



# EMU: Evolutionary Map of the Universe

**WESTERN SYDNEY**  
UNIVERSITY



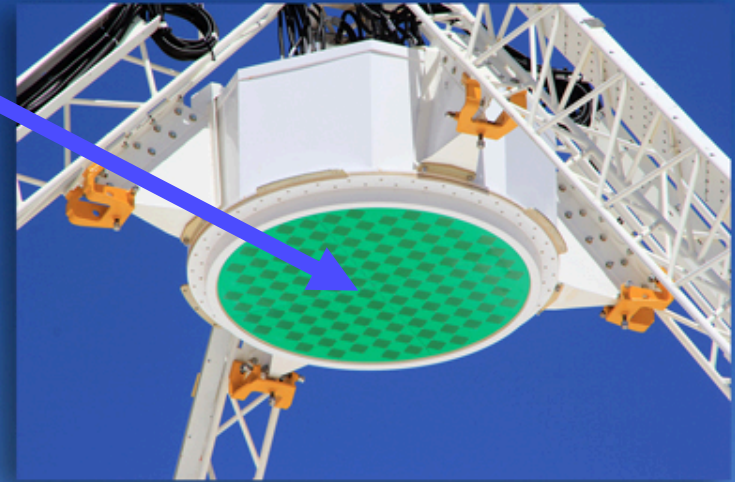
**Ray Norris, Western Sydney University &  
CSIRO Astronomy & Space Science,**





