CARMA Observations of AME in Perseus

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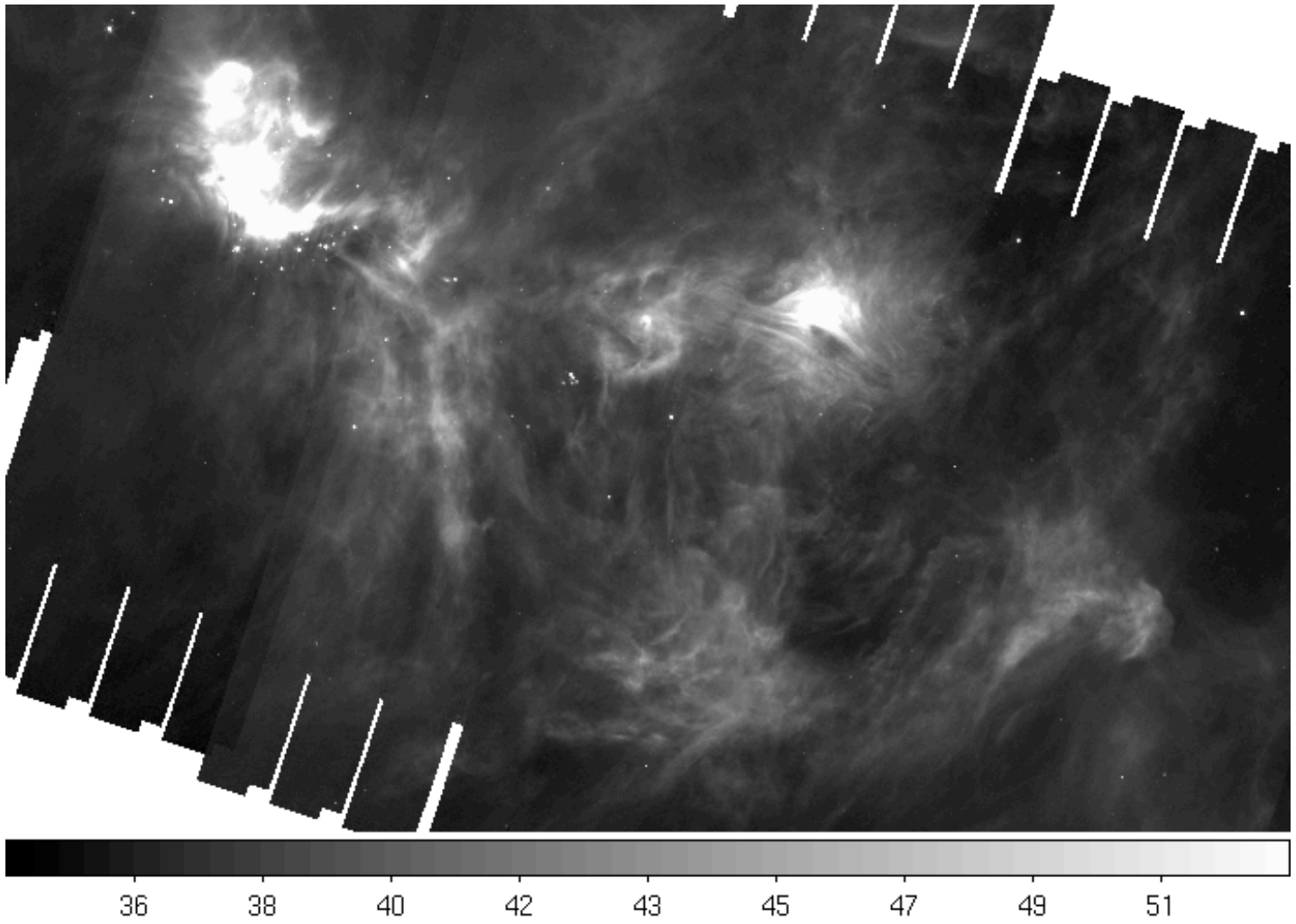
July 4, 2012
Manchester AME Workshop

Overview

- observe Perseus AME regions & Planck-identified region with CARMA 8-element array (30 GHz)

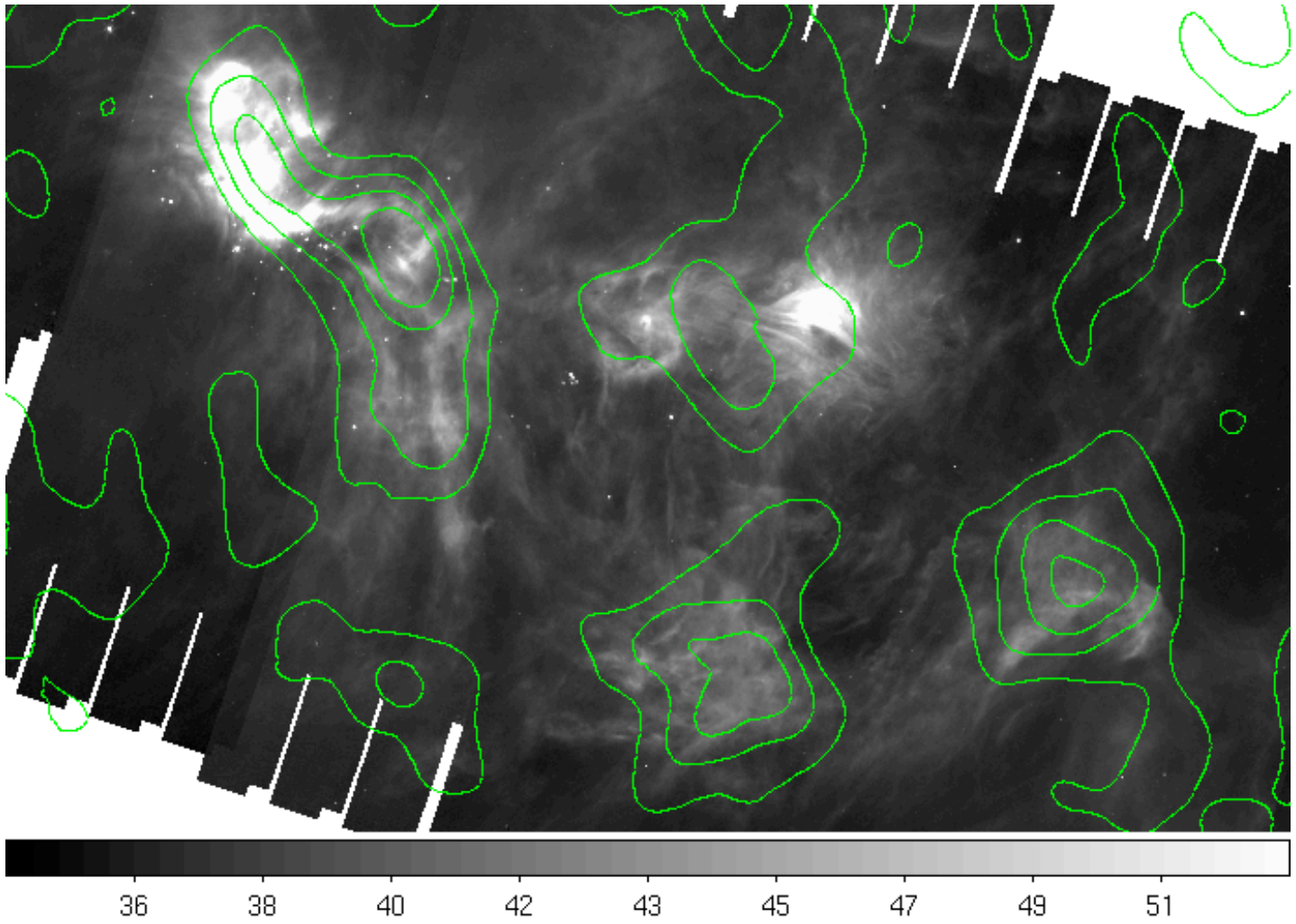
- compare to:
  - Spitzer high resolution infrared images
  - AMI Small Array observations

