



# ASKAP HI imaging of a nearby spiral galaxy

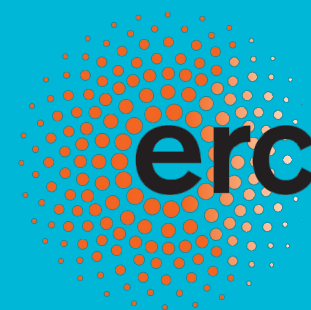
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OAC

Osservatorio Astronomico di Cagliari



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European Research Council

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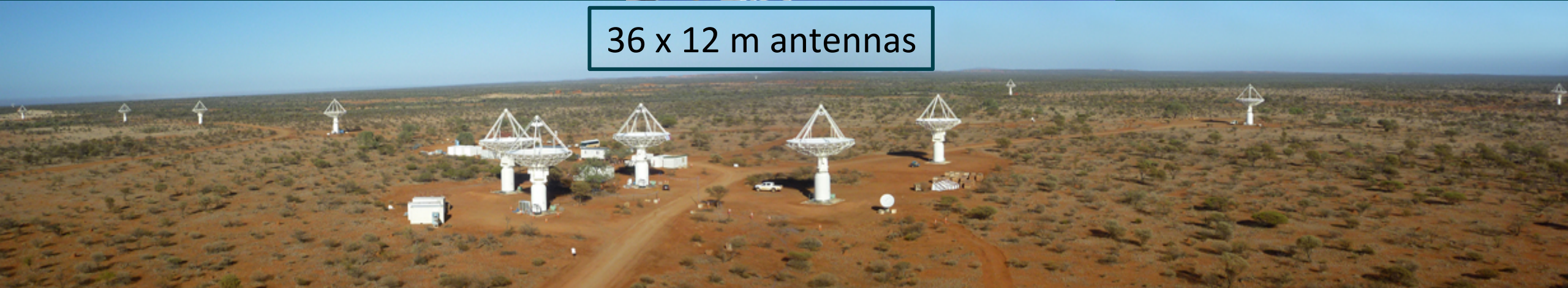
# Australian Square Kilometre Array Pathfinder (ASKAP)

- ✧ 6 km max baseline
- ✧ Frequency range = 700 MHz – 1.8 GHz
- ✧ 300 MHz bandwidth
- ✧ SKA pathfinder:
  - ✧ New mount design
  - ✧ New receivers