# Key ASKAP innovation

**PAF = Phased Array Feed**



- **Phased Array Feeds (PAF) give 30 sq deg FOV and an amazing survey speed**

# Galactic Centre

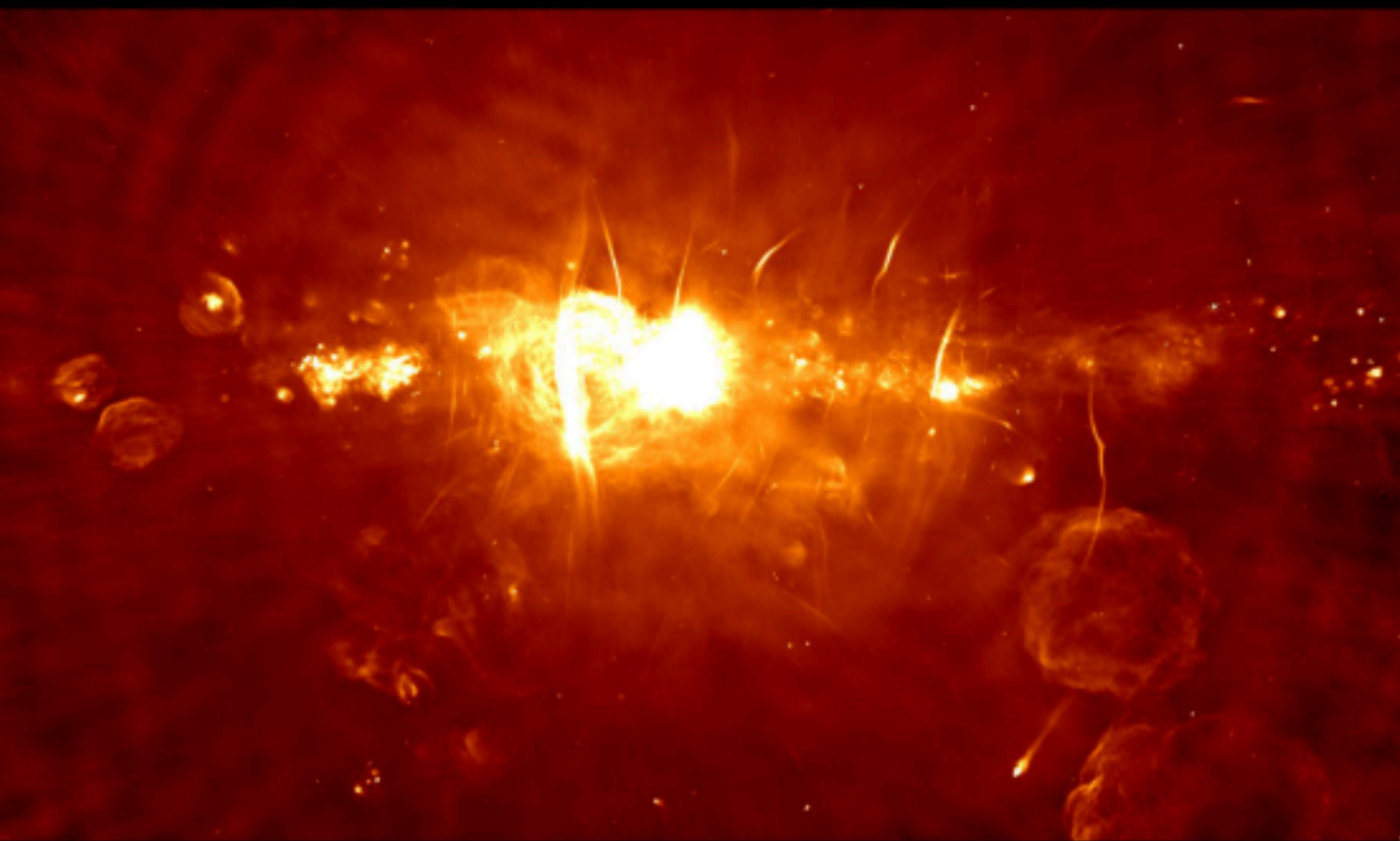


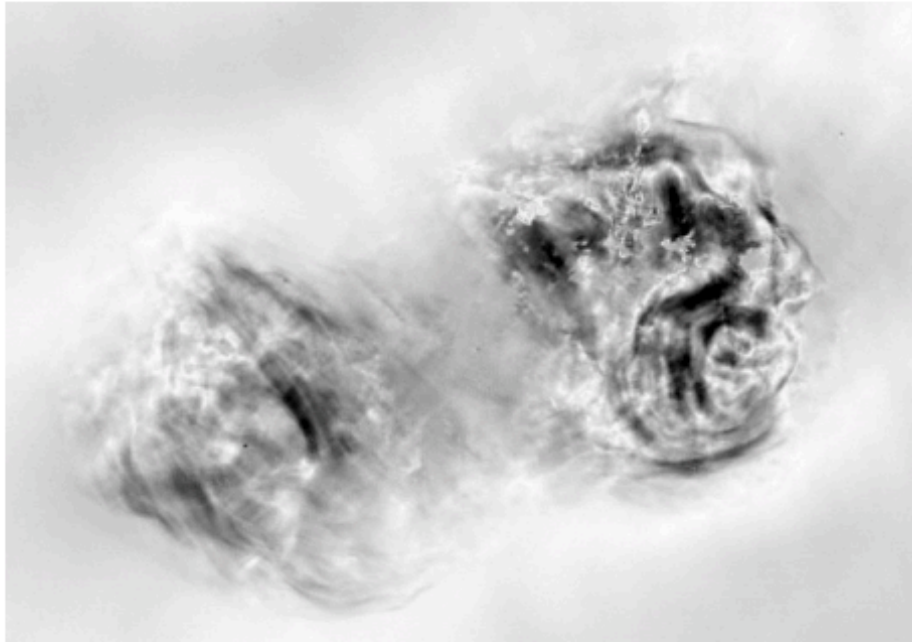
Image by Emil Lenc



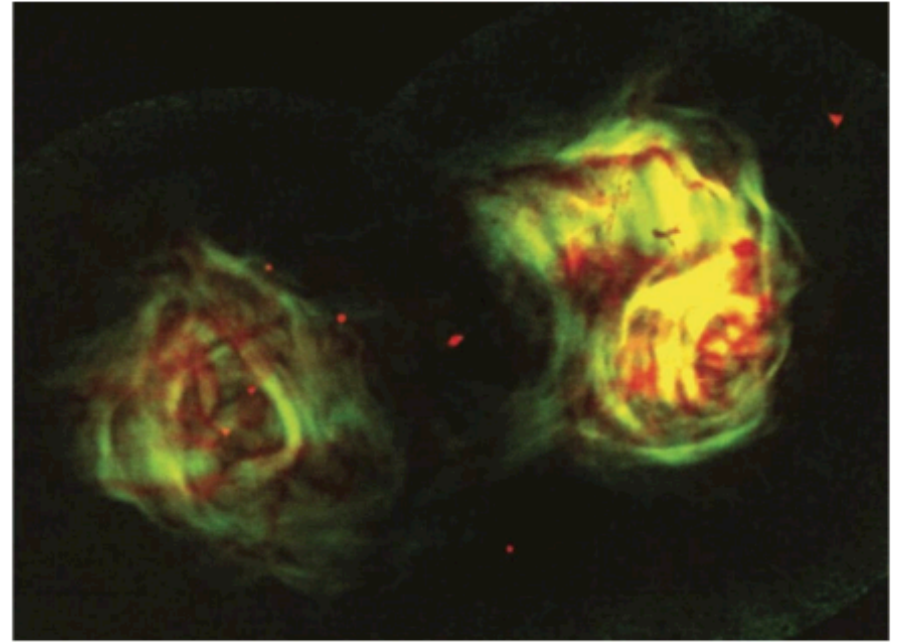
Fornax A



# Fornax A linearly polarised intensity



ASKAP image courtesy of Craig Anderson



VLA image courtesy of NRAO/AUI

# EMU: the ASKAP continuum survey

Evolutionary Map of the Universe

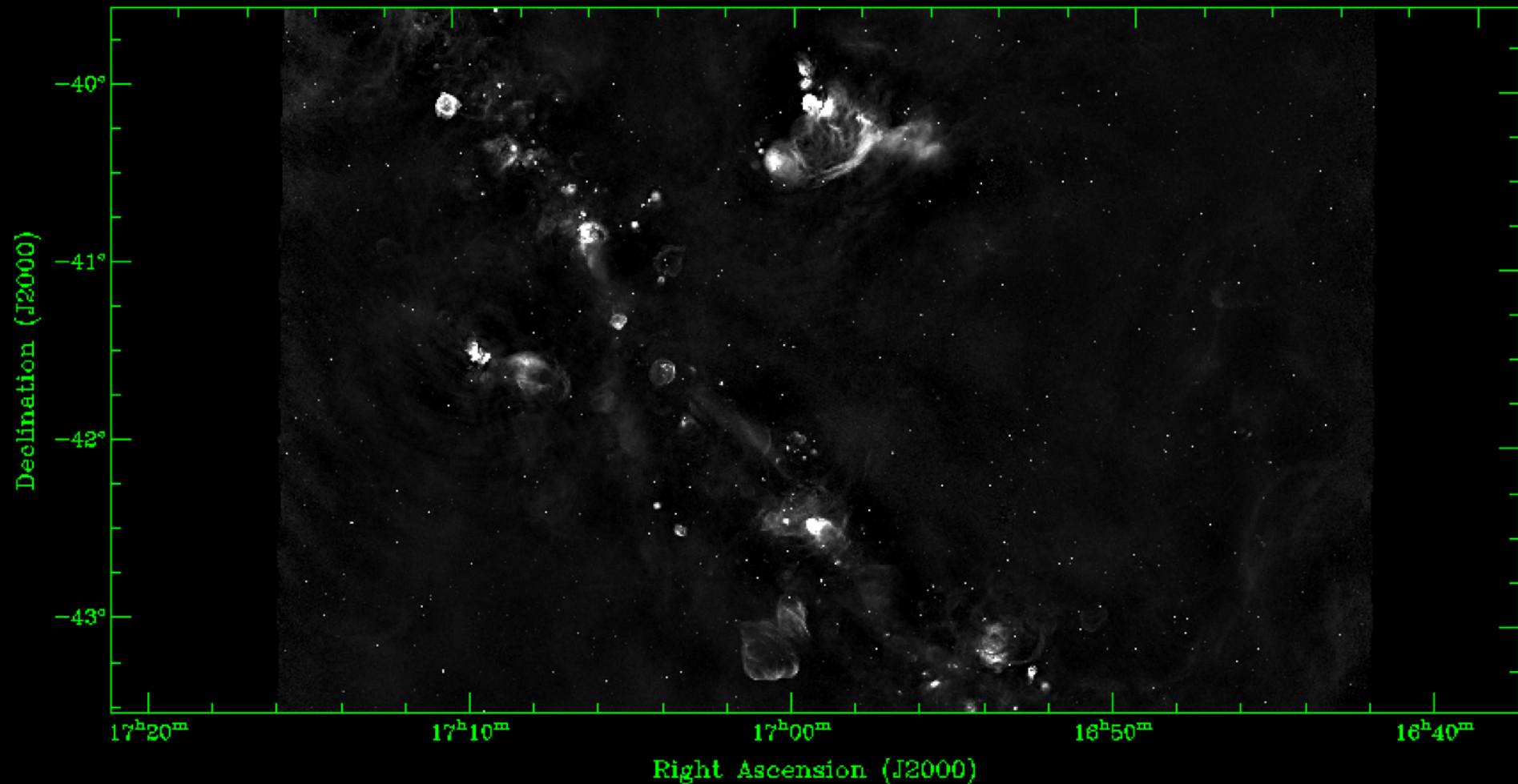
- **Deep radio image of 75% of the sky (to declination  $+30^\circ$  )**
- **Will detect and image ~70 million galaxies at 20cm**
  - c.f. 2.5 million detected over the entire history of radio-astronomy so far
- **Science-driven international project**
  - 300 scientists in 21 countries
- **Will deliver science-ready products, including:**
  - Cross-identification with optical/IR/Xray data
  - Ancillary data (redshifts etc)
  - Algorithms to “discover the unexpected” (WTF?)



EMU will deliver the deepest-ever radio image of the extragalactic sky (image shows part of the EMU pilot survey)



EMU will deliver the deepest-ever survey of the radio continuum in the Galactic Plane  
(image show EMU Early Science data in the SCORPIO field)