Spitzer: Perseus



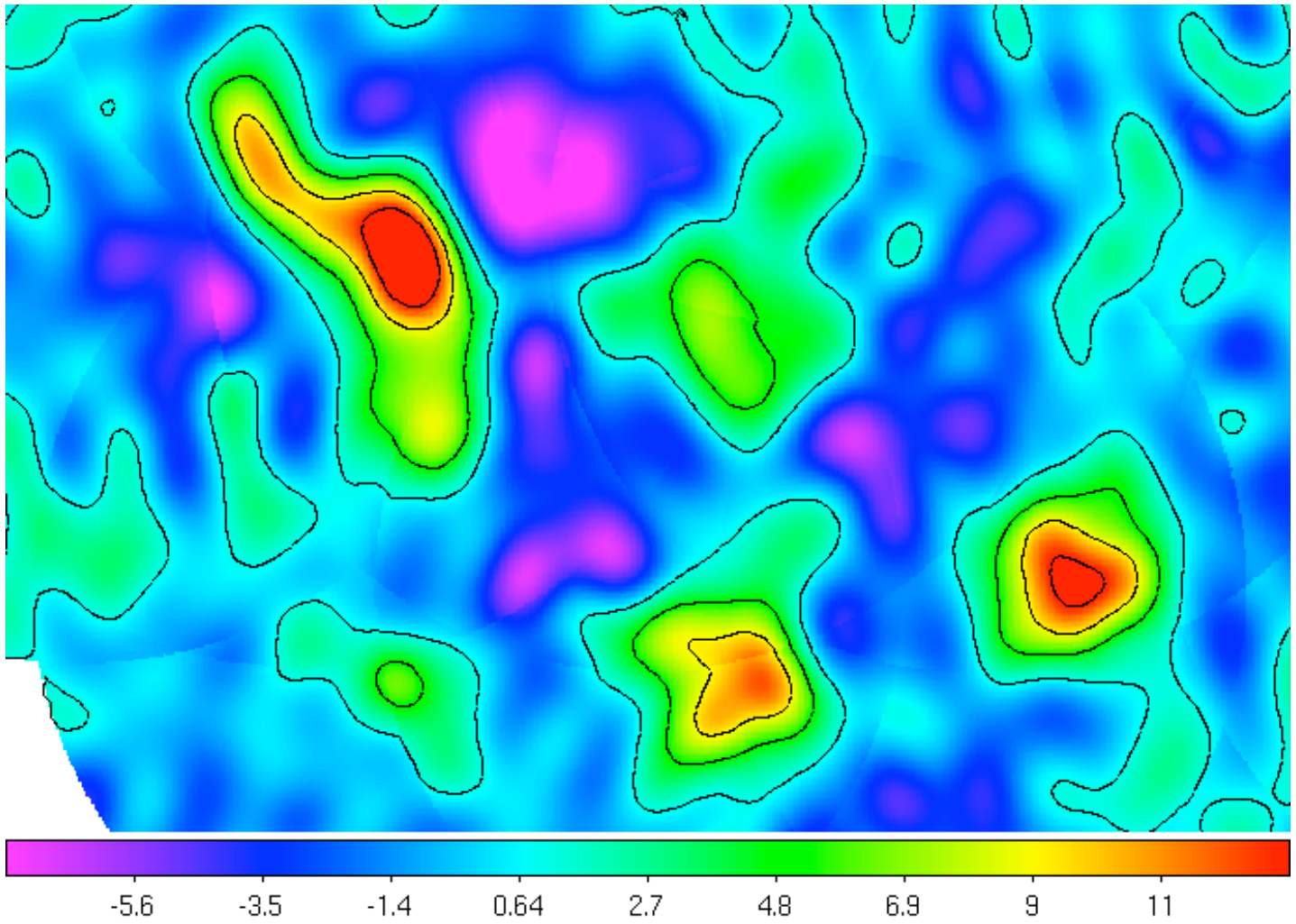
24 micron

Spitzer: Perseus



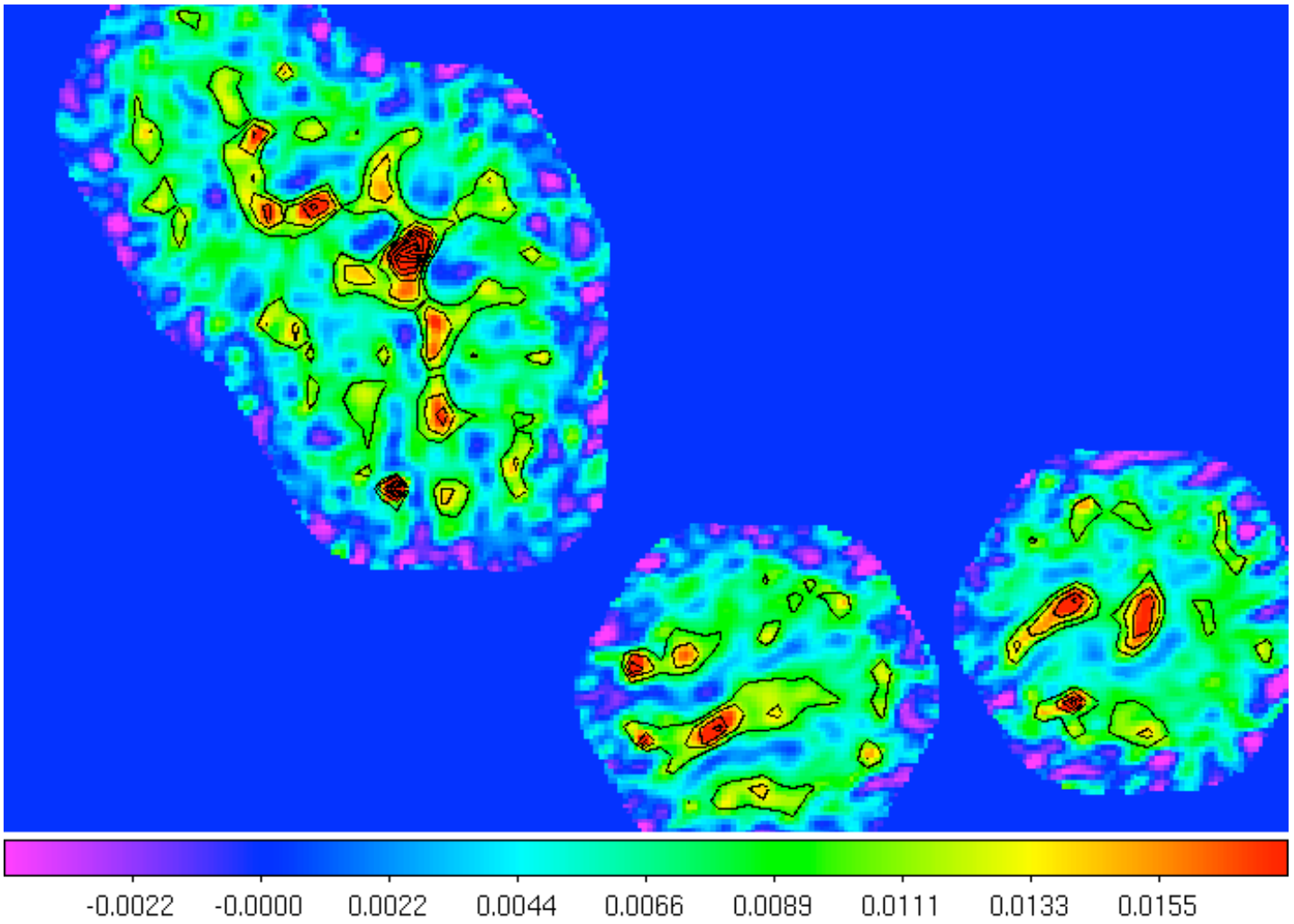
Contours: VSA

VSA: Perseus



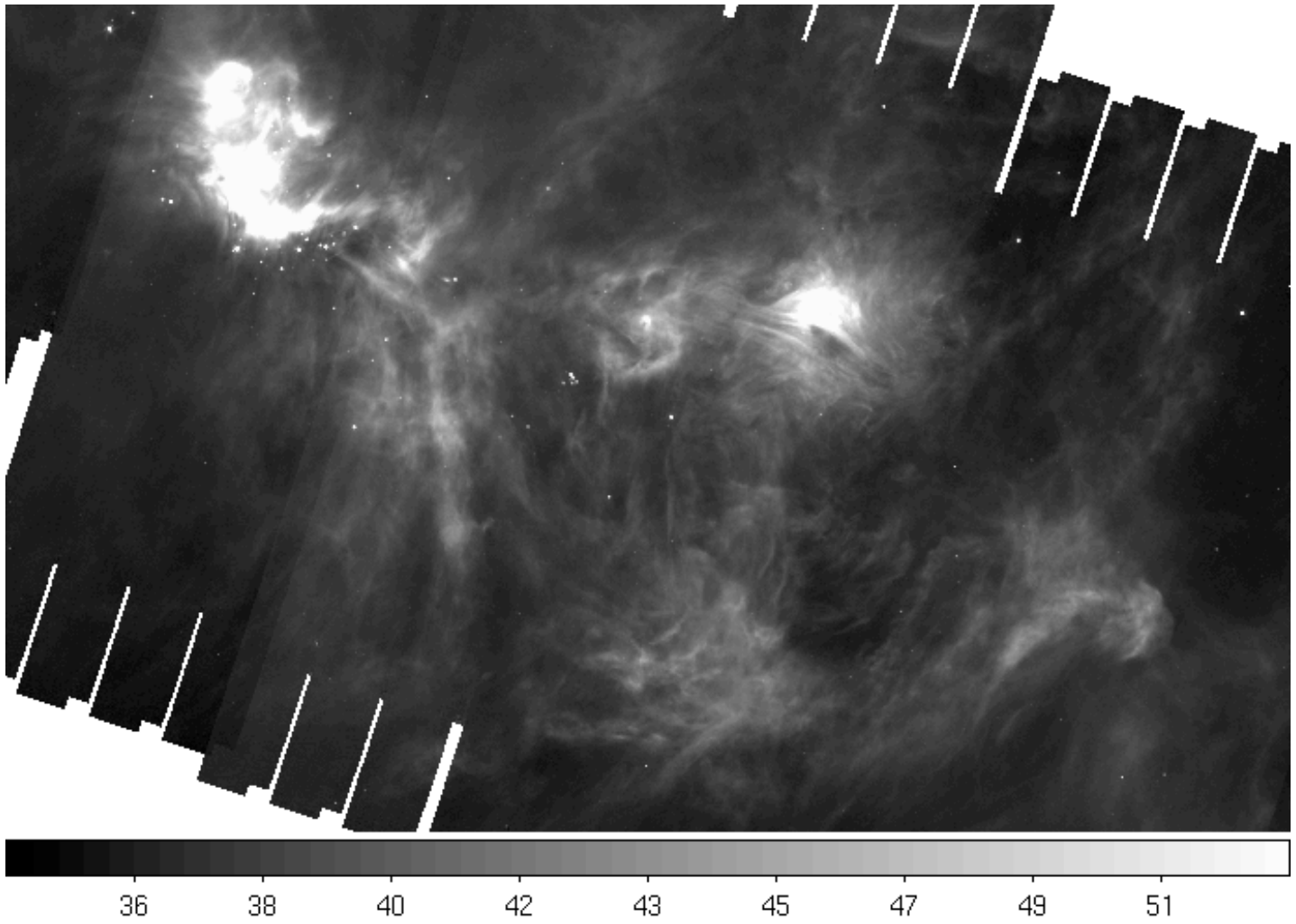
33 GHz - Resolution: 7’

