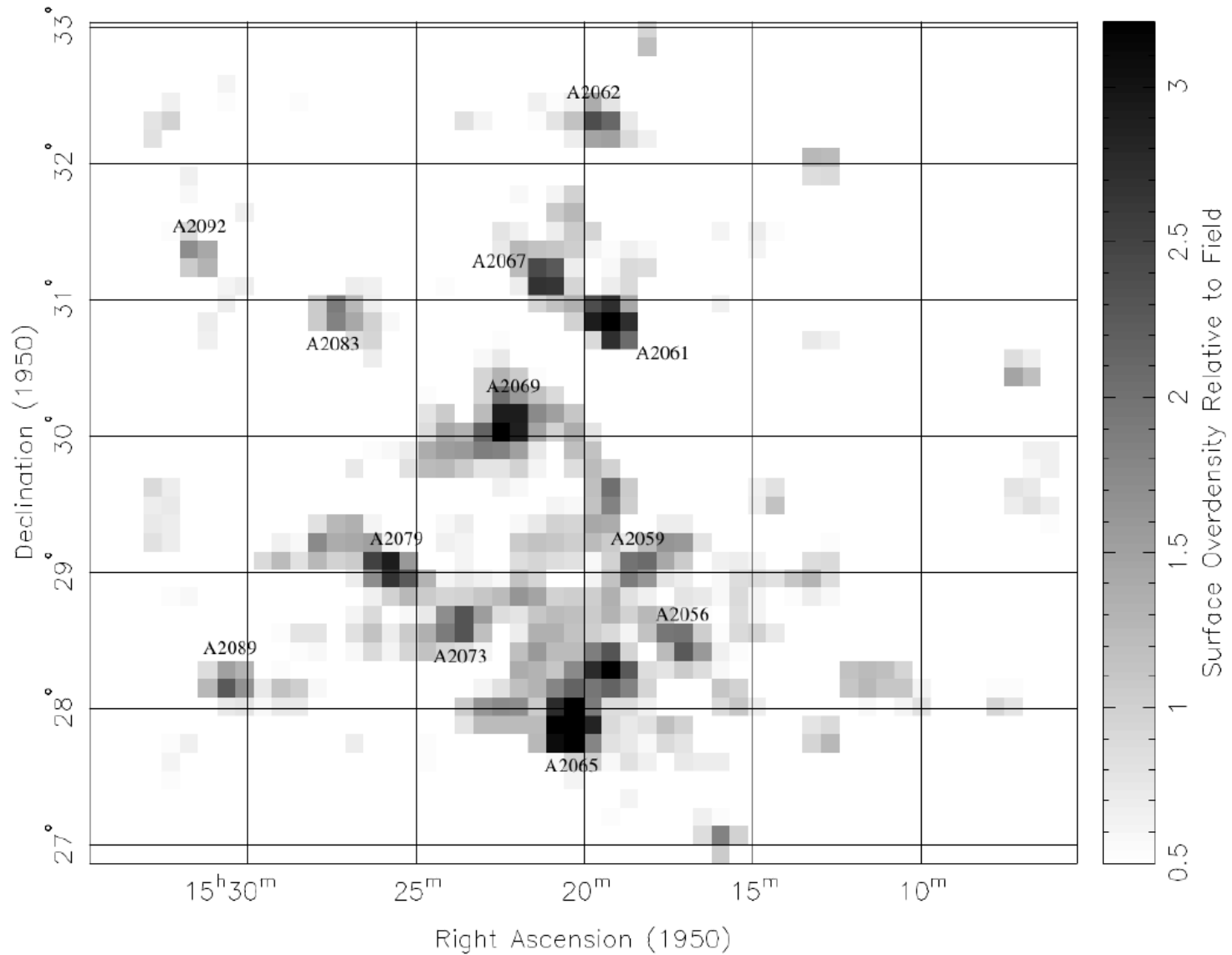


Alexander Drabent

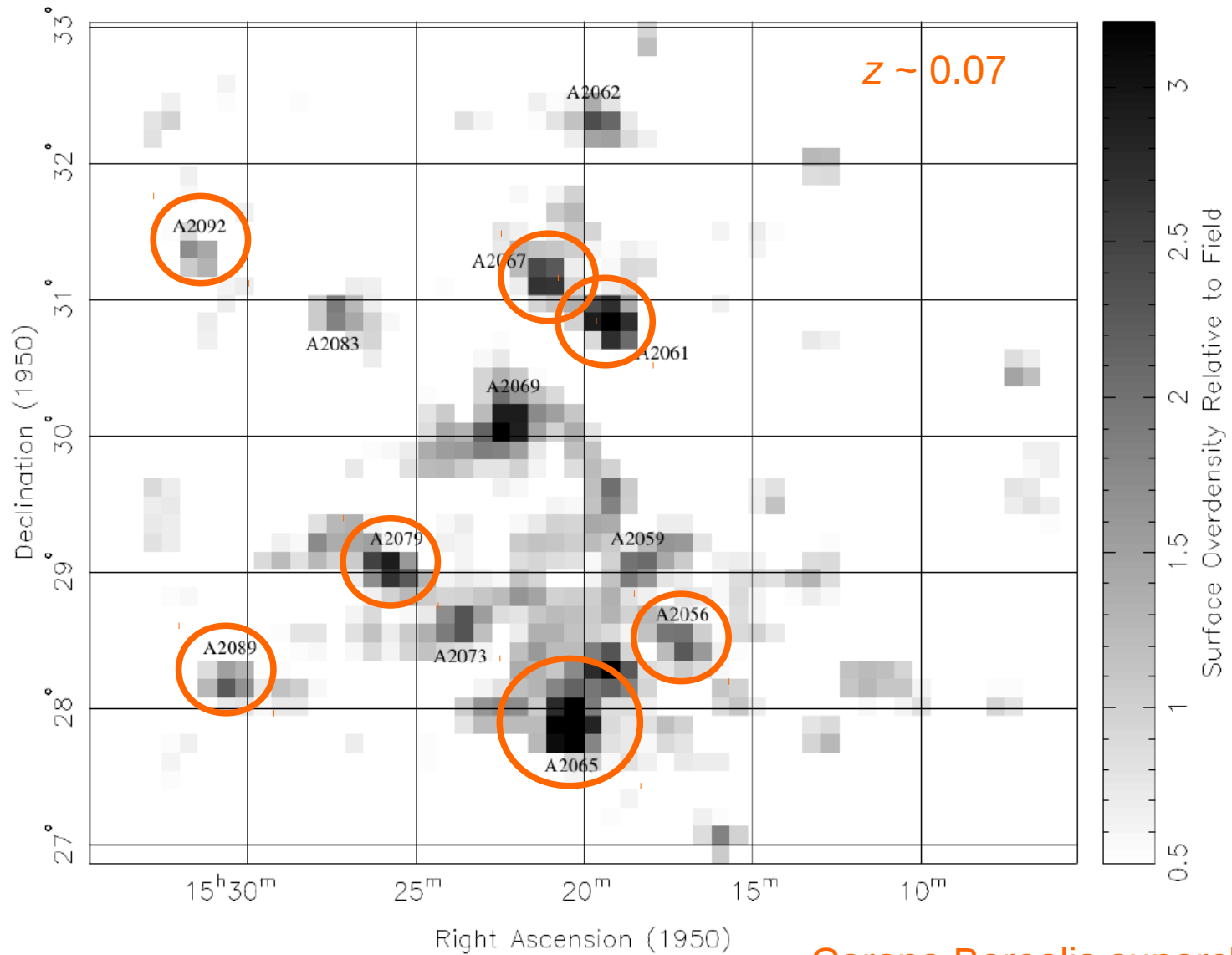
M. Hoeft, M. Brüggen, G. Brunetti, T. W. Shimwell
and the LOFAR Surveys KSP Cluster working group