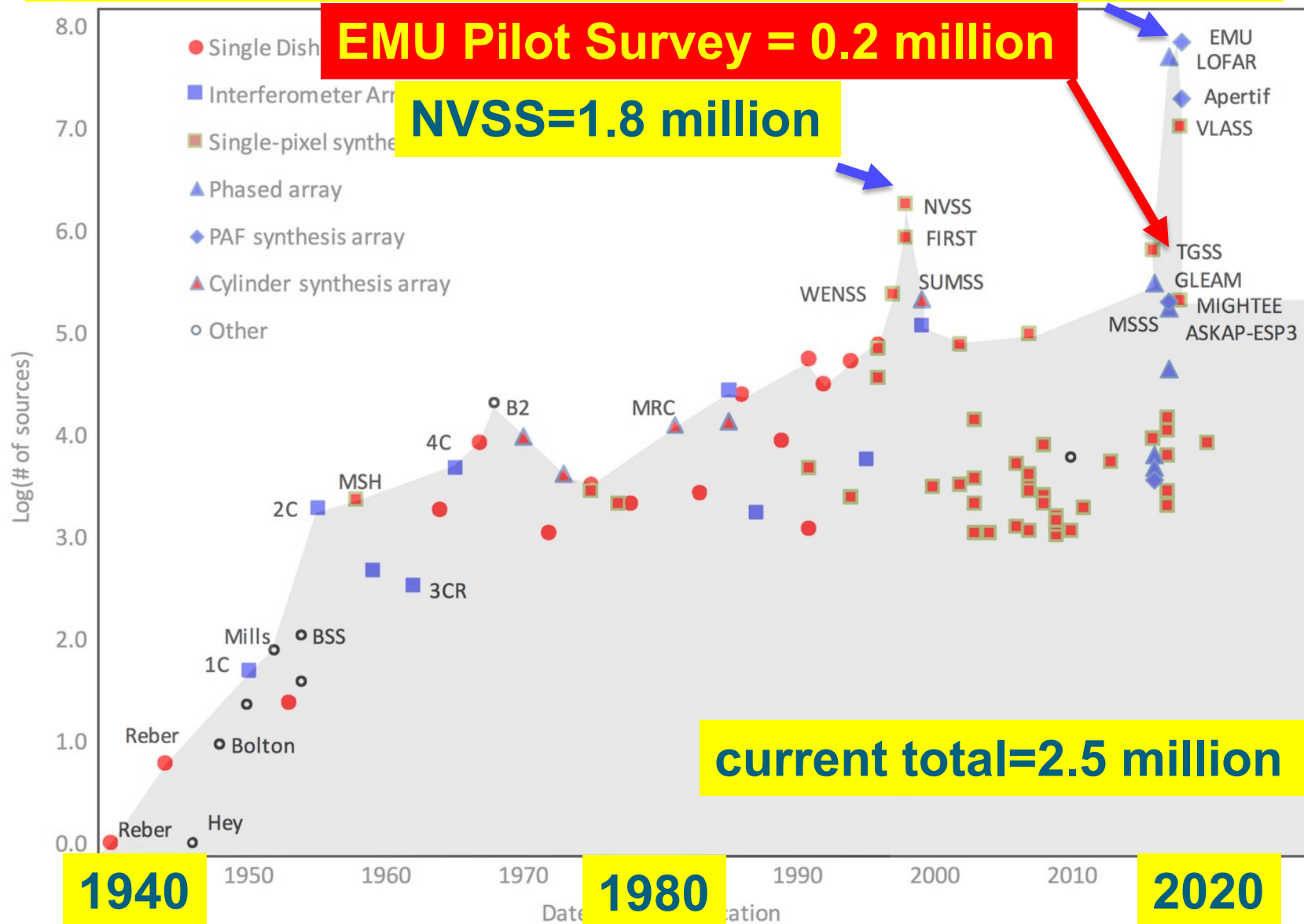


# Size of radio continuum surveys over time

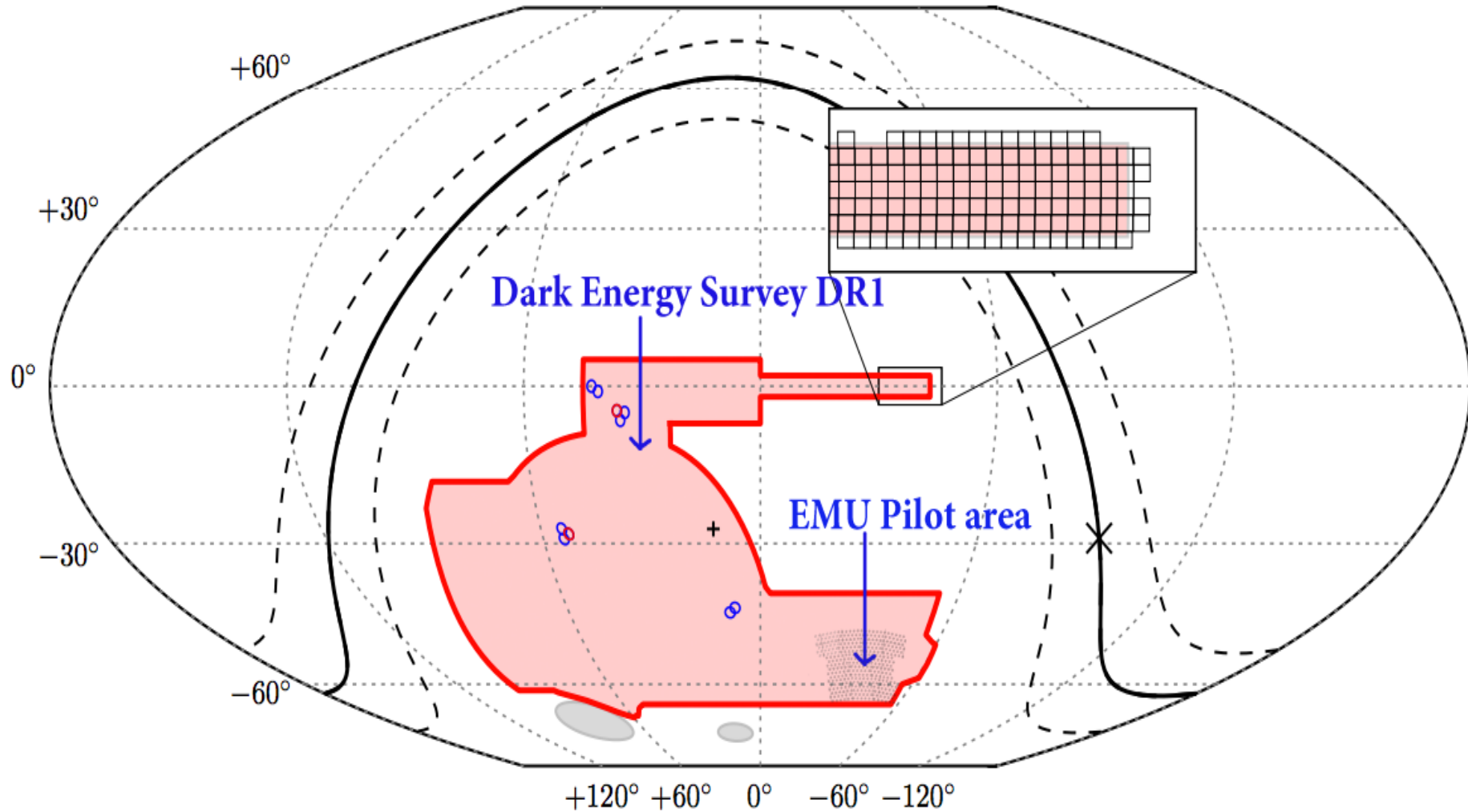
**ASKAP Radio Continuum survey: EMU = 70 million**