CARMA: Perseus

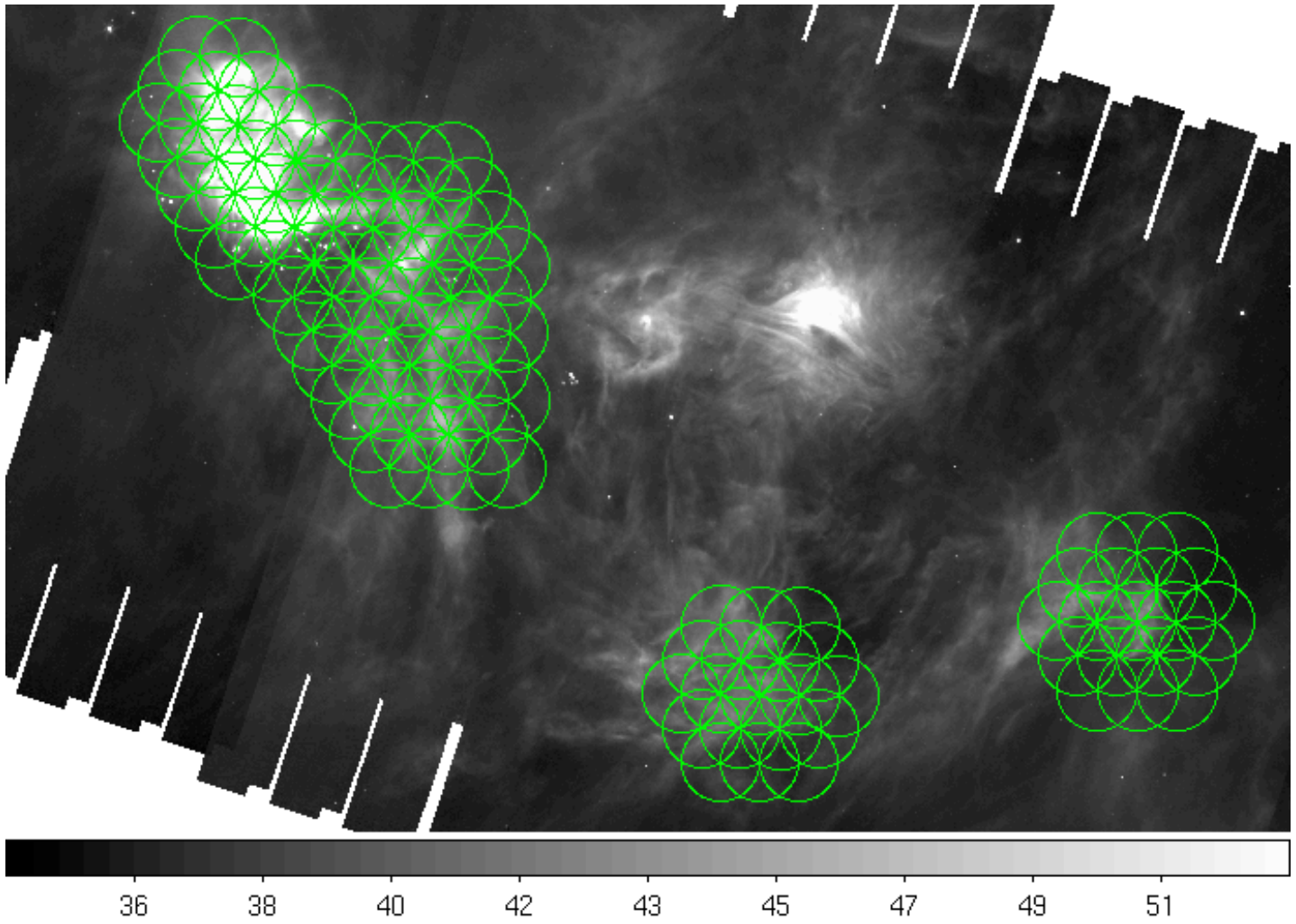


31 GHz - Resolution: 2.5’

CARMA: Perseus

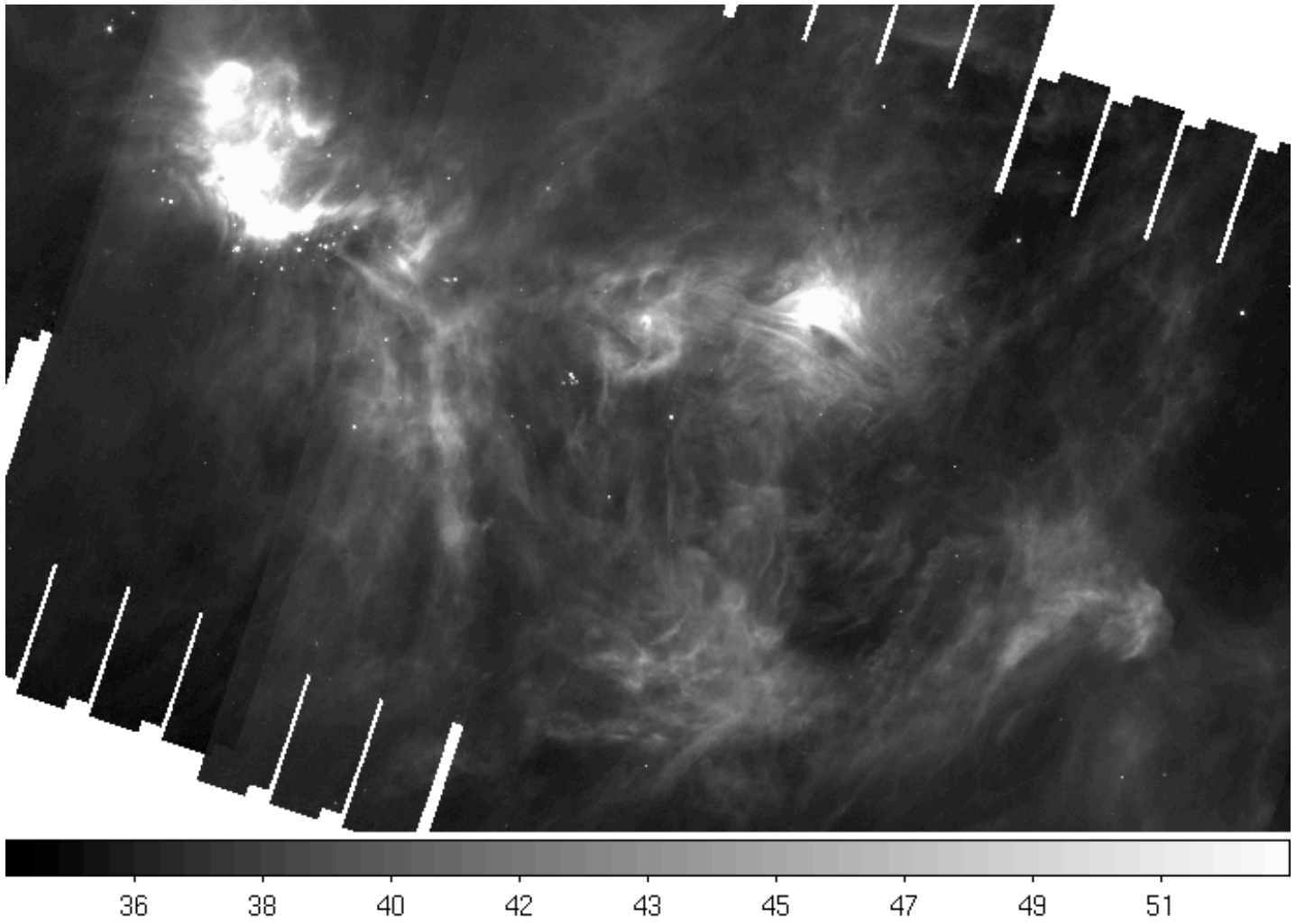


CARMA: Perseus

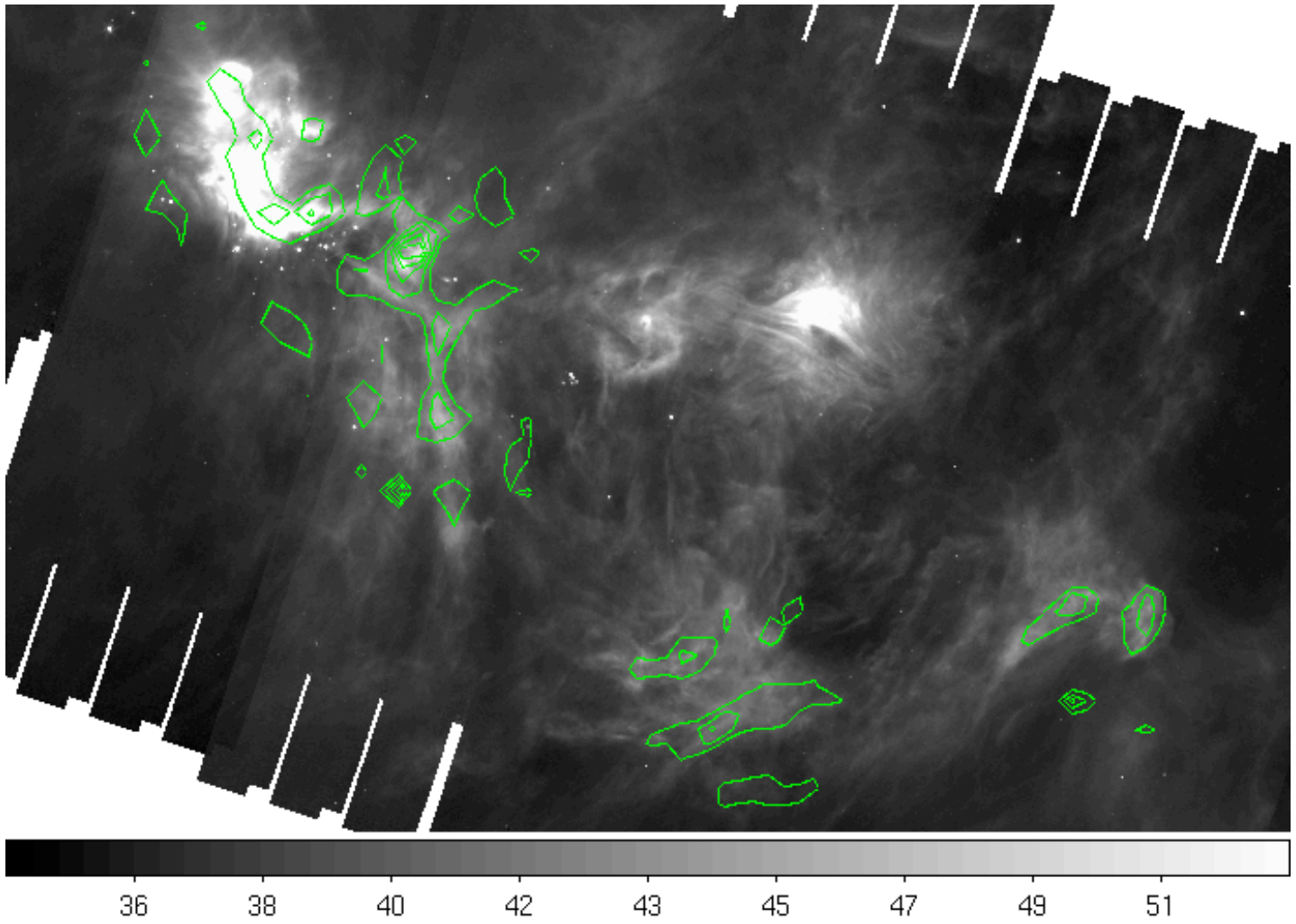


Primary beam: 8’

CARMA: Perseus



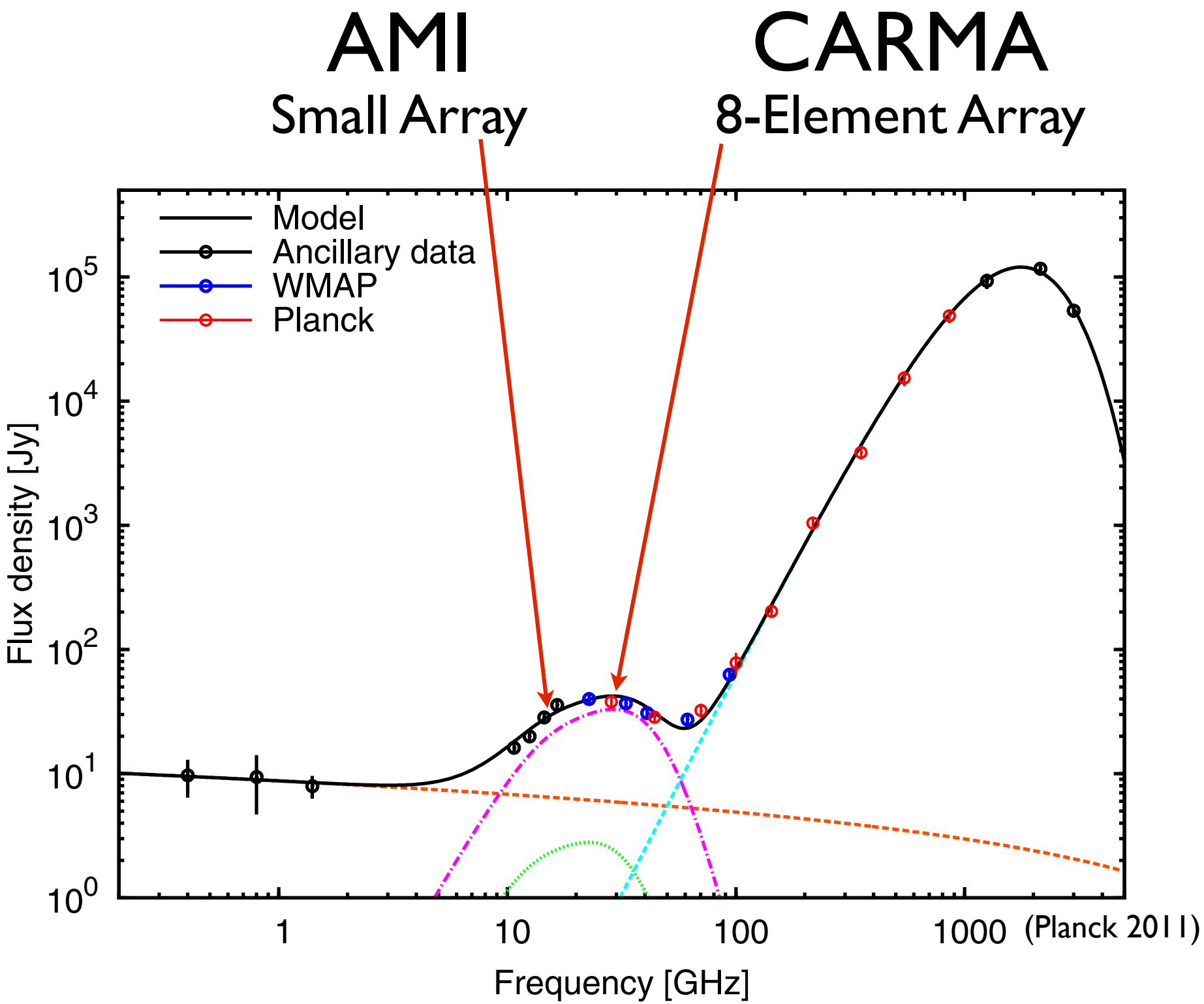
CARMA: Perseus



Arcminute Microkelvin Imager (AMI)

Combined Array for Millimeter-wave Astronomy (CARMA)