26th October, 2017

The Corona Borealis Supercluster field

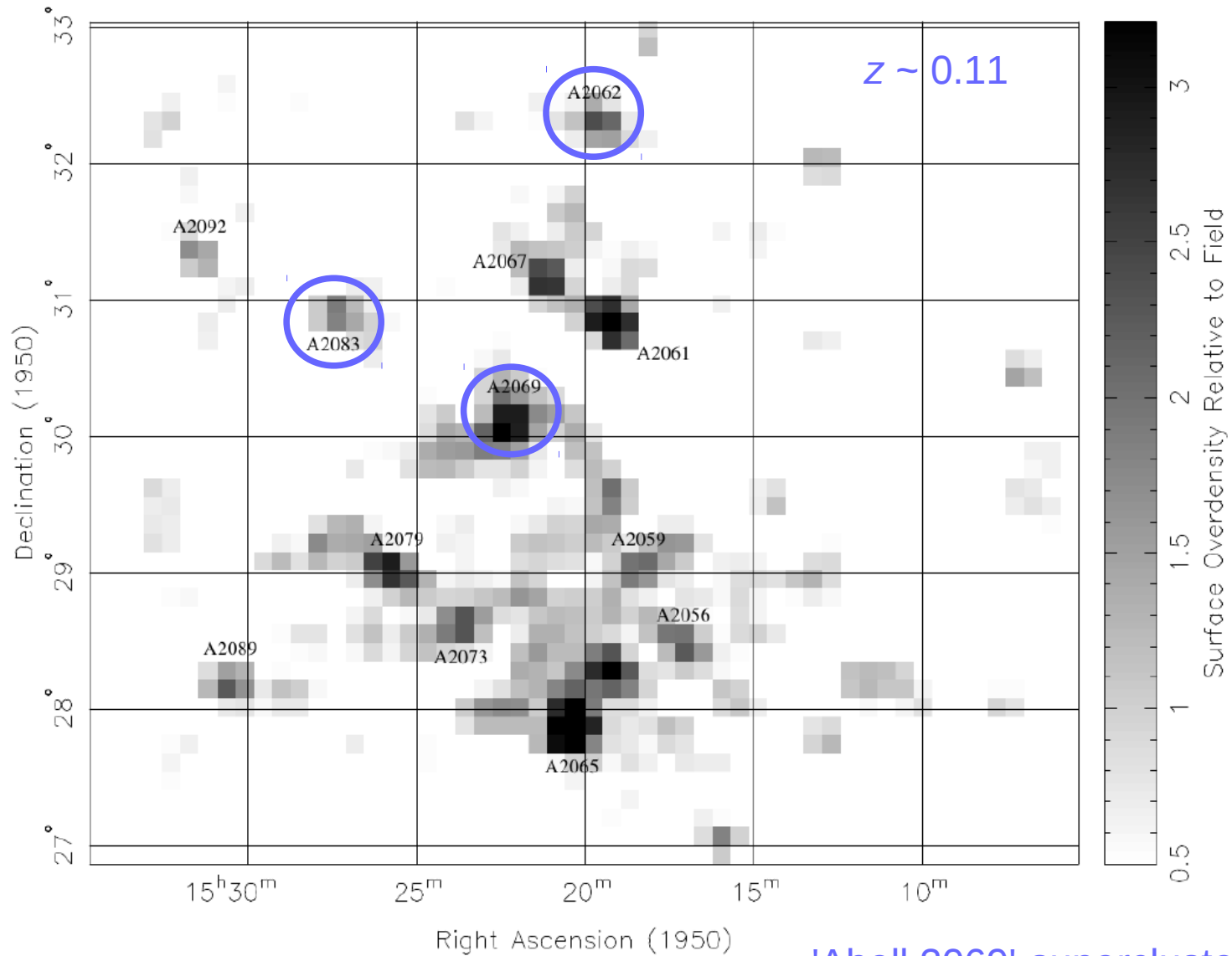


The Corona Borealis Supercluster field



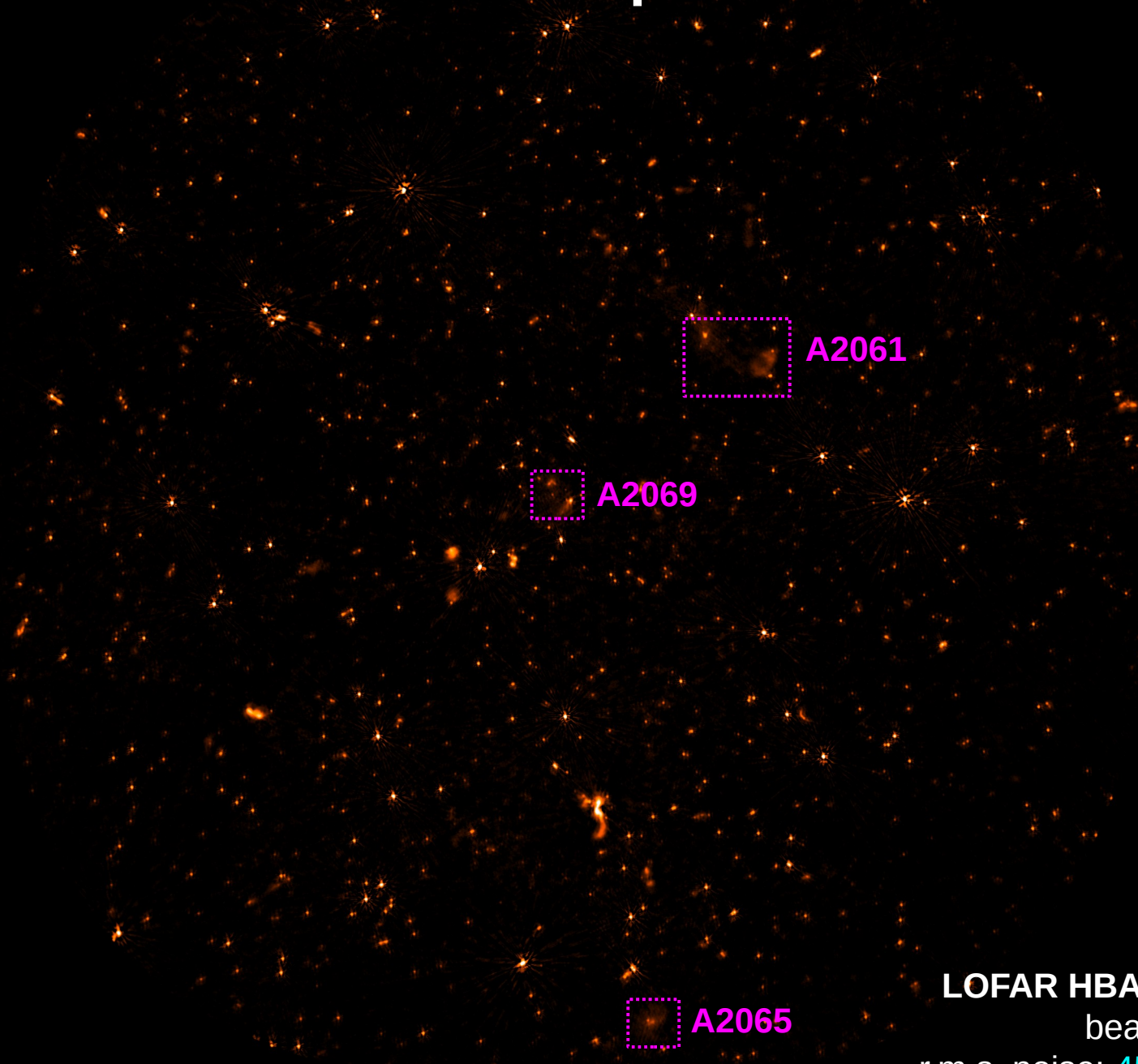
Corona Borealis supercluster

The Corona Borealis Supercluster field



Corona Borealis supercluster field

5°

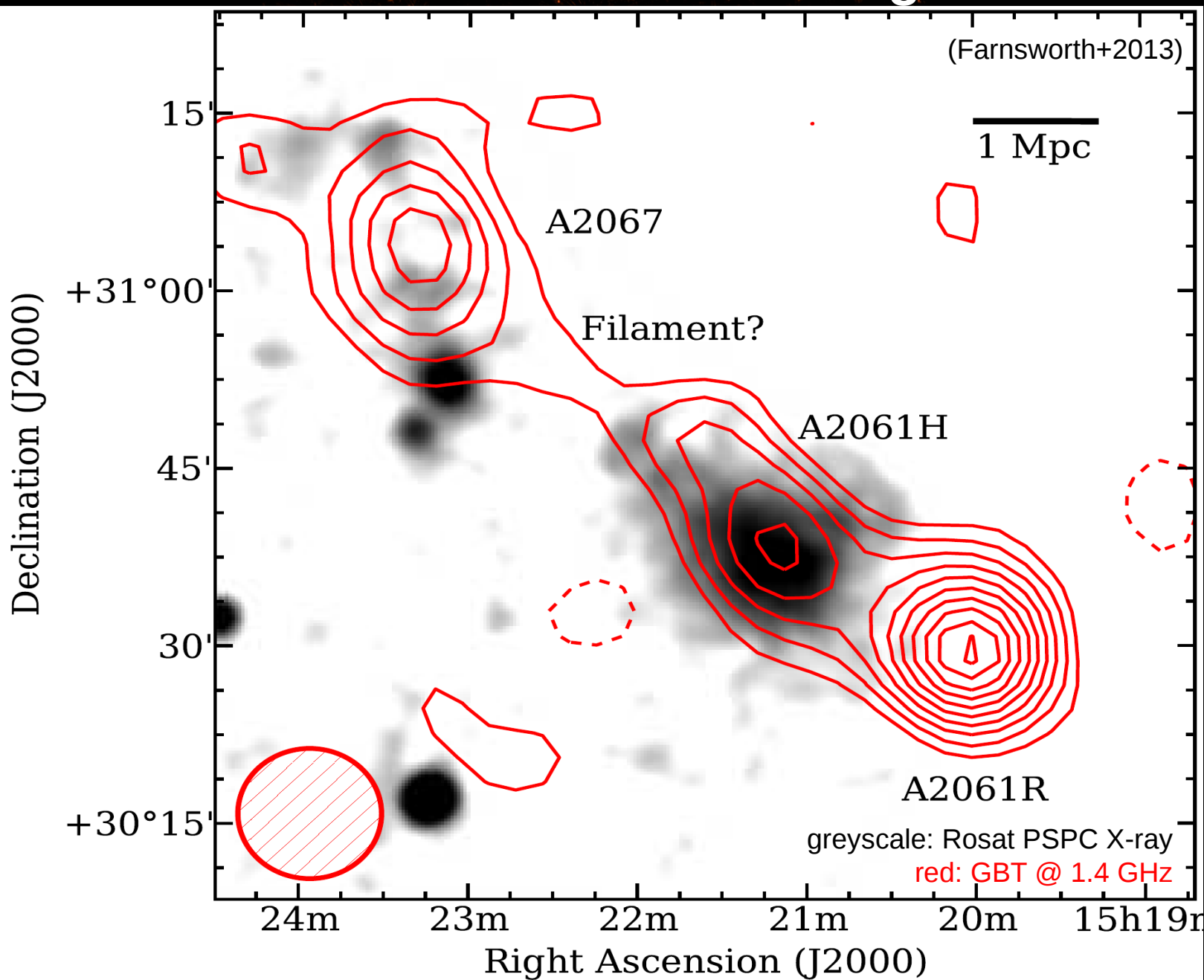


LOFAR HBA @ 153 MHz

beam: 28" × 24"

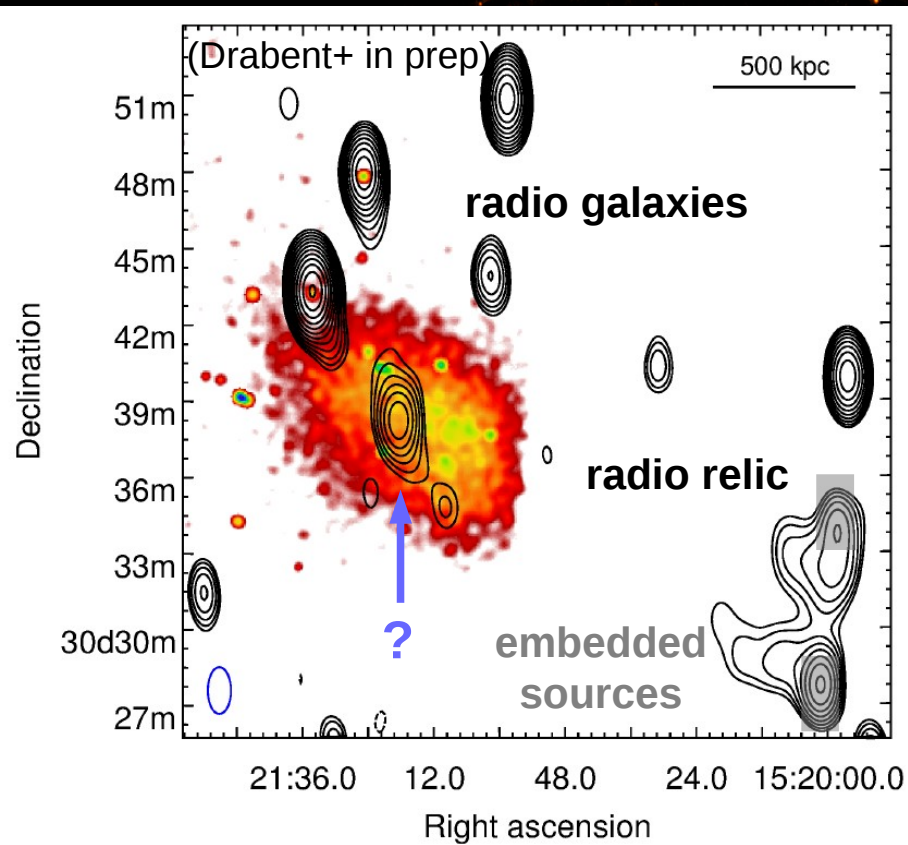
r.m.s. noise: 450 μ Jy/beam

Abell 2061-Abell 2067 bridge?