**EMU Pilot Survey = 0.2 million**

**NVSS=1.8 million**



# The EMU Pilot Survey (1% of EMU)



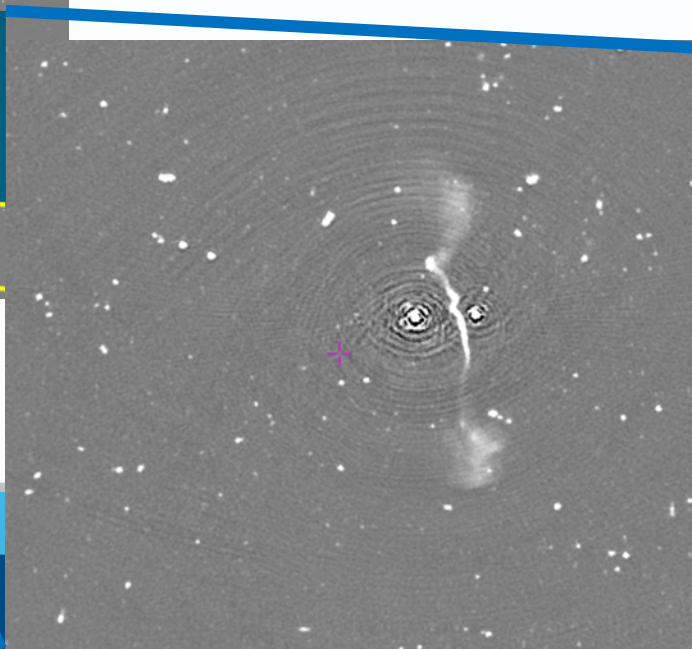
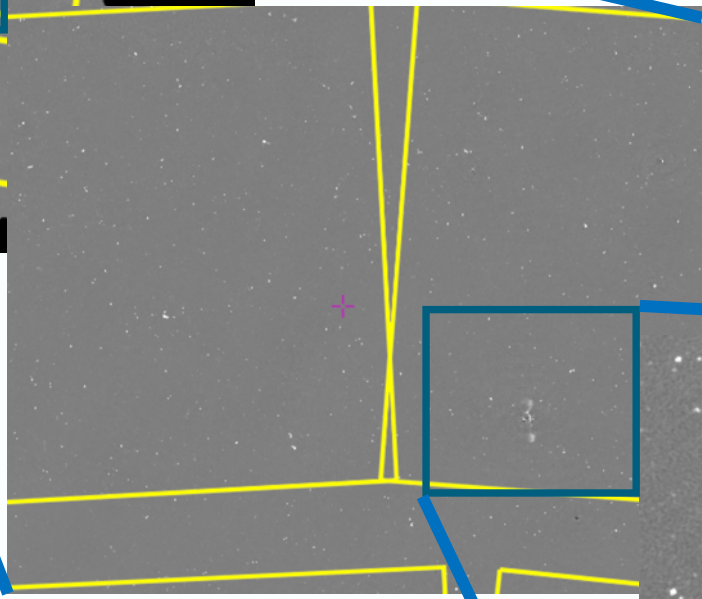
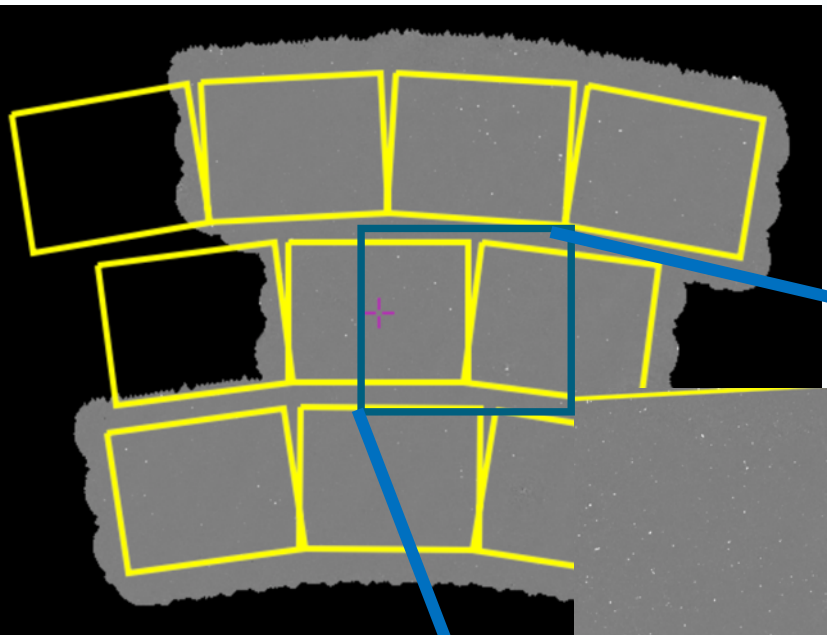


## 2. The EMU Pilot Survey

- **1% of EMU – almost complete**
- Detected about 250,000 sources
- Unprecedented sensitivity to low-surface-brightness structures
- Sampling a new area of parameter space compared to previous radio surveys
- Several unexpected discoveries
- Multiwavelength data essential to understand science