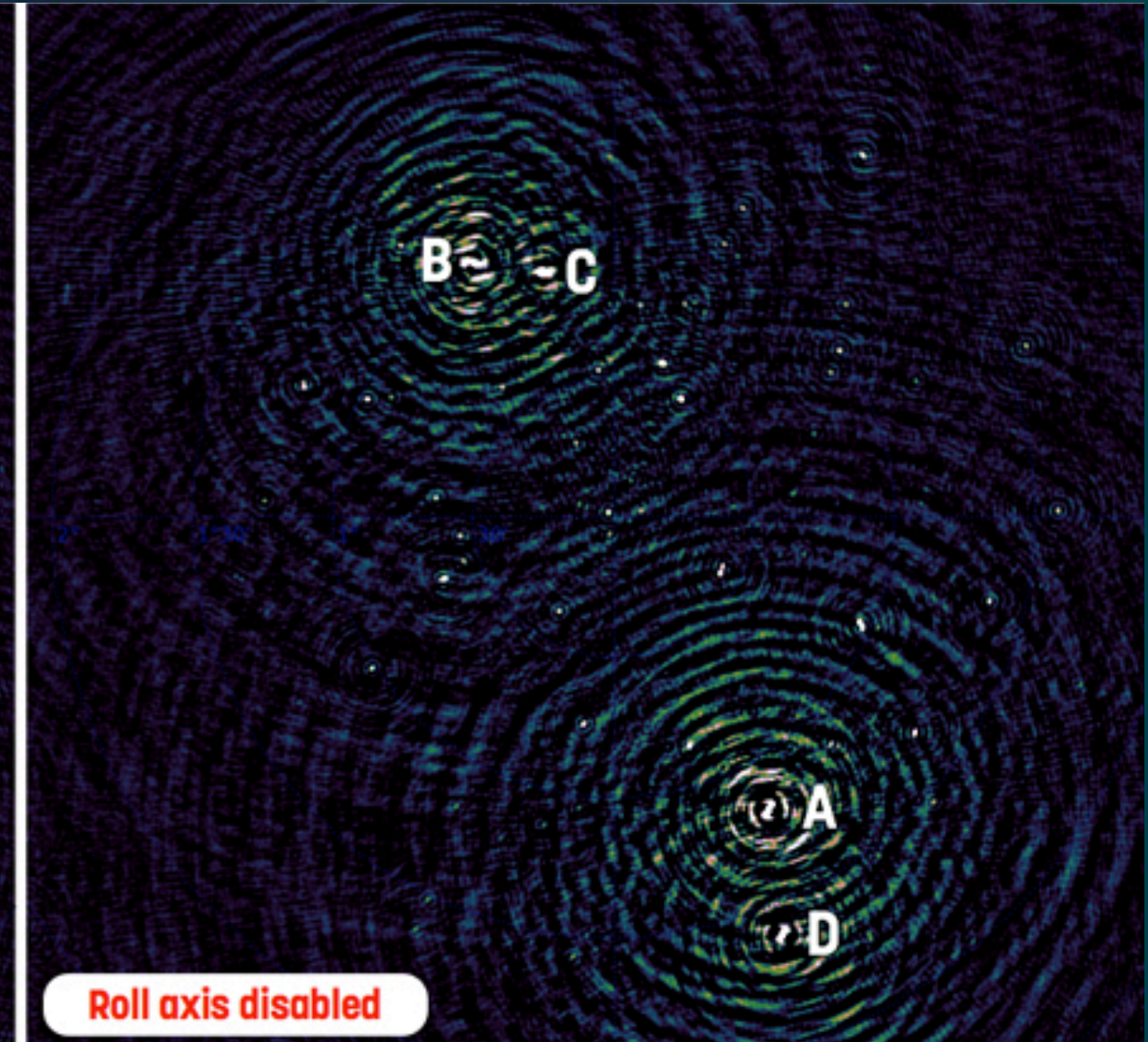
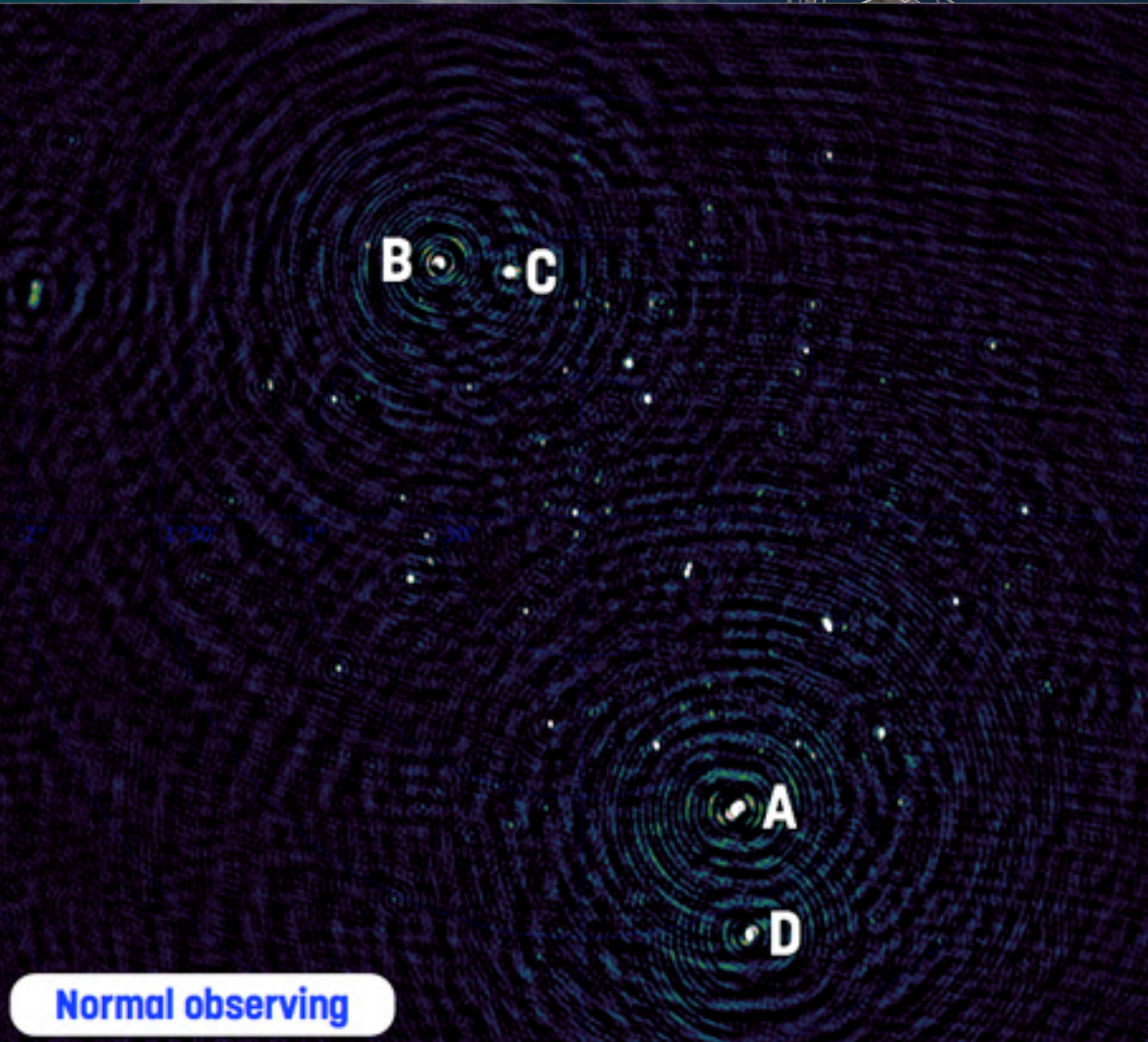