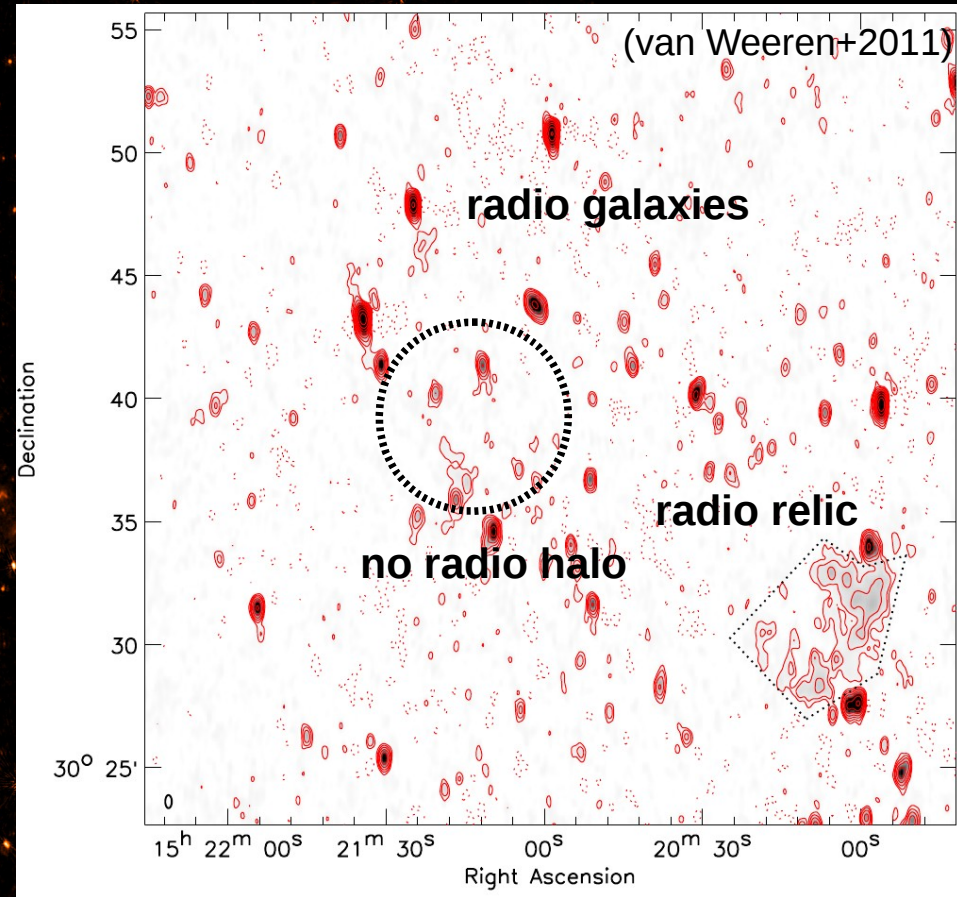
Abell 2061

steep spectrum radio source at cluster center



contours: WSRT @ 346 MHz

Radio relic: (90 ± 9) mJy



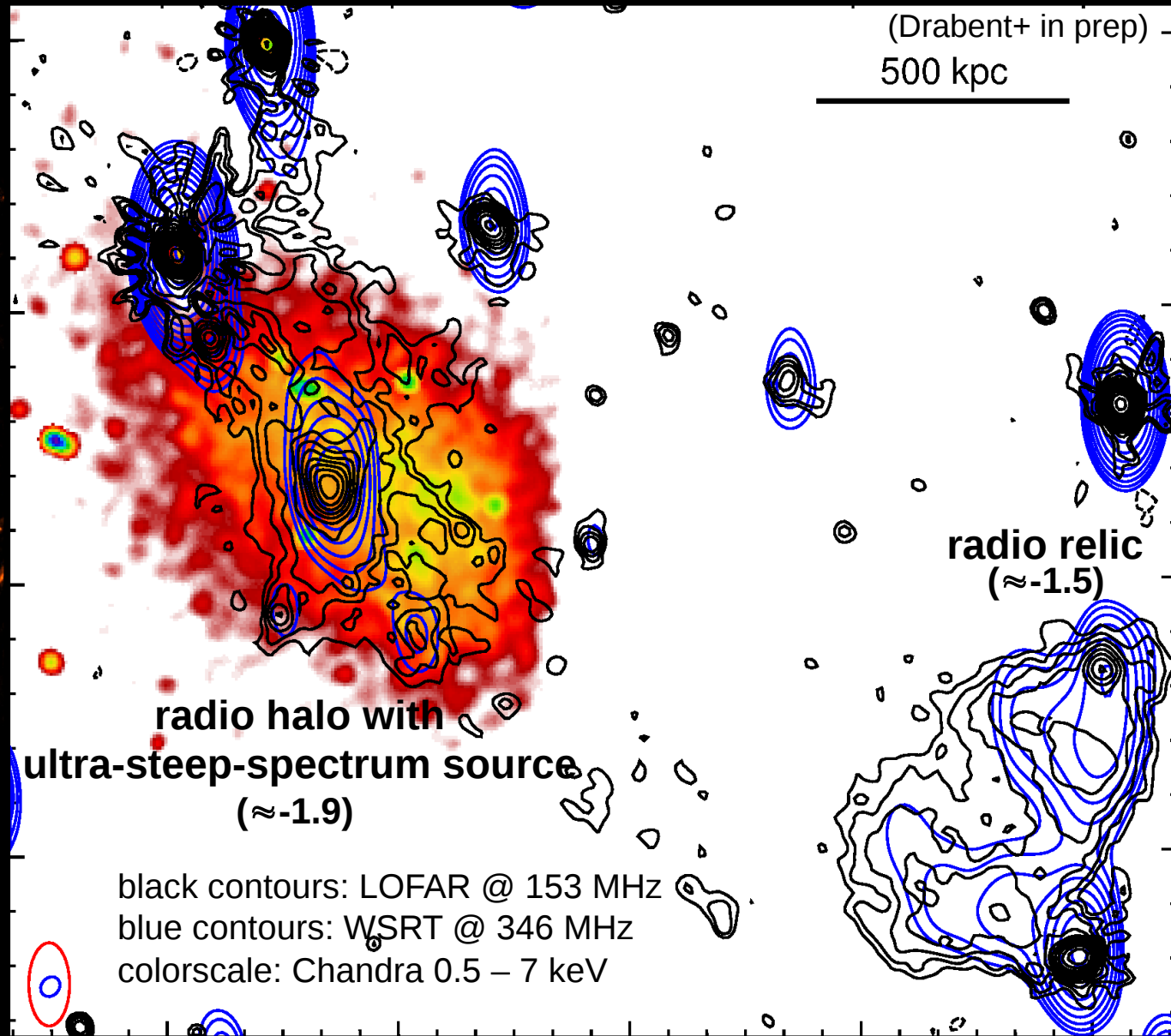
contours: WSRT @ 1.4 GHz

(27 ± 1) mJy

spectral index of radio relic: -0.9 ± 0.1

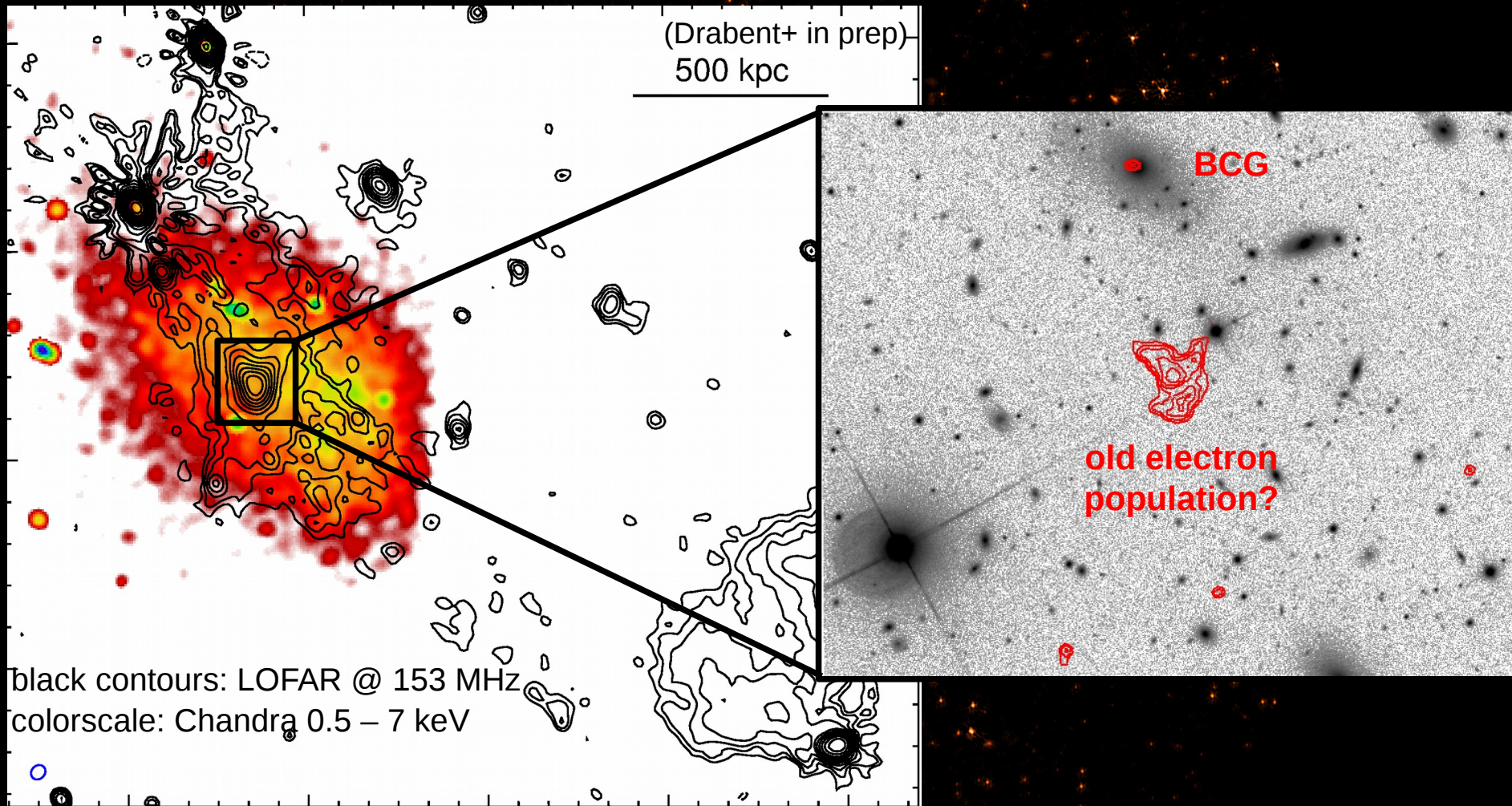
Abell 2061