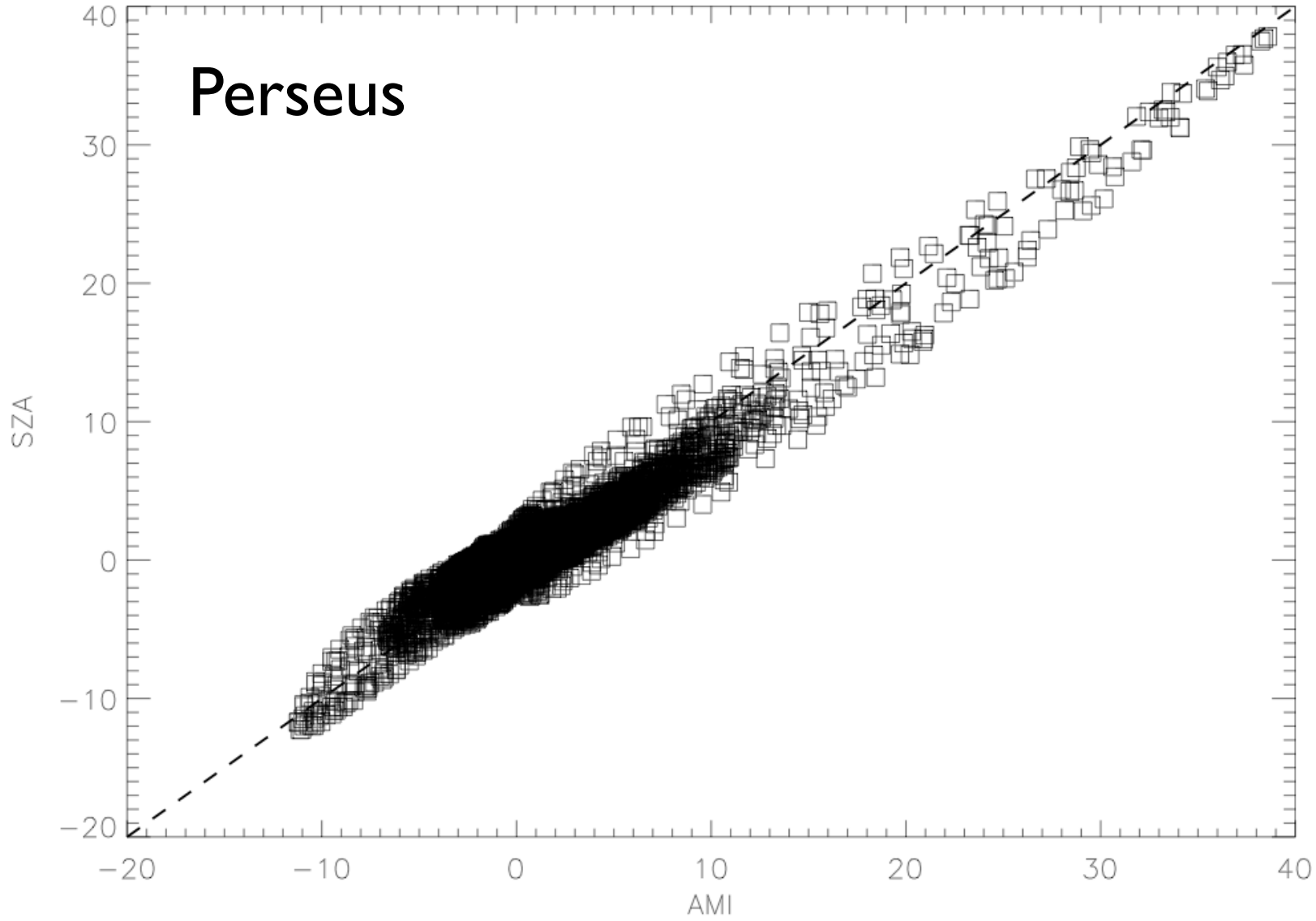
	AMI Small Array	CARMA 8-Element Array
Frequency	15 GHz	31 GHz
Bandwidth	6 GHz (8 x 750 MHz)	8 GHz (16 x 500 MHz)
Antennas	10 x 3.7-m	6 x 3.5-m
Shortest baseline	5 m / .25 kλ / 14’	4 m / 0.4 kλ / 9’
Longest baseline	20 m / 1 kλ / 3.5’	12 m / 1.2 kλ / 3’
Latitude	52°	37°


AMI
Small Array
CARMA
8-Element Array
Model
Ancillary data
WMAP
Planck
Flux density [Jy]
10^0
10^1
10^2
10^3
10^4
10^5
1
10
100
1000
Frequency [GHz]
(Planck 2011)

Spectral Index Maps

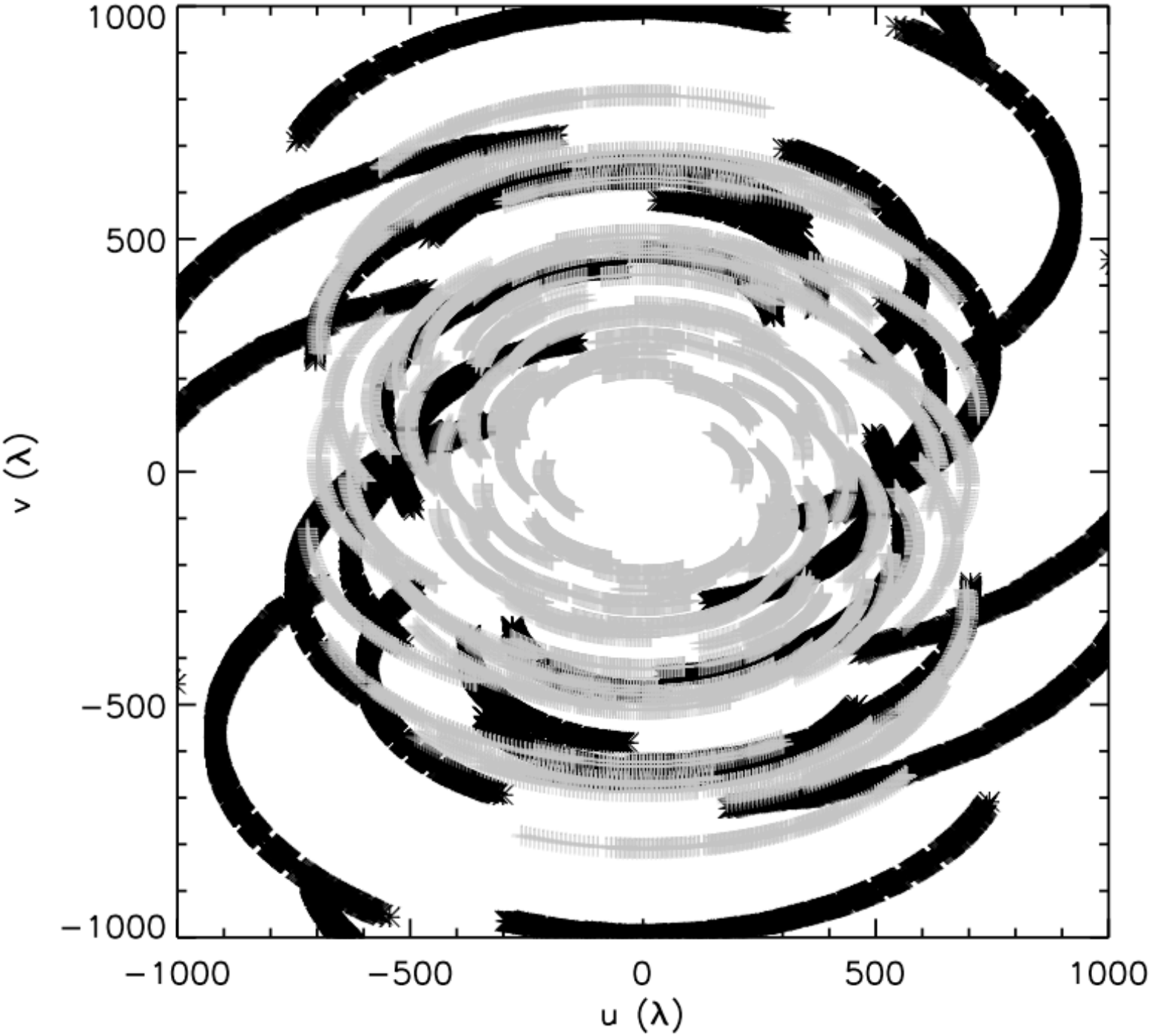
- Goal: 15-to-30 GHz spectral index map
- Important factors:
  - Flux calibration
    - ideally same flux calibrator
  - Matching uv coverage
  - Missing short spacings

Simulations



- assumed same flux for CARMA & AMI (= uniform flat spectral index)