- ✧ Future of radio astronomy
- ✧ Other telescopes are buying or building PAFs

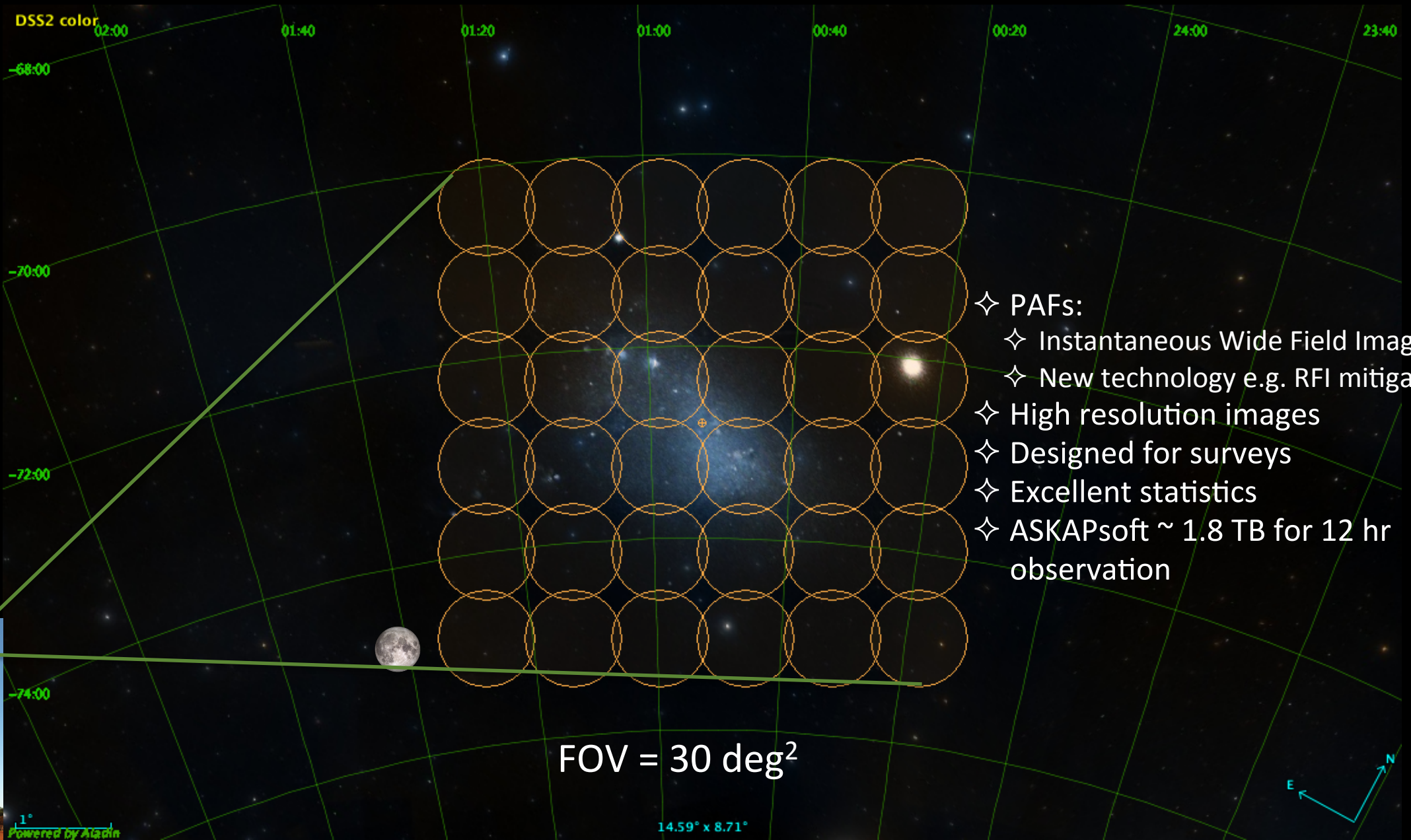
36 x 12 m antennas



# What makes ASKAP special?



# What makes ASKAP special?



- ✧ PAFs:
  - ✧ Instantaneous Wide Field Images
  - ✧ New technology e.g. RFI mitigation
- ✧ High resolution images
- ✧ Designed for surveys
- ✧ Excellent statistics
- ✧ ASKAPsoft ~ 1.8 TB for 12 hr observation

FOV = 30 deg<sup>2</sup>

# ASKAP Surveys

- ✧ Continuum - **EMU**
- ✧ Spectral line:
  - ✧ Emission - **WALLABY, DINGO, GASKAP**
  - ✧ Absorption - **FLASH**
- ✧ Polarization - **POSSUM**
- ✧ Transients - **CRAFT, VAST**

And more...

Observe **75%** of the sky

Detect **70 million** radio continuum galaxies

Detect **500 000** galaxies in HI

Dedicated FRB survey



# ASKAP status

## Properties:

- 28 antennas
- 14.5 hrs of
- 19 x 14 arc
- RMS ~ 17  $\mu$
- Dynamic r
- Approachi