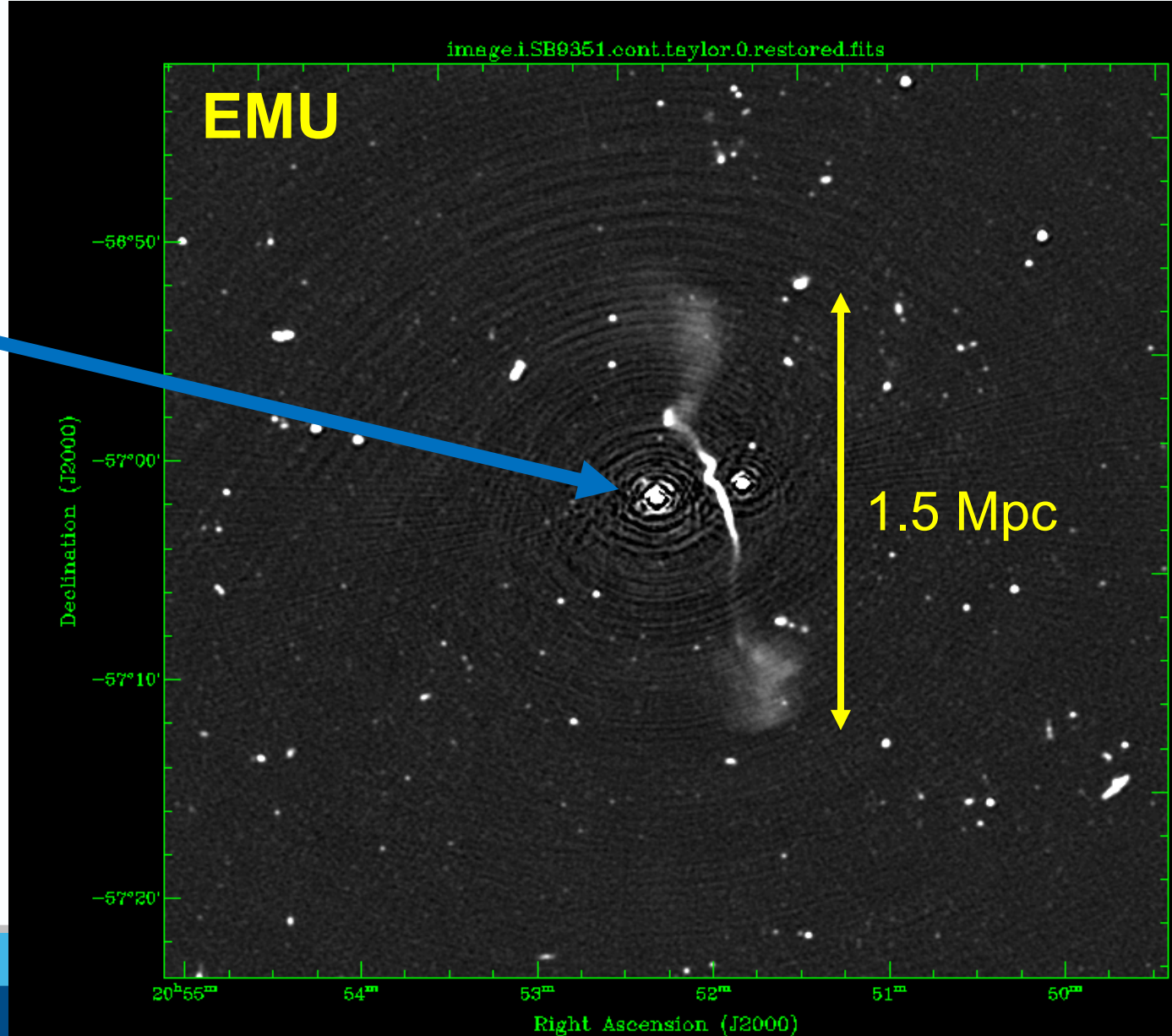
# The EMU Pilot Survey

Access this zoomable image on [emu-survey.org](http://emu-survey.org)