radio halo found – filaments of radio relic visible

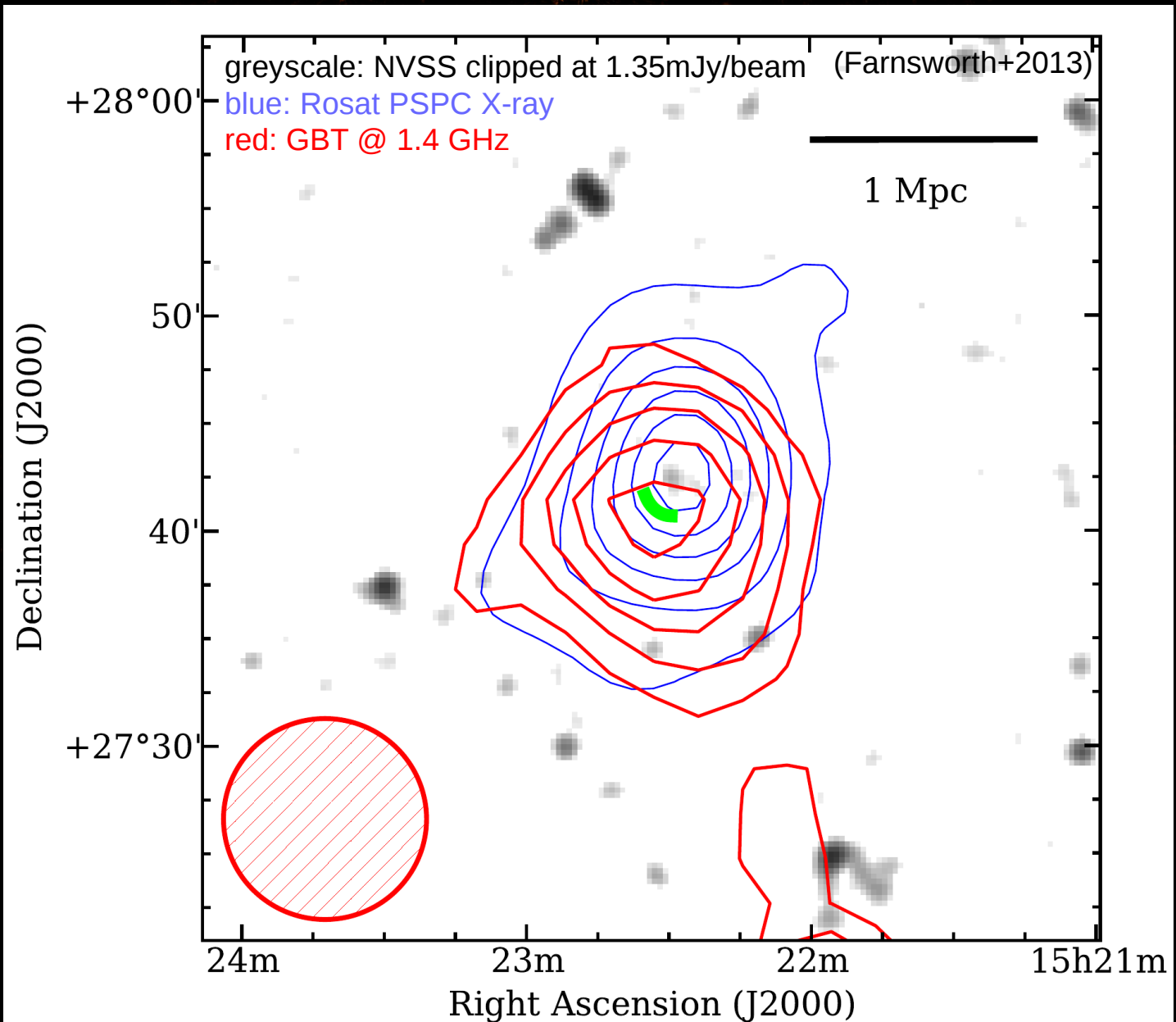


Abell 2061

radio halo + embedded ultra-steep spectrum source

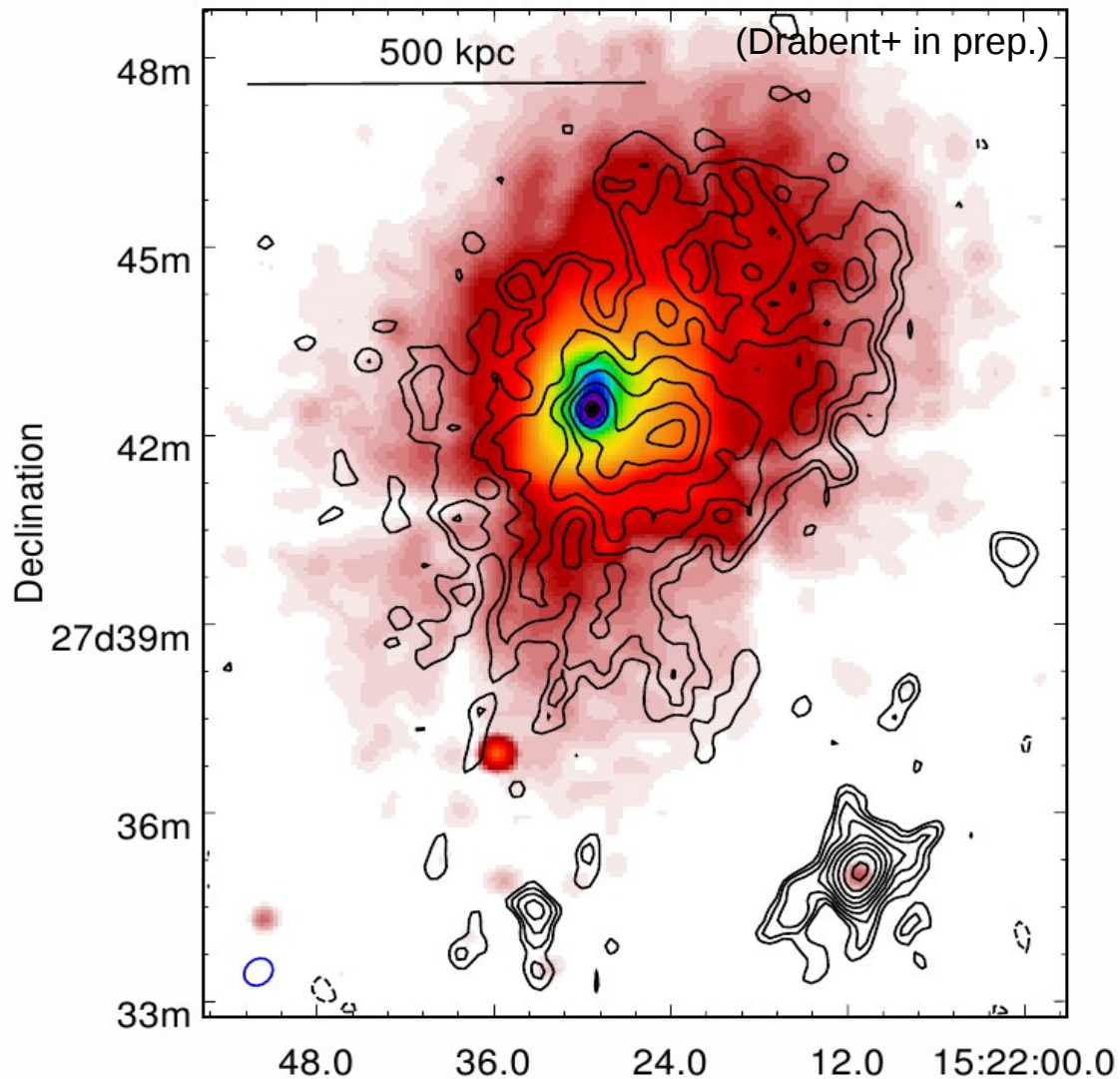


Abell 2065



Abell 2065

radio halo structure recovered



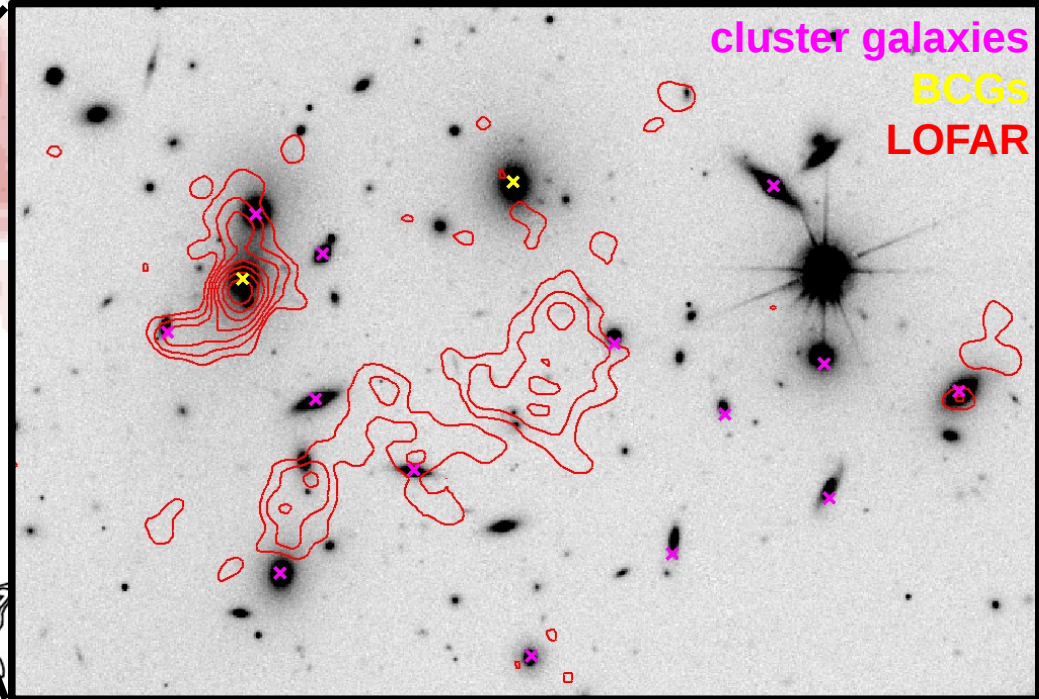
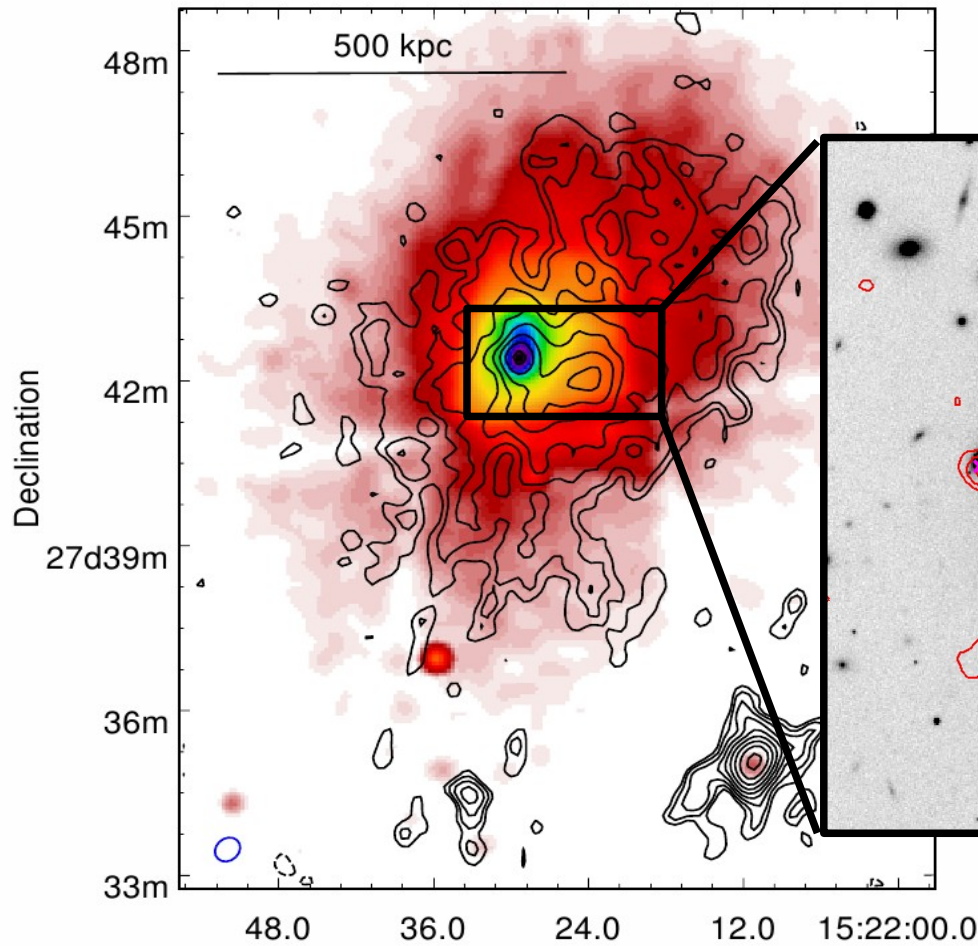
black contours: LOFAR @ 153 MHz