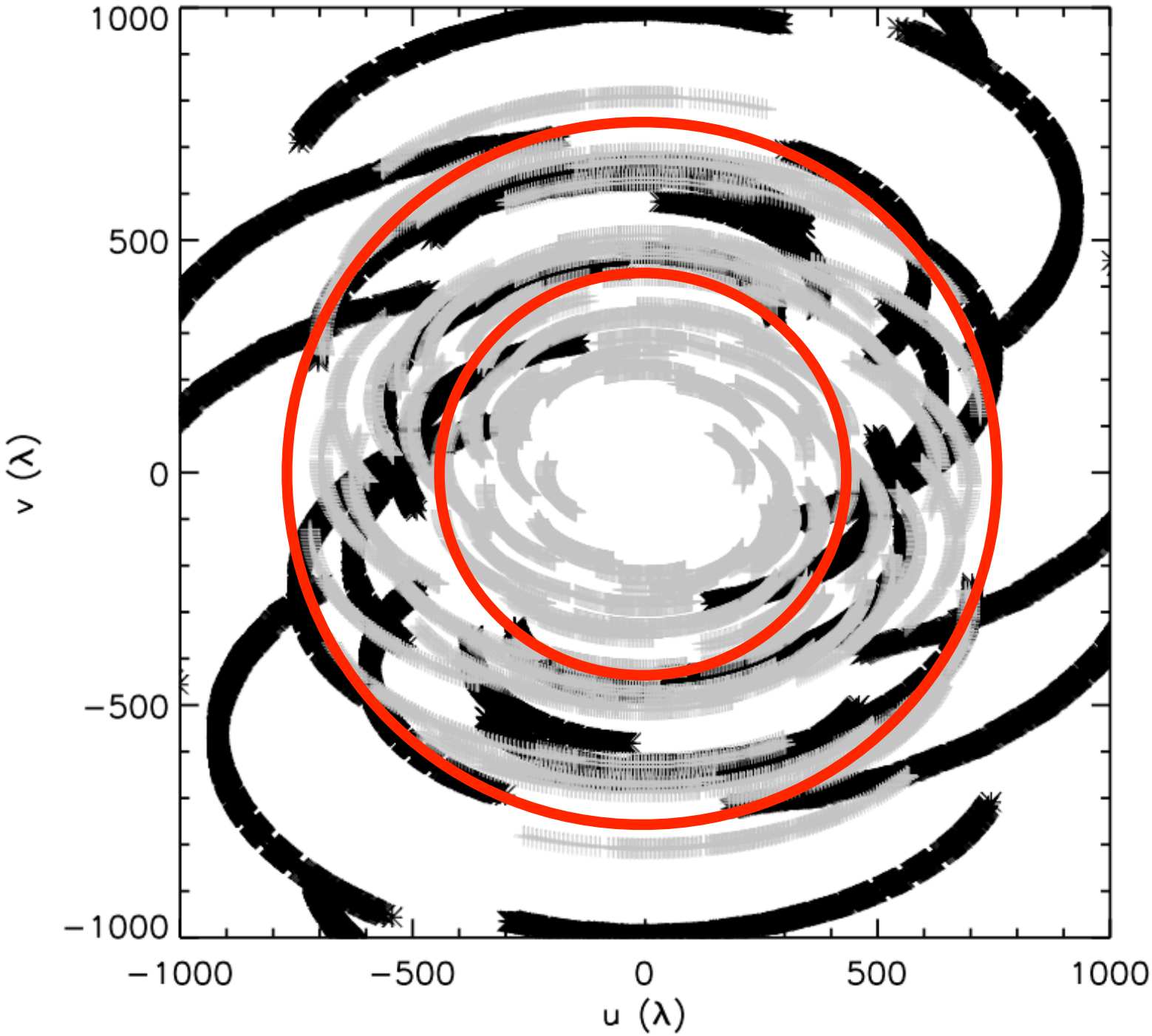
uv Coverage



uv Coverage

- Question: what is best way to match uv coverage?
  - uv-distance restriction
  - filter uv points based on distance from each other - cutoff distance:
    - 1/(mosaic size)?
    - 1/(primary beam)?