# Wiggly jets and a Giant Radio Galaxy

IC5063

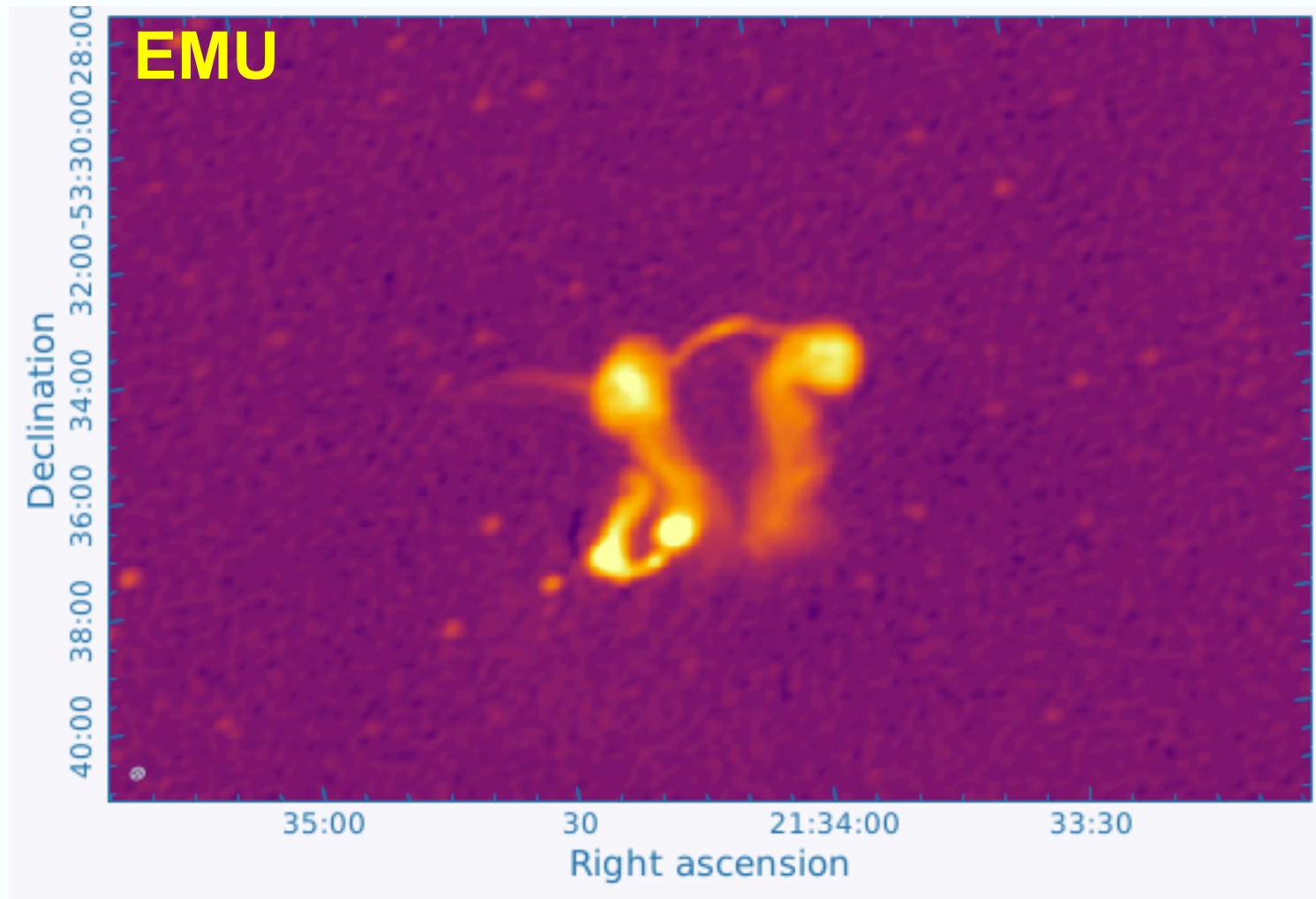




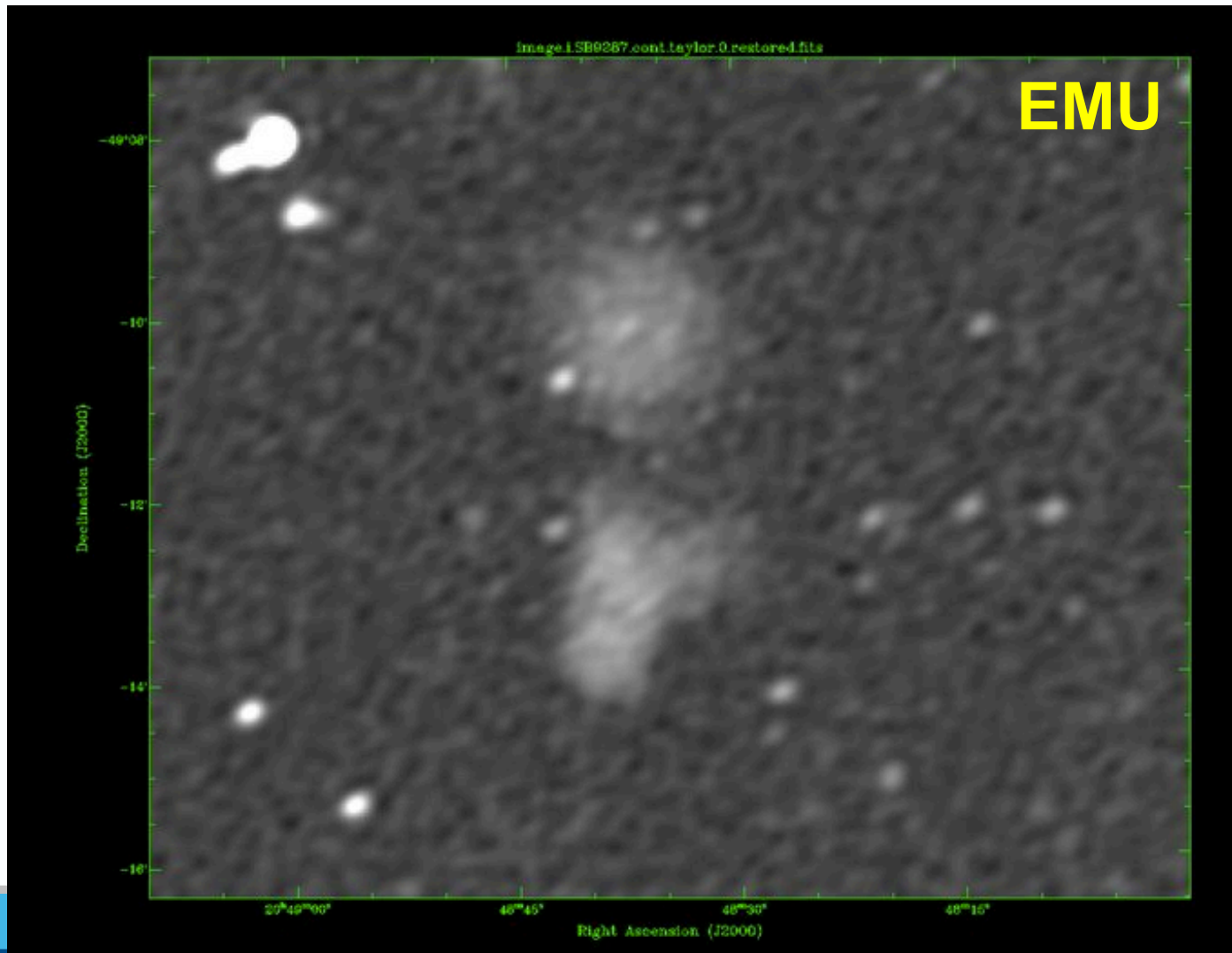
# The EMU Pilot Survey

- Survey an area of about 300 sq deg in the Dark Energy Survey field at 800-1088 MHz.
- All observations completed, data reduction 90% complete.
- Rms of 25-35  $\mu\text{Jy}/\text{beam}$ , resolution  $\sim 12$  arcsec
- Detected about 200,000 sources
- Unprecedented sensitivity to low-surface-brightness structures
- Sampling a new area of parameter space compared to previous radio surveys
- Several unexpected discoveries
- Multiewavelength data essential to understand science