colorscale: Chandra 0.5 – 7 keV

Right ascension

Abell 2065

radio halo structure recovered

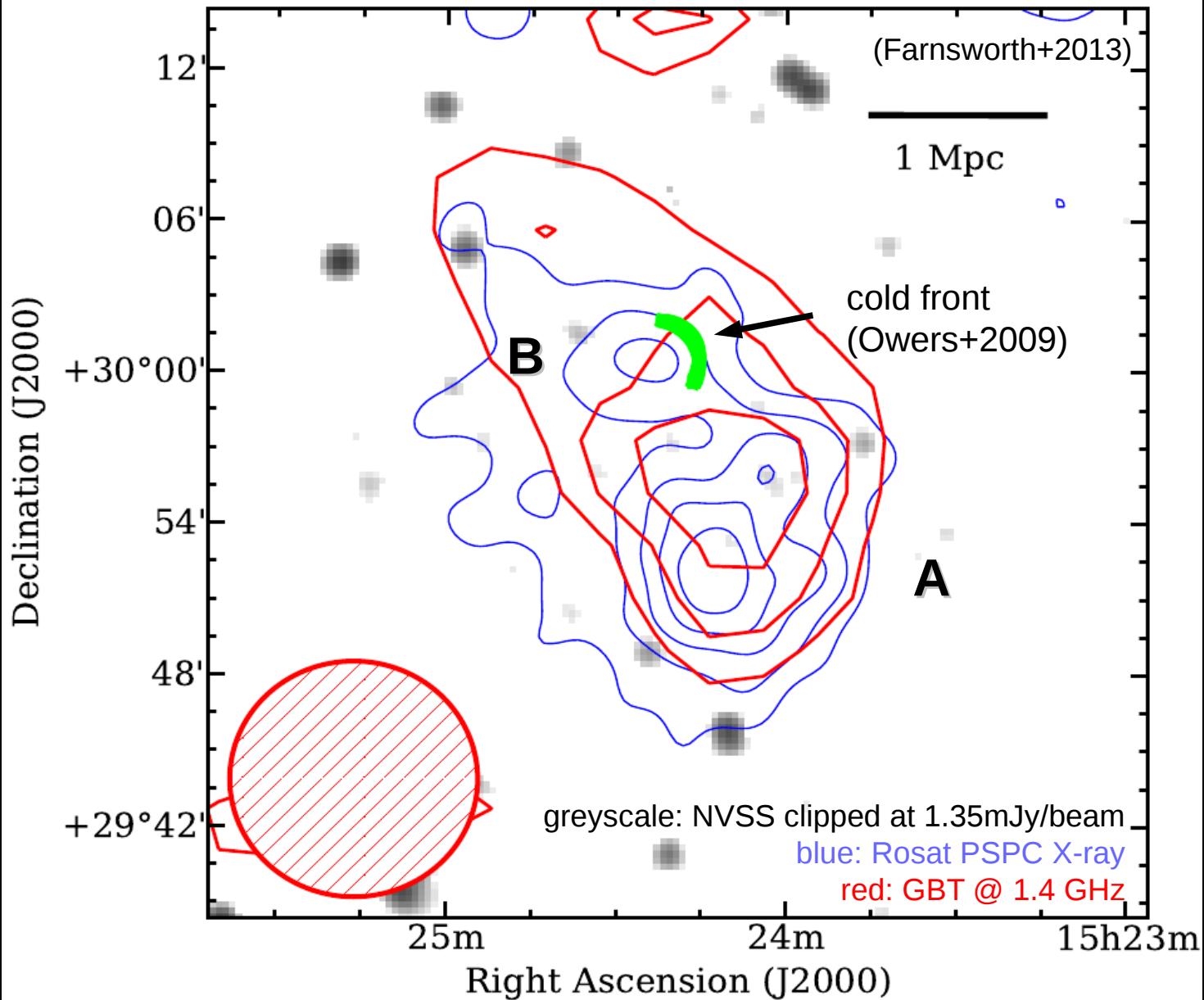


black contours: LOFAR @ 153 MHz

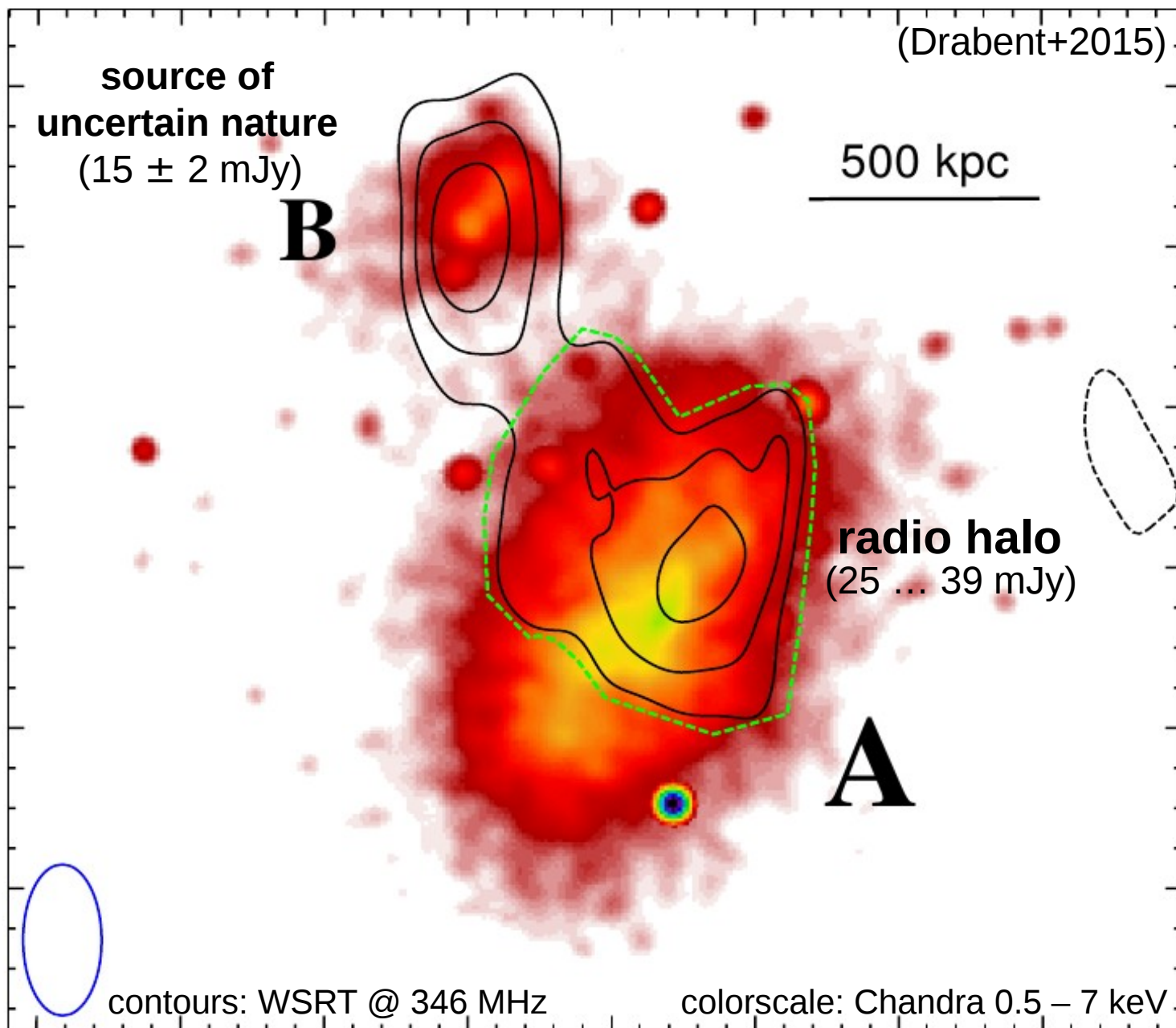
colorscale: Chandra 0.5 – 7 keV

Right ascension

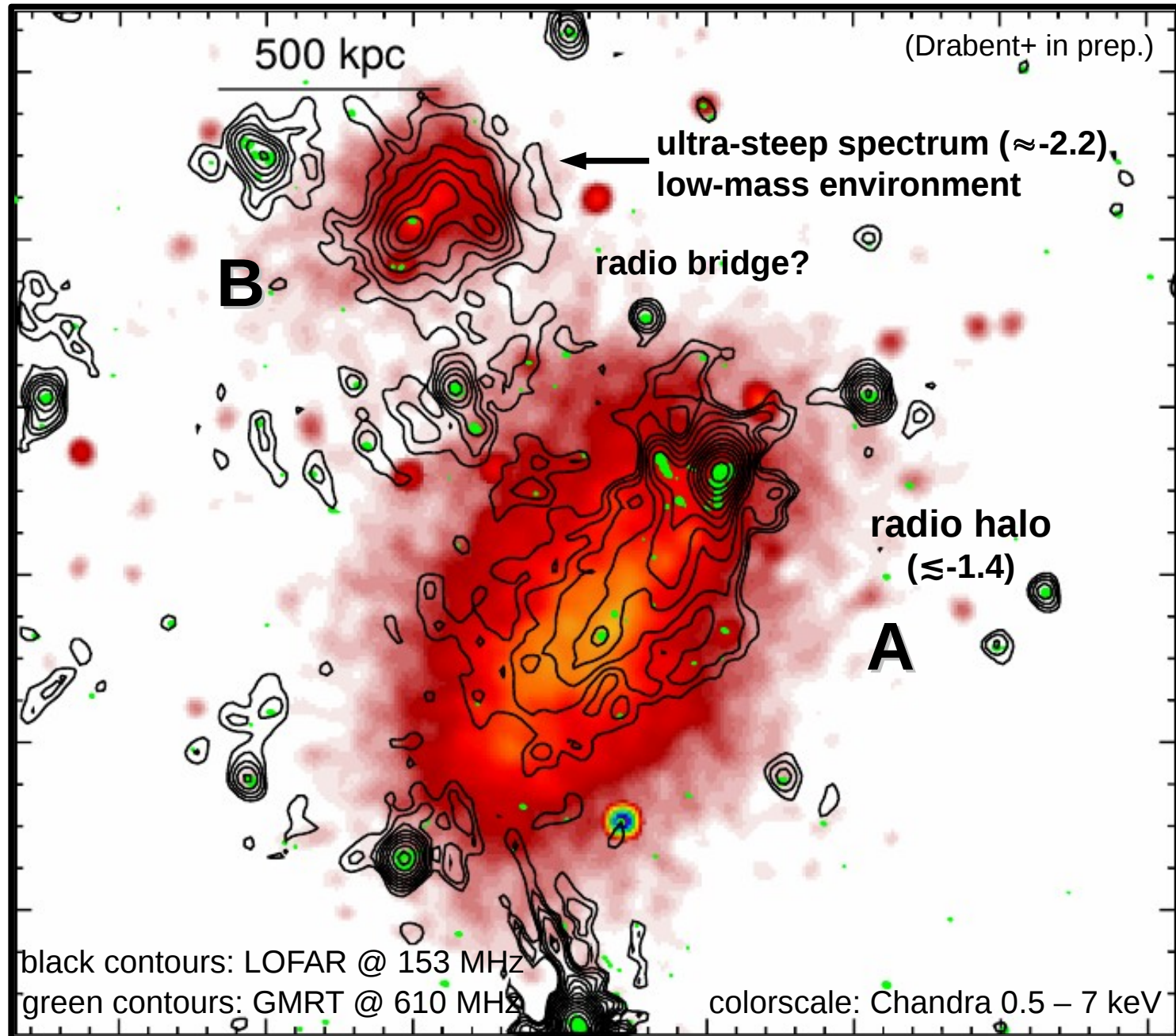
Abell 2069