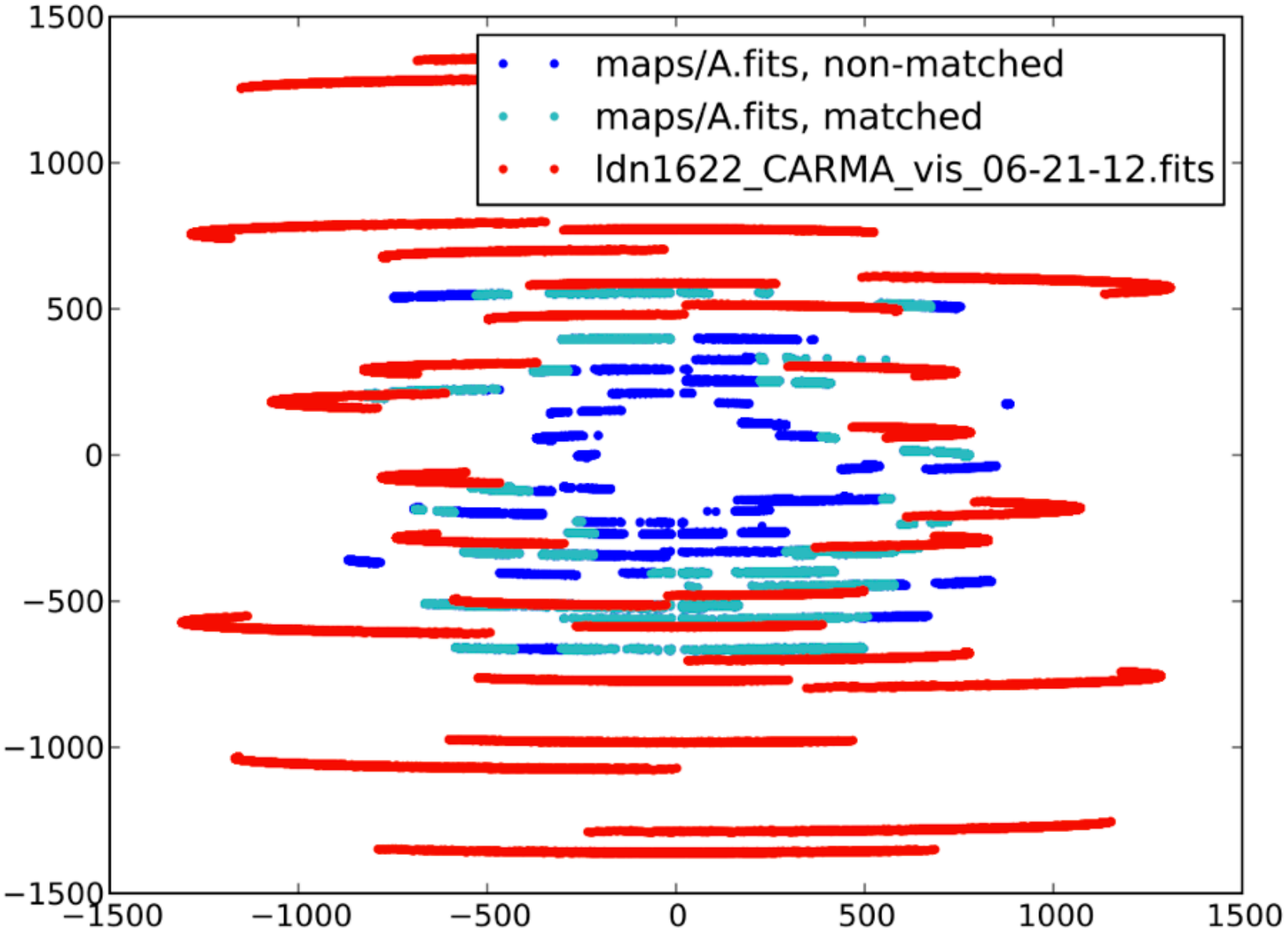
uv Coverage



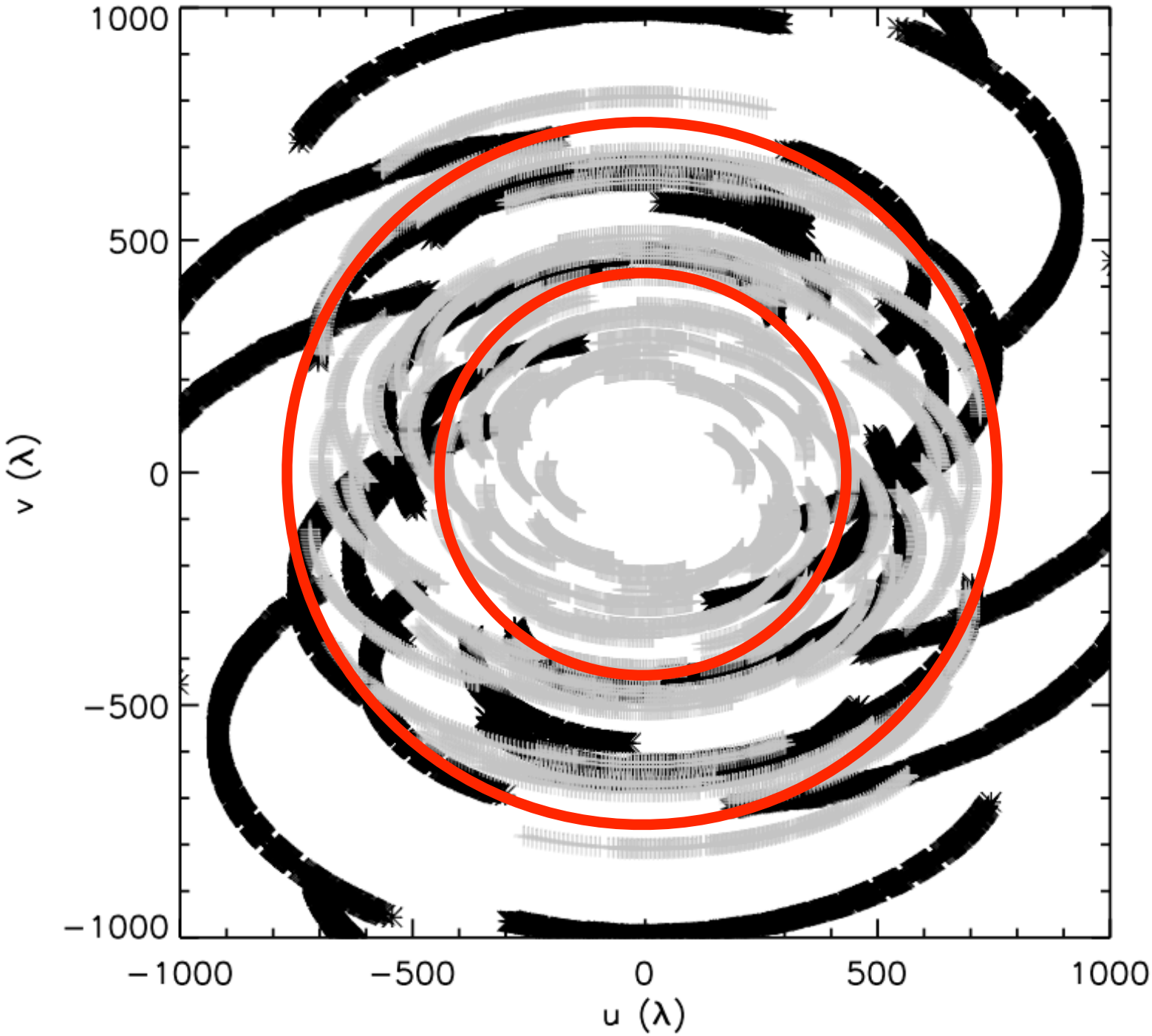
uv Coverage

- Question: what is best way to match uv coverage?
  - **uv-distance restriction**
  - filter uv points based on distance from each other - cutoff distance:
    - 1/(primary beam)?
    - N/(primary beam)? N ~ 0.5
    - 1/(mosaic size)?