# Lots of weird things in the EMU Pilot



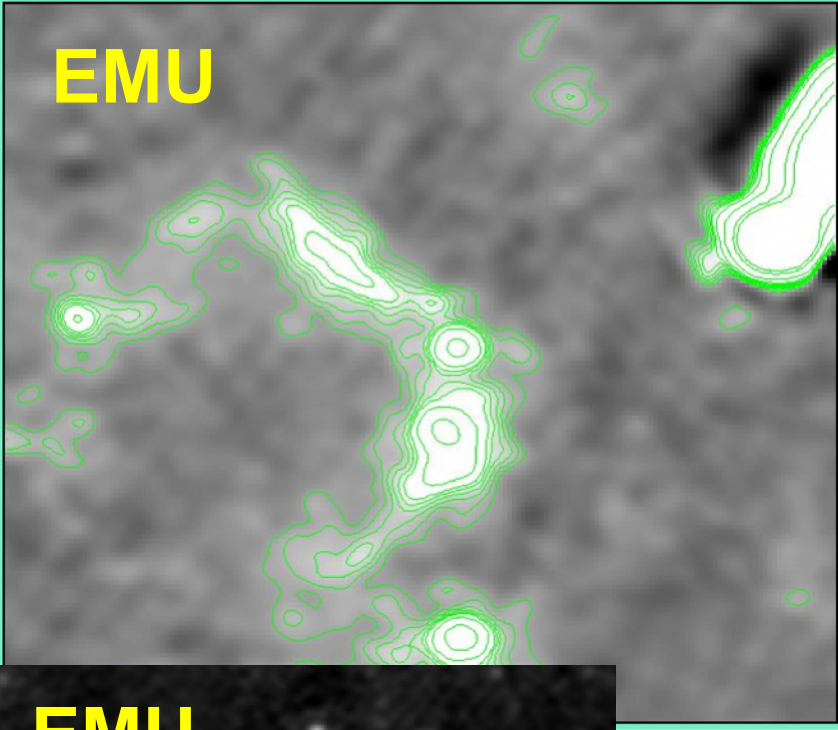
# “Smoking-gun” remnant galaxies (and Giant Radio Galaxies)



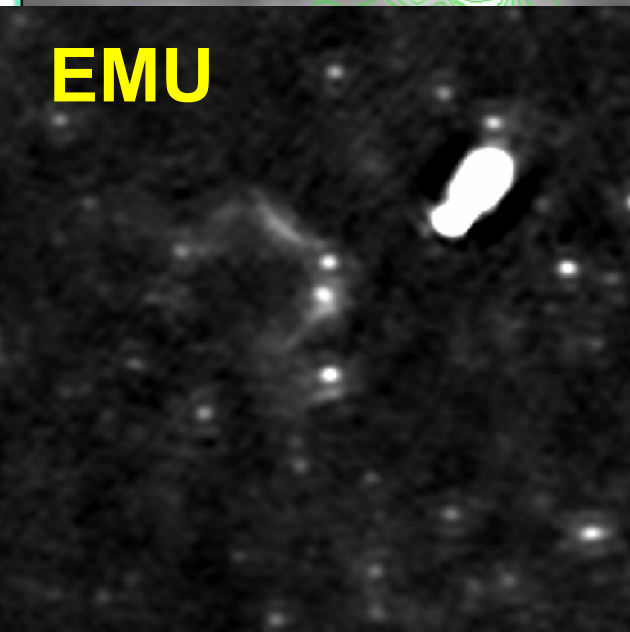


# Wisps and filaments

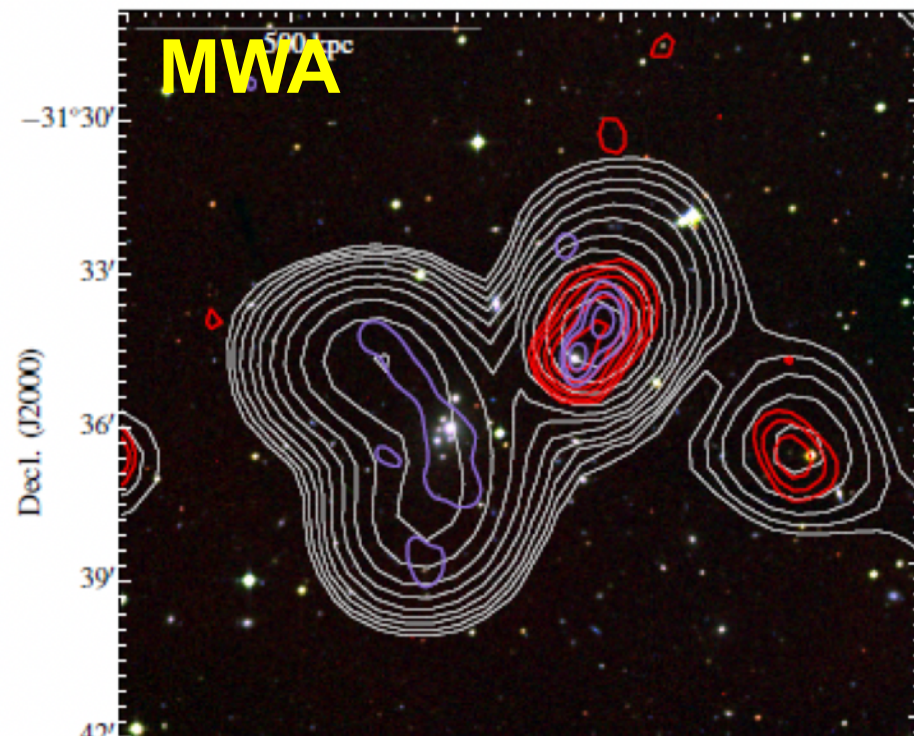
EMU



EMU



MWA



- First seen in the ASKAP Early Science image of Abell S1136
- Appears as a diffuse blob in MWA data
- Now seen in several clusters in the Pilot Survey.
- Similar to, but different morphology from, previously seen “relics”
- Relics? Shock-excited electrons?

*P. Macgregor et al., in preparation*

*We acknowledge the Wajarri Yamaji people as  
the traditional owners of the ASKAP site*

**YOU ARE NOW LEAVING THE  
MURCHISON RADIO-ASTRONOMY  
OBSERVATORY**

**THANK YOU FOR BEING RADIO QUIET**