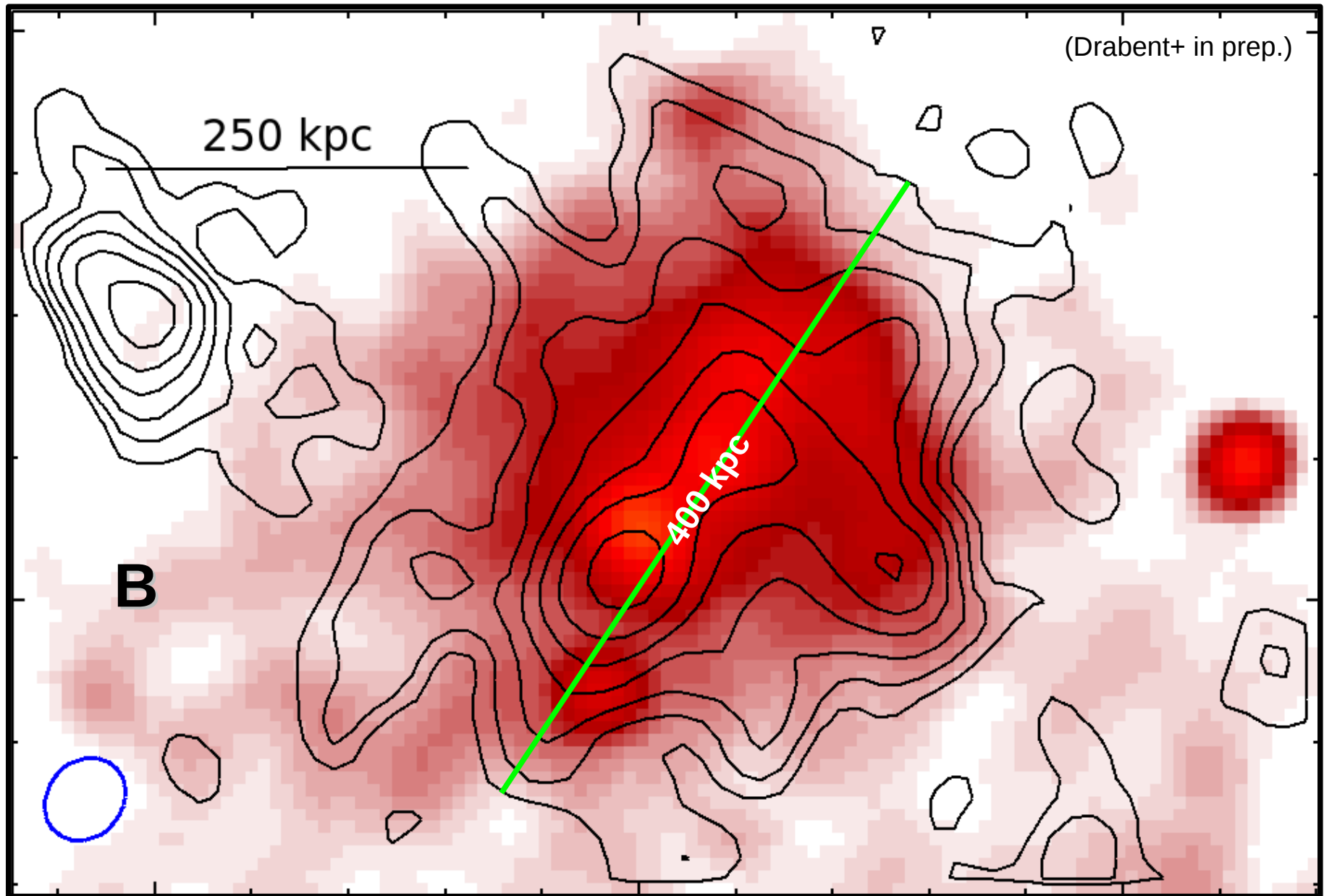
Abell 2069: diffuse emission in both components



Abell 2069: diffuse emission is ultra-steep



Abell 2069B: Too small for a radio halo



Abell 2069B: no powerful AGN present

(Drabent+ in prep.)

250 kpc

“old” electron population?

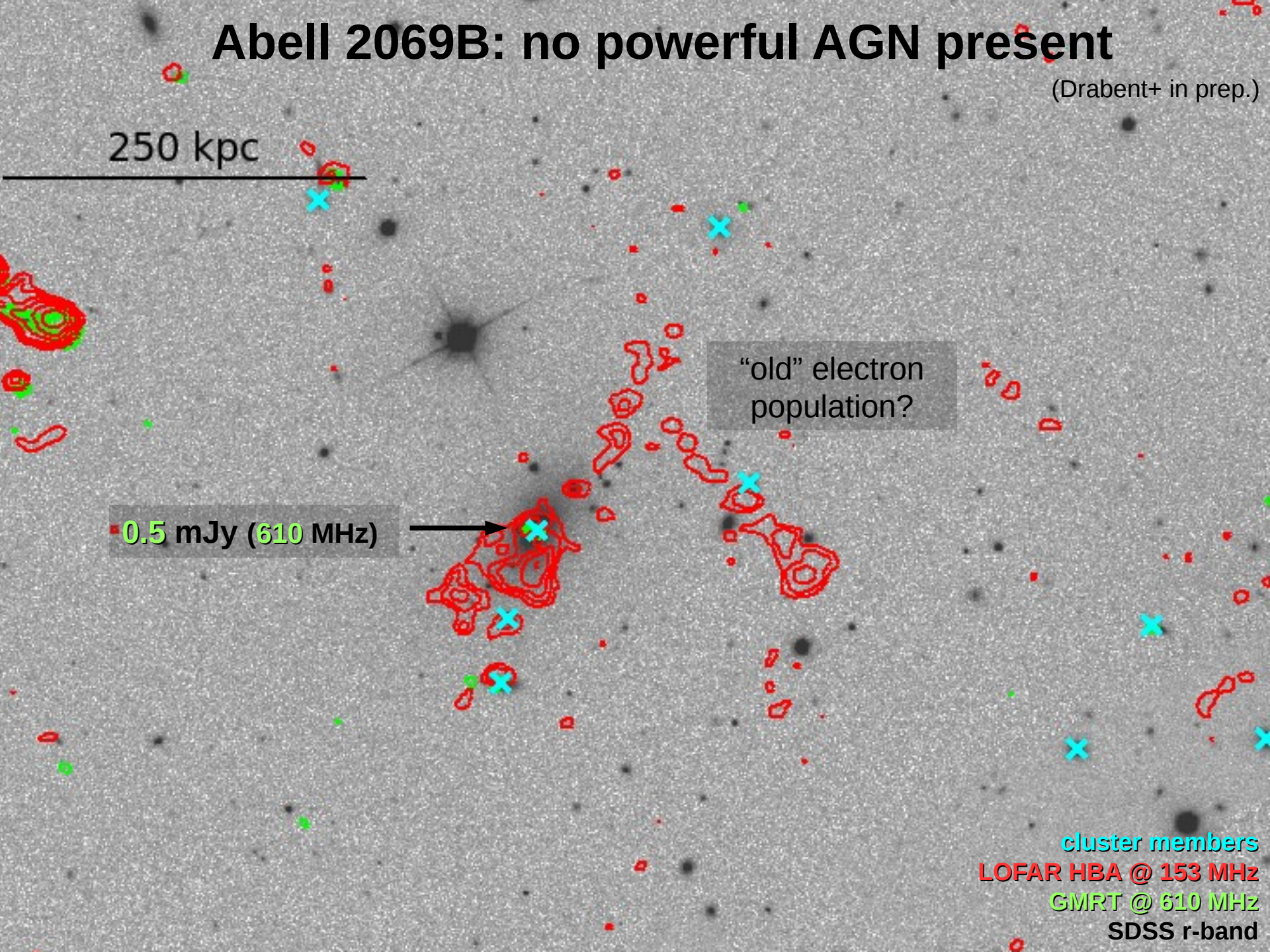
0.5 mJy (610 MHz)