✧ All hardware

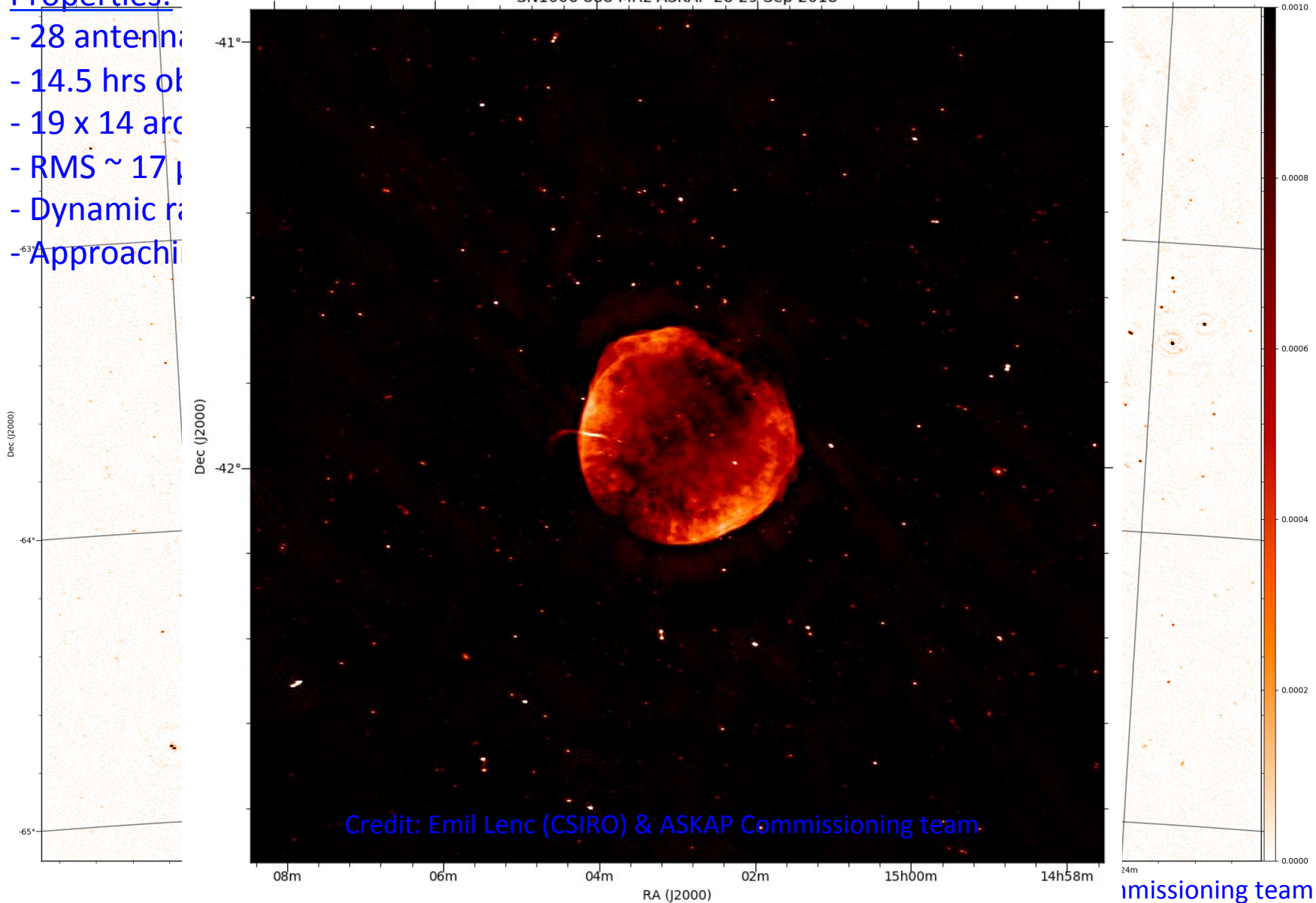
✧ Incremental

✧ 1 - 12 antennas

✧ 2 - 18 antennas

✧ 3 - 28 antennas

✧ 4 - Full array



missioning team

# ASKAP-28+ Pilot surveys

- ✧ Commencing in Feb 2019
- ✧ Observatory projects to further commission and develop ASKAP:
  - ✧ Shallow all-sky survey
  - ✧ Deep survey of the GAMA fields
  - ✧ Fields with complex and extended emission (e.g. Galactic Plane, Centaurus A)
- ✧ Correlate the final 8 antennas
- ✧ 100 hours with **ASKAP-36** for each survey
- ✧ Crucial for observing, calibrating and data reduction for huge data volumes