uv Filtering



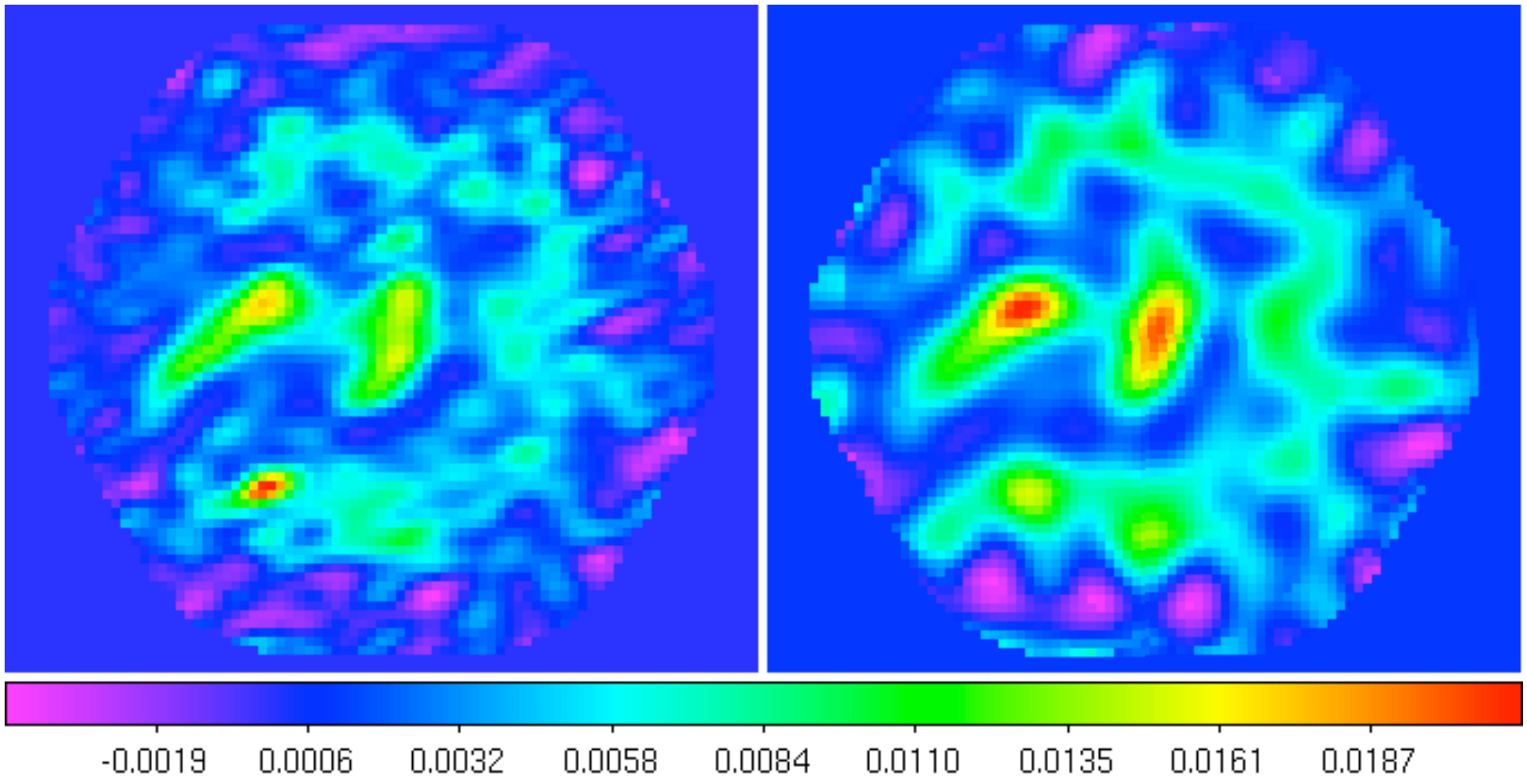
uv Coverage



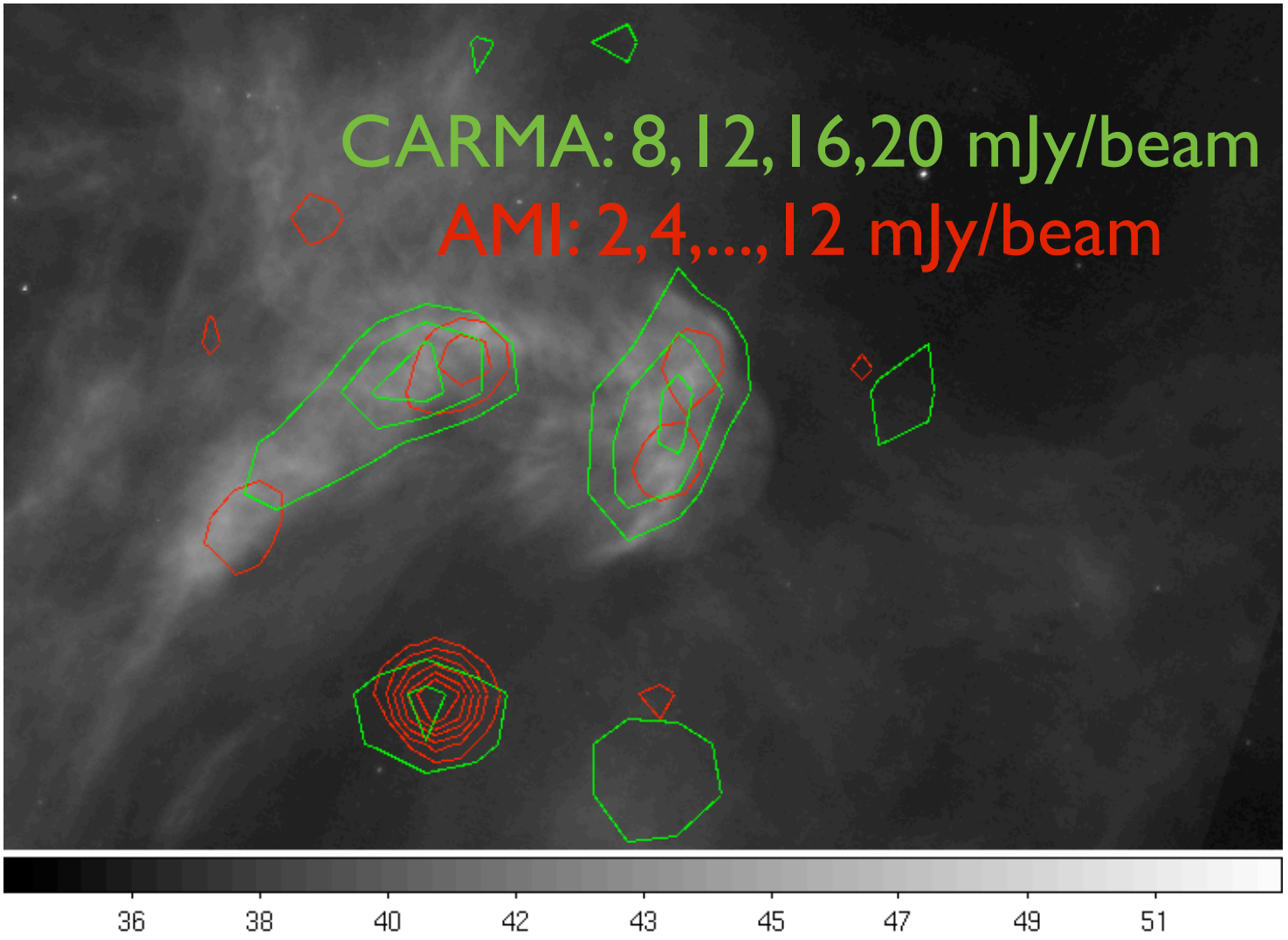
uv Filtering

Before

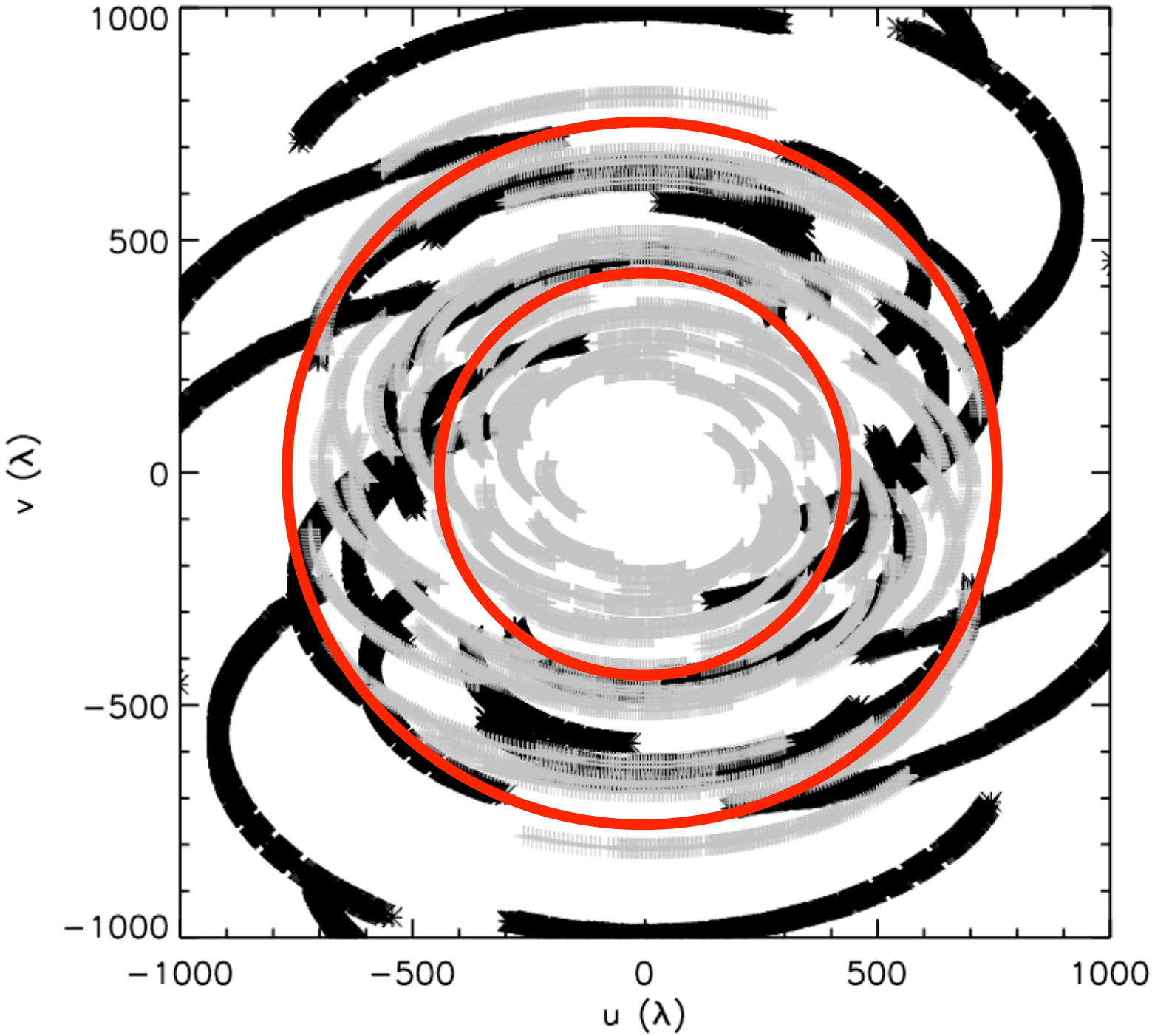
After



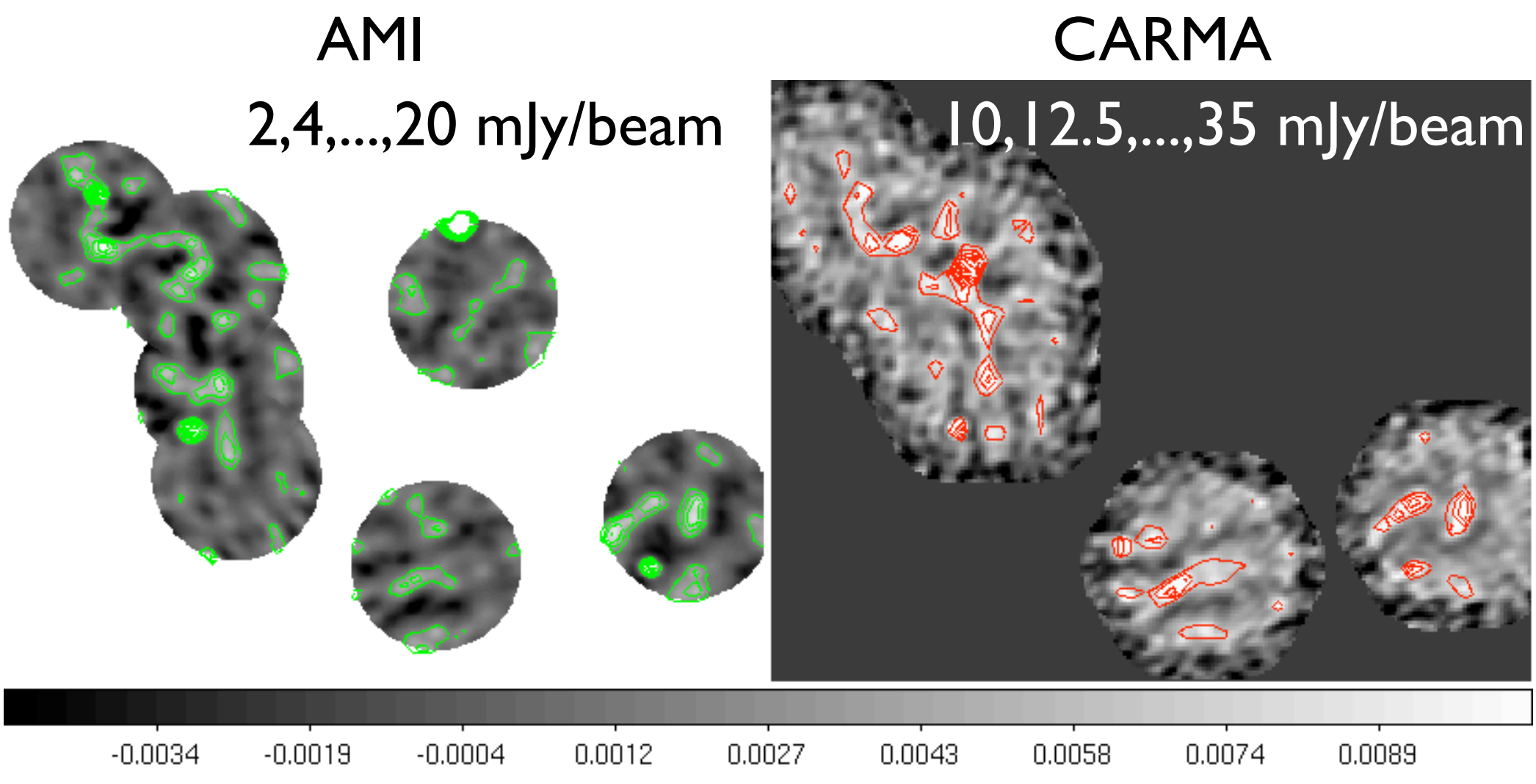
Perseus C: CARMA and AMI



uv Coverage



Perseus: CARMA and AMI



Free-free & Thermal Dust

- Free-free: planned ATA observations
- Thermal dust: Herschel 500 micron

Future

- More simulations
- More wavelengths - ATA, Herschel
- Zero spacings & short baselines
- Component separation?
- CARMA upgrade - 1 cm receivers on large dishes, long baselines - pair with AMI Large Array?
- Potential follow up: Planck, AMI SA rising spectral index sources