cluster members

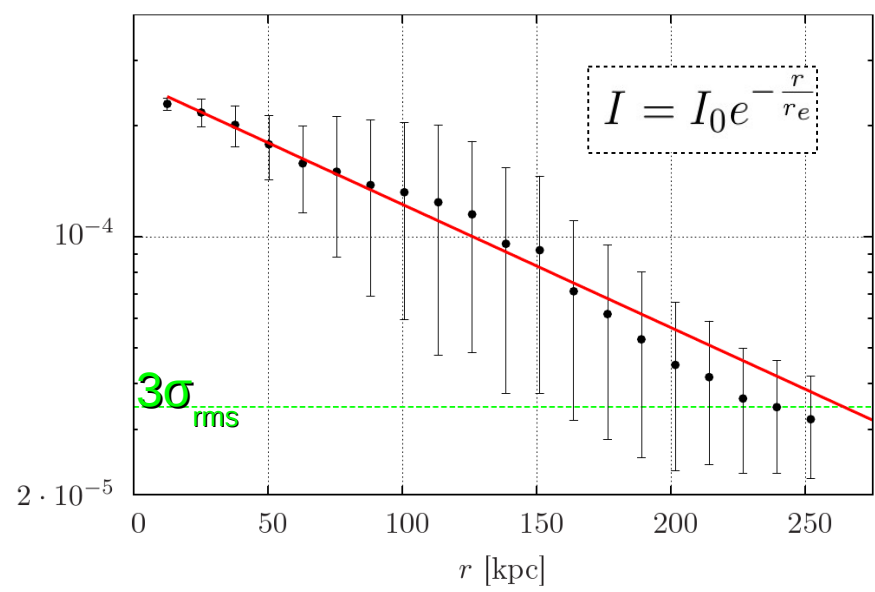
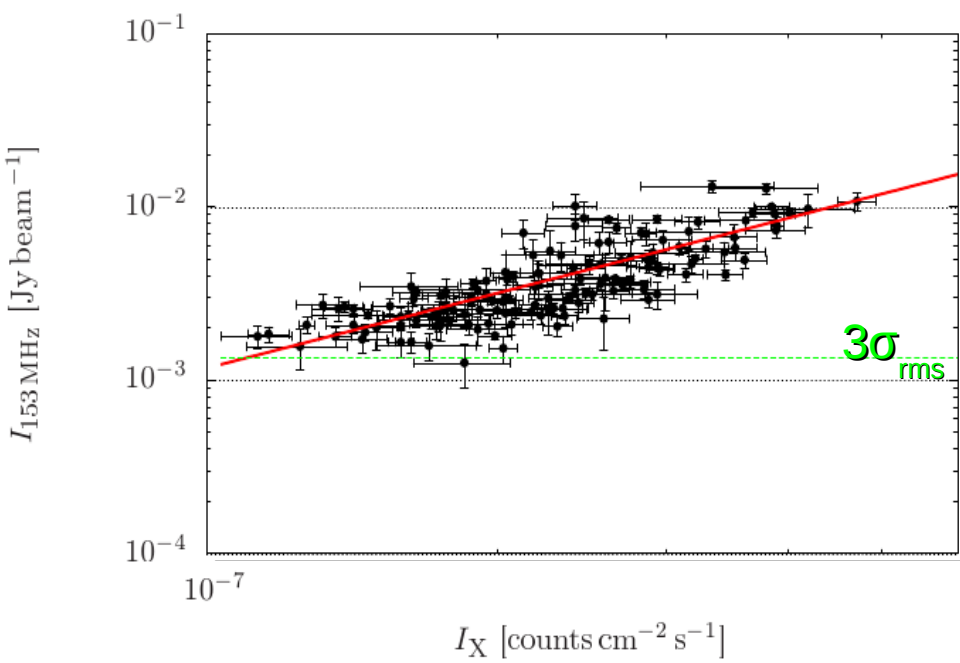
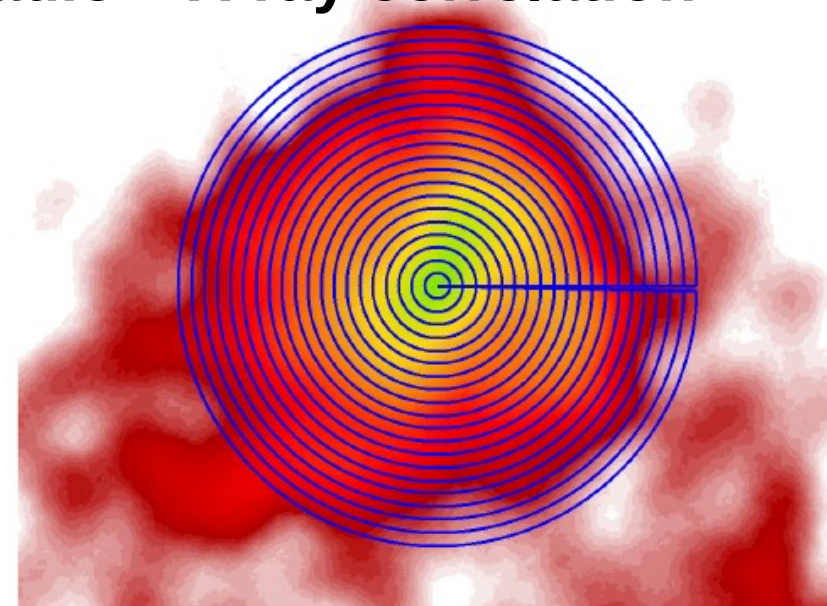
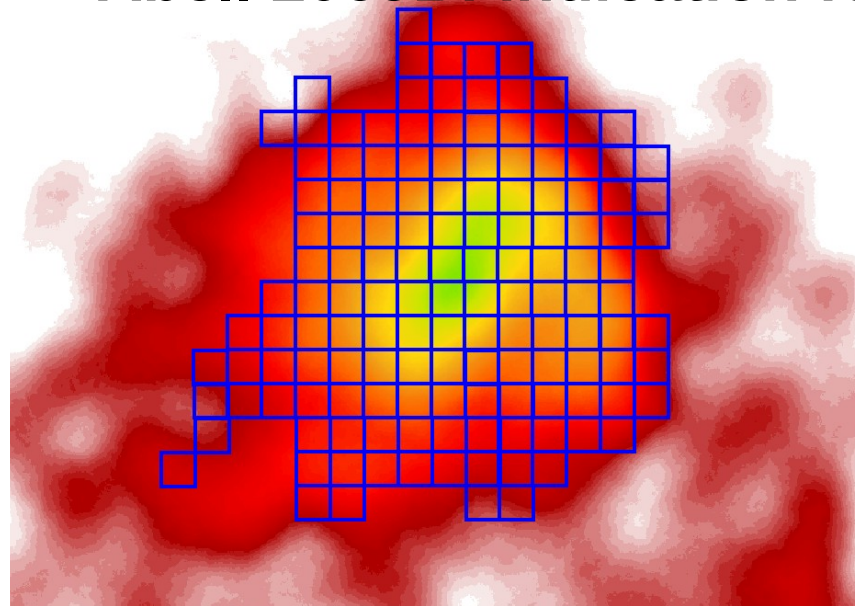
LOFAR HBA @ 153 MHz