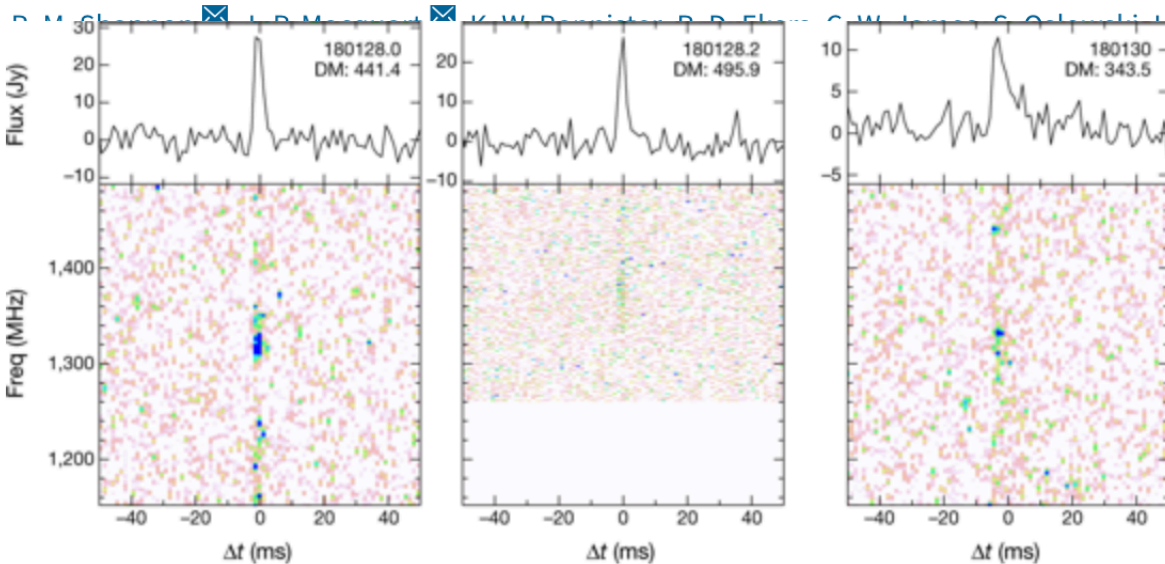
# ASKAP recent highlights

**nature**  
International journal of science

**nature**  
**astronomy**

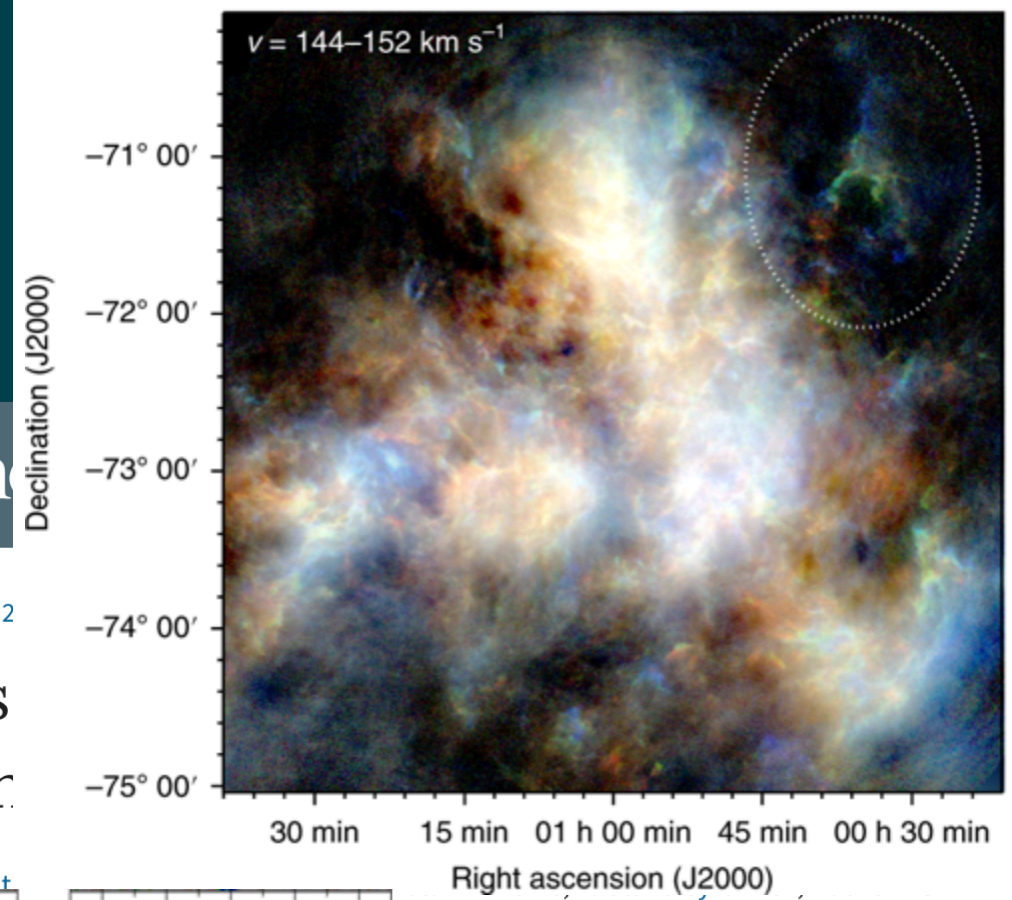
Letter | Published: 10 October 2018

## The dispersion–brightness relation for fast radio bursts from a wide-field survey



Letter | Published: 2

## Cold gas in the Magellanic Clouds



Collier, A. P. Chippendale, T. Franzen, Gülay  
ell, D. McConnell, A. Popping, Jonghwan Rhee, C.



# Widefield ASKAP L-band Legacy All-sky Blind surveY (WALLABY)

## ✧ High resolution neutral hydrogen (HI) maps

- ✧ Covering 75% of the entire sky ( $-90 < \text{dec} < 30$ )
- ✧ Velocity range of  $-2\,000 < v < 78\,000$  km/s
- ✧ Angular resolution of  $\sim 30$  arcsec
- ✧ Spectral resolution of 4 km/s channel
- ✧ Sensitivity of  $\sim 1.7$  mJy per channel

## ✧ Should detect 500,000+ gas-rich galaxies (Duffy et al. 2012)

## ✧ Largest, most homogenous sample of HI galaxies yet

## ✧ Study the properties and environments of galaxies

- ✧ E.g. HI mass function, evolution of cool gas, missing satellite problem, star formation etc...



- ✧ Array phase 2: 10 – 16 antennas
- ✧ 48 – 240 MHz bandwidth
- ✧ Played a huge role in commissioning, esp. ASKAPsoft.
- ✧ Enough observations to reach WALLABY sensitivity.
- ✧ Do ‘WALLABY’ science!

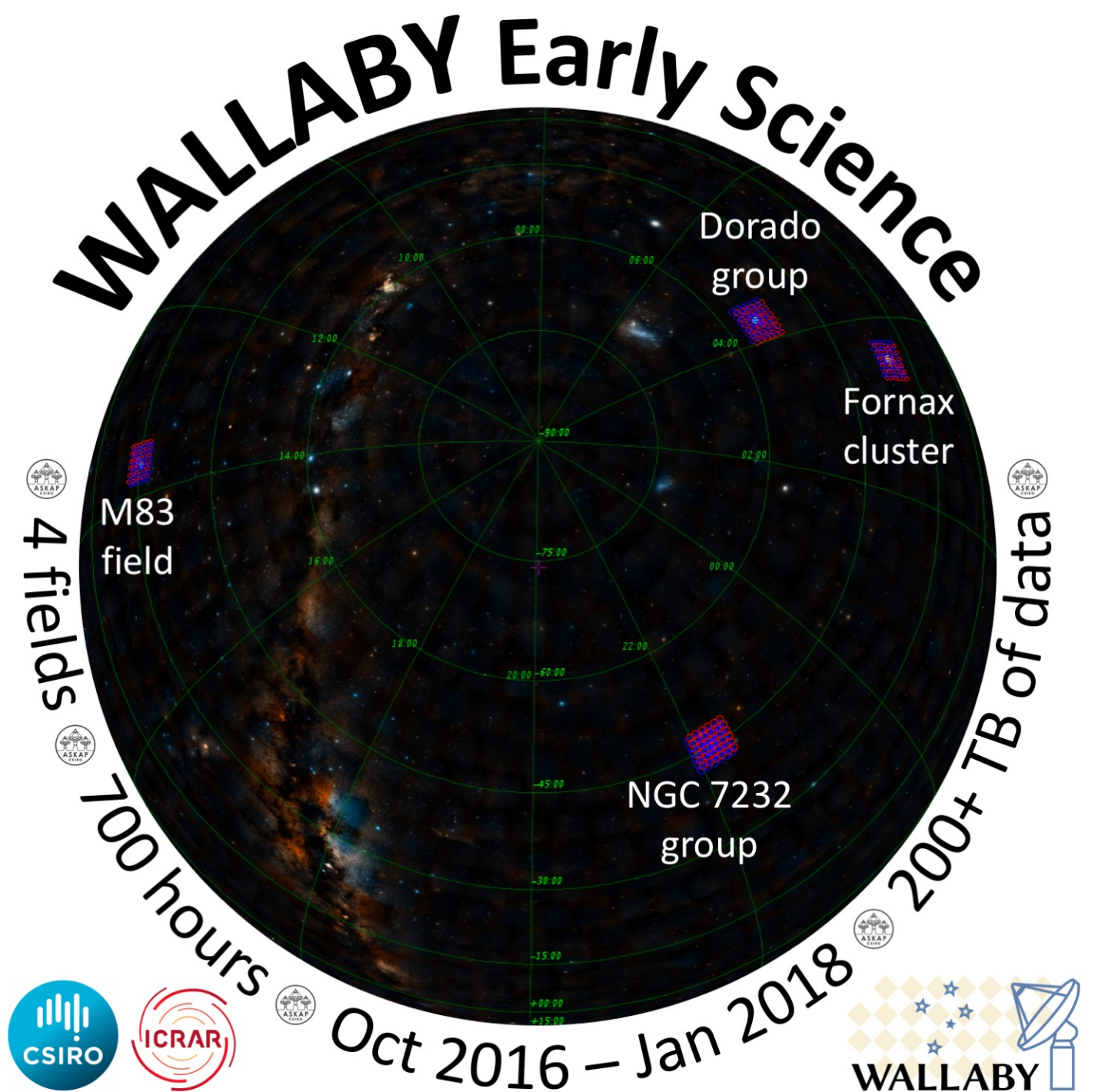
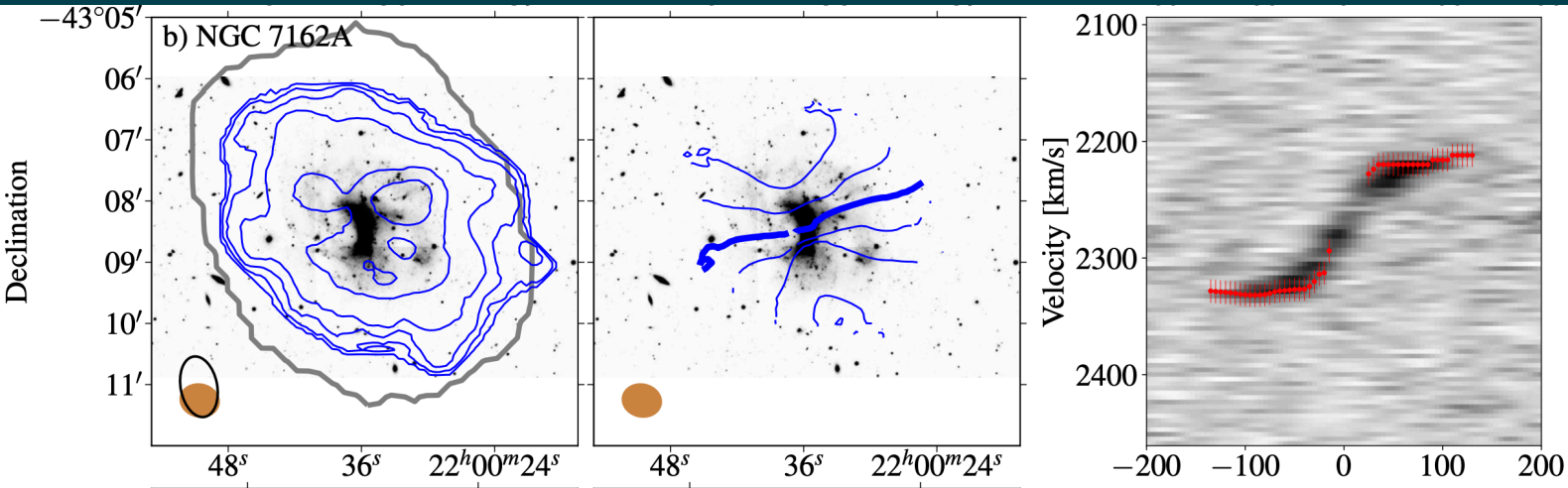
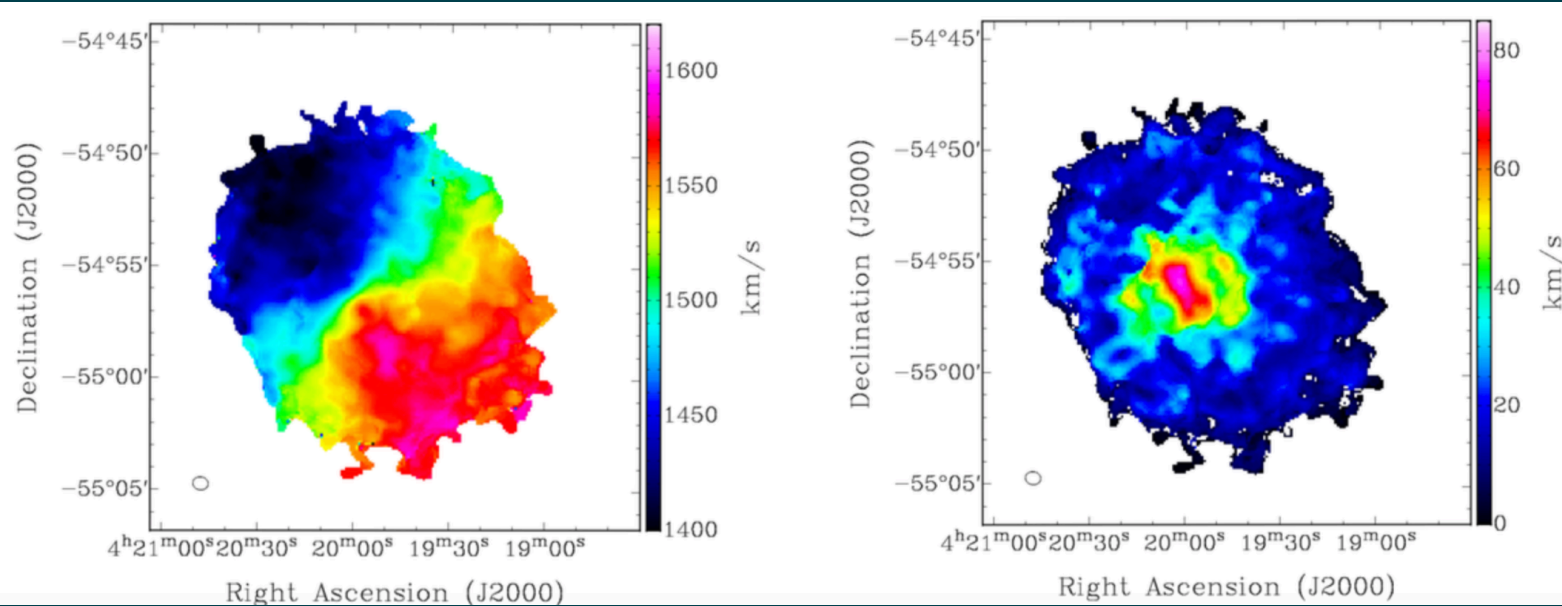


Figure credit: Karen Lee-Waddell

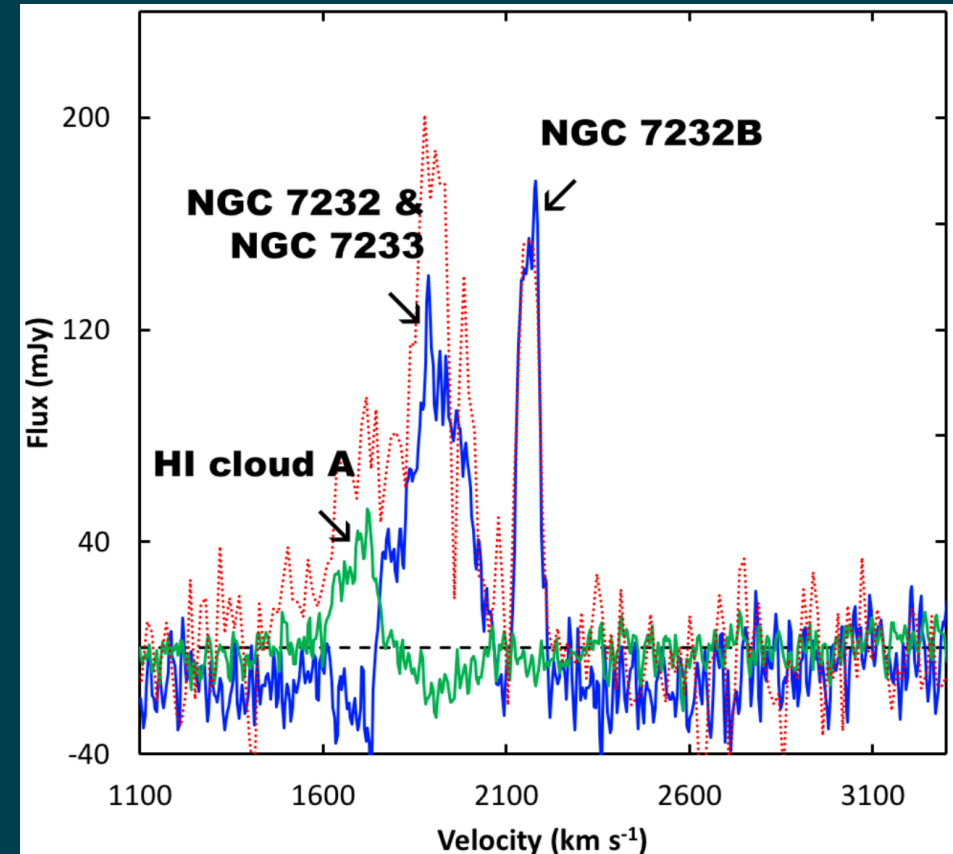
# WALLABY Early Science Results



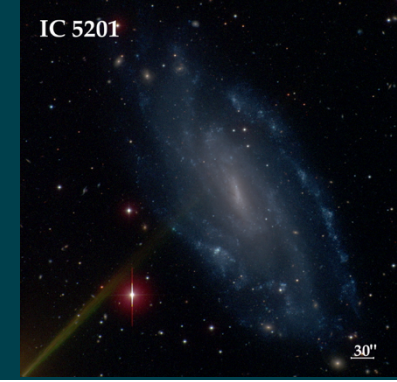
Reynolds et al. (accepted)



Alagali et al. (submitted)

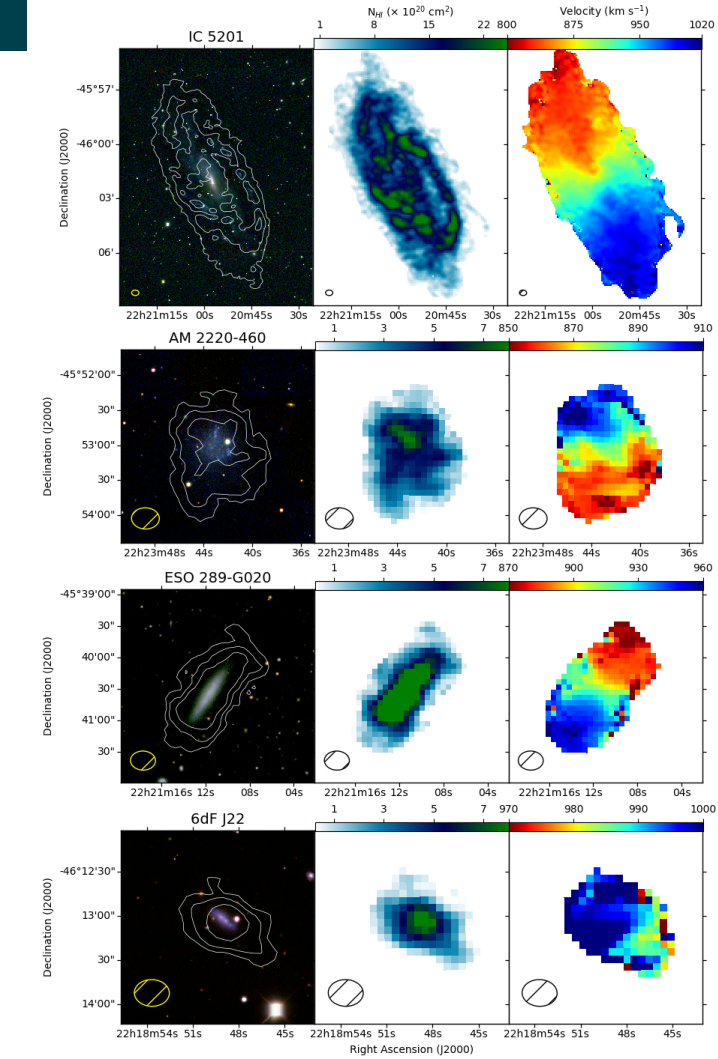