GMRT @ 610 MHz

SDSS r-band

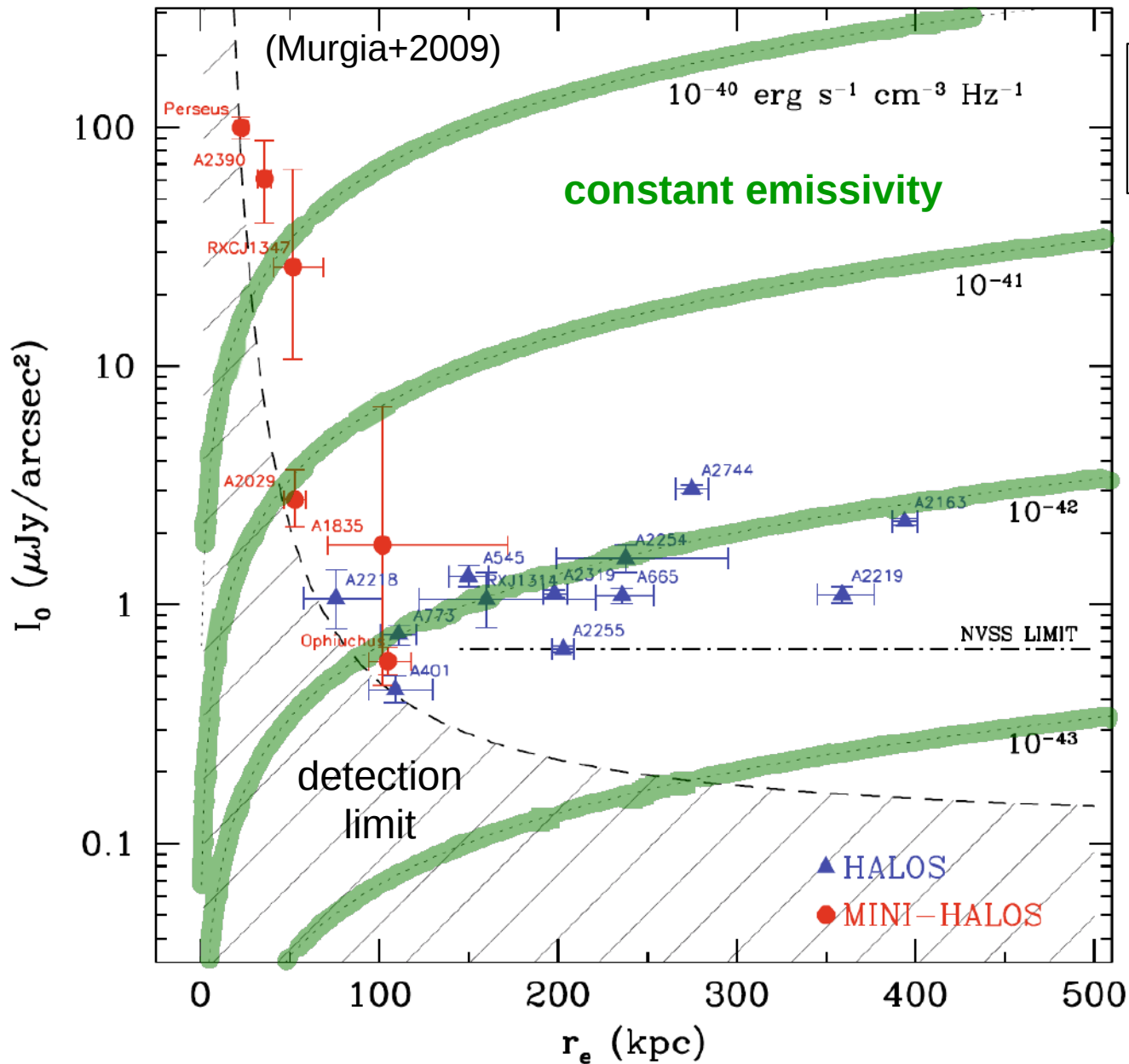


Abell 2069B: indication for radio – X-ray correlation



➔ derive radio emissivity

Radio mini-halos are not small radio halos



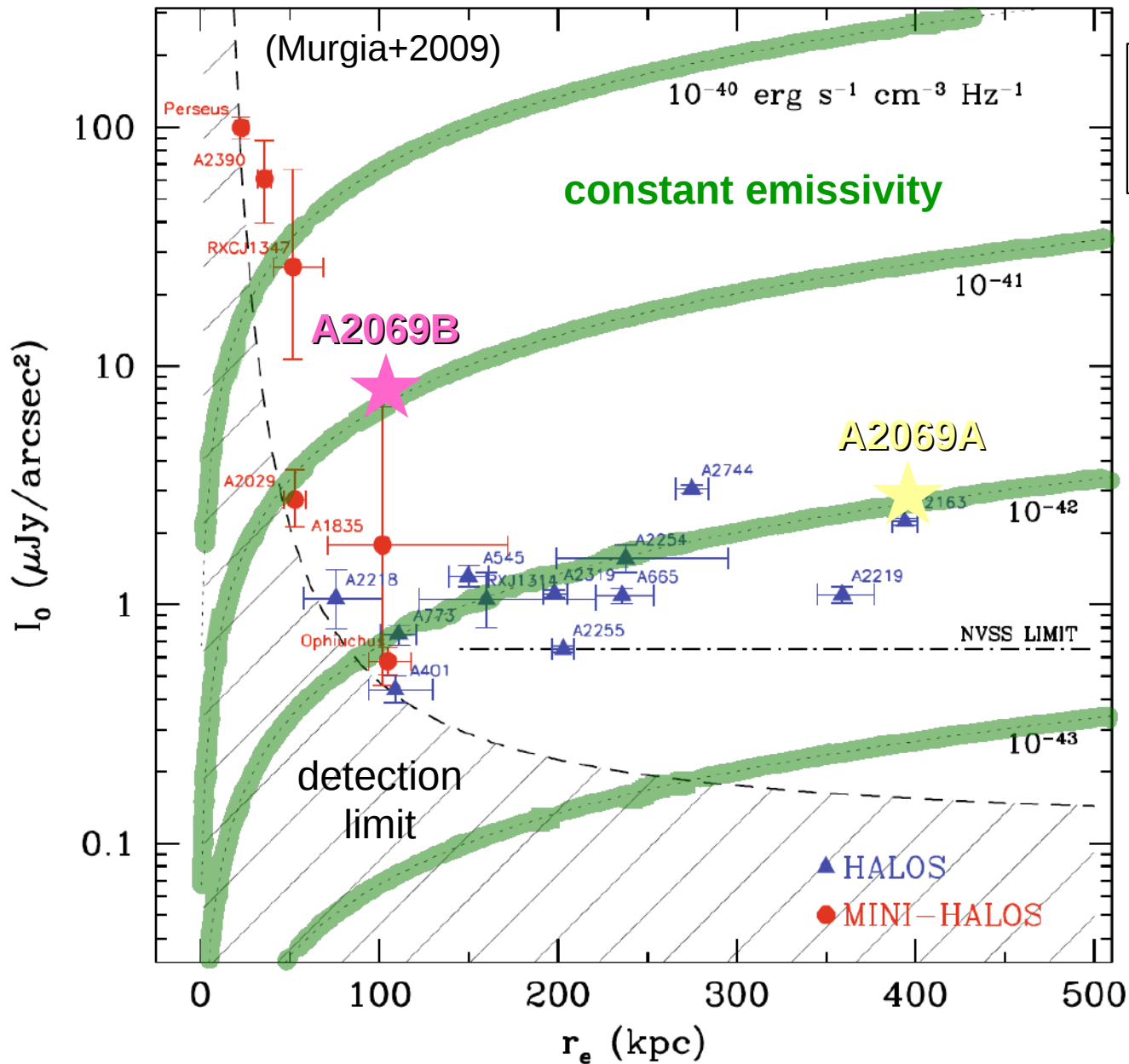
$$I = I_0 e^{-\frac{r}{r_e}}$$

↓

**volume-averaged
radio emissivity**

**Radio mini-halos:
wide span of
emissivities**

Radio mini-halos are not small radio halos



$$I = I_0 e^{-\frac{r}{r_e}}$$

↓

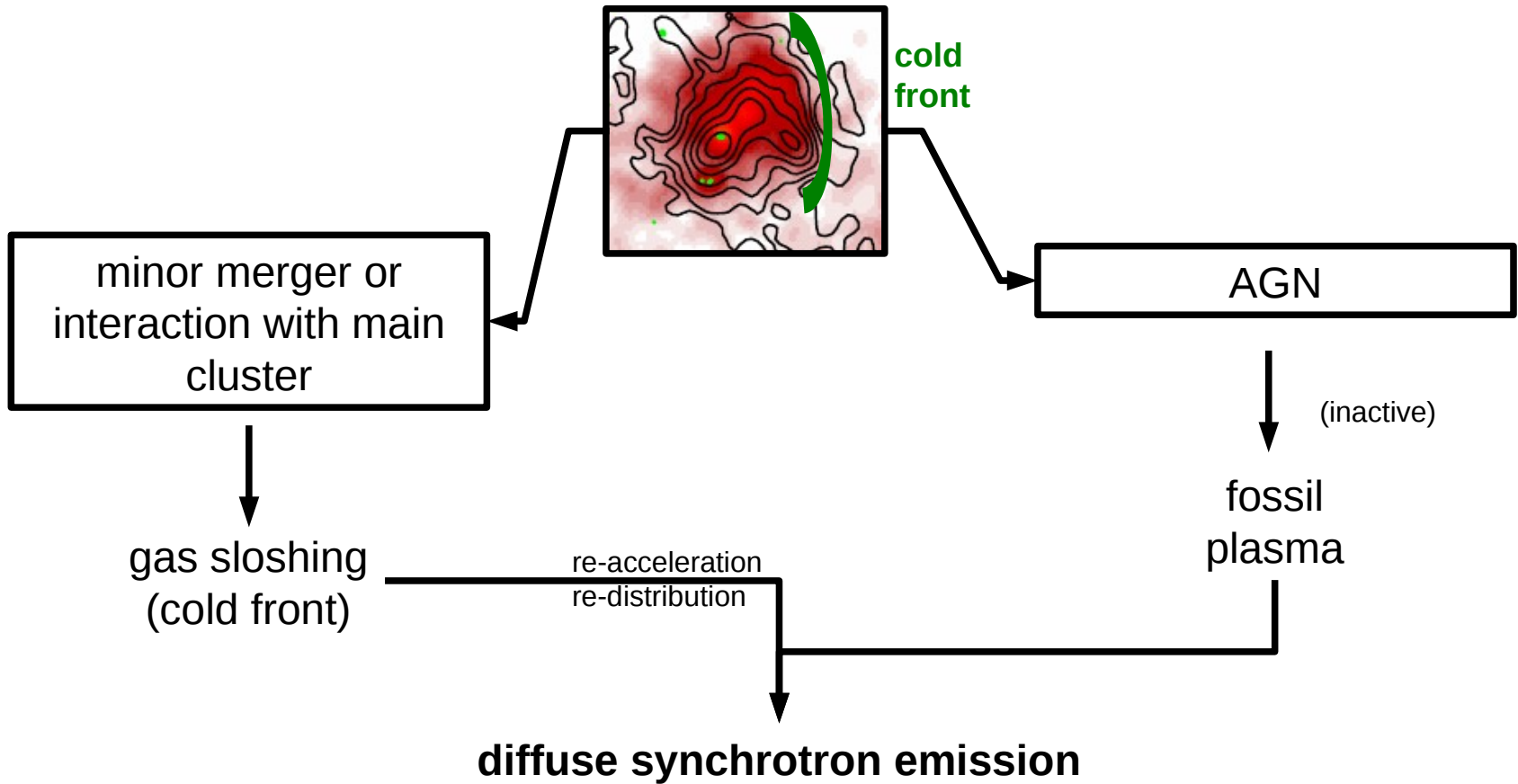
volume-averaged
radio emissivity

A2069B
comparable to
A2029

↓

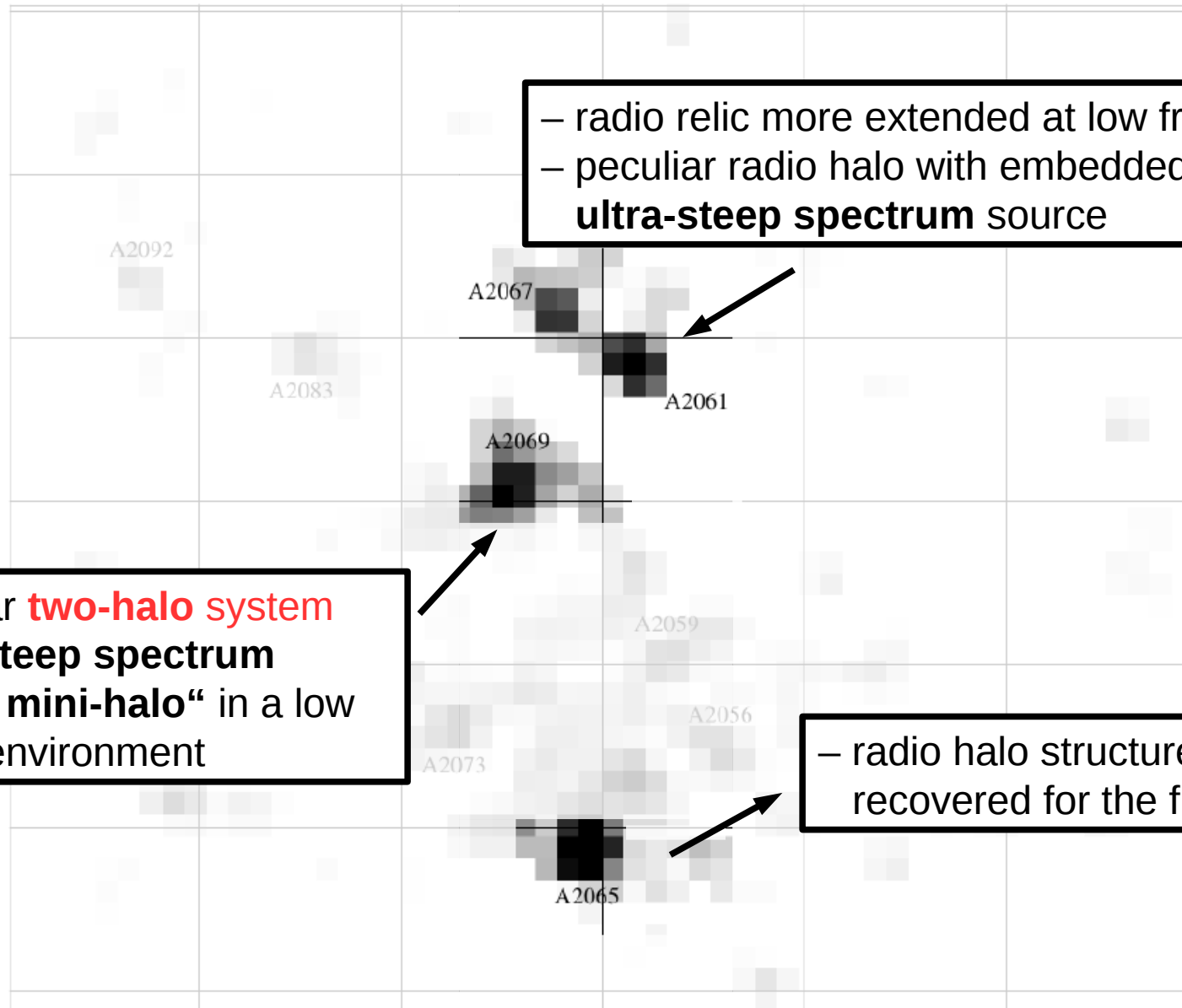
radio mini-halo?

Abell 2069B: potential scenario for its origin



→ Abell 2069 is a two-halo system

Diffuse radio emission in the Corona Borealis supercluster field



– radio relic more extended at low frequencies
– peculiar radio halo with embedded **ultra-steep spectrum** source

– peculiar **two-halo system**
– **ultra-steep spectrum**
„radio mini-halo“ in a low mass environment

– radio halo structure recovered for the first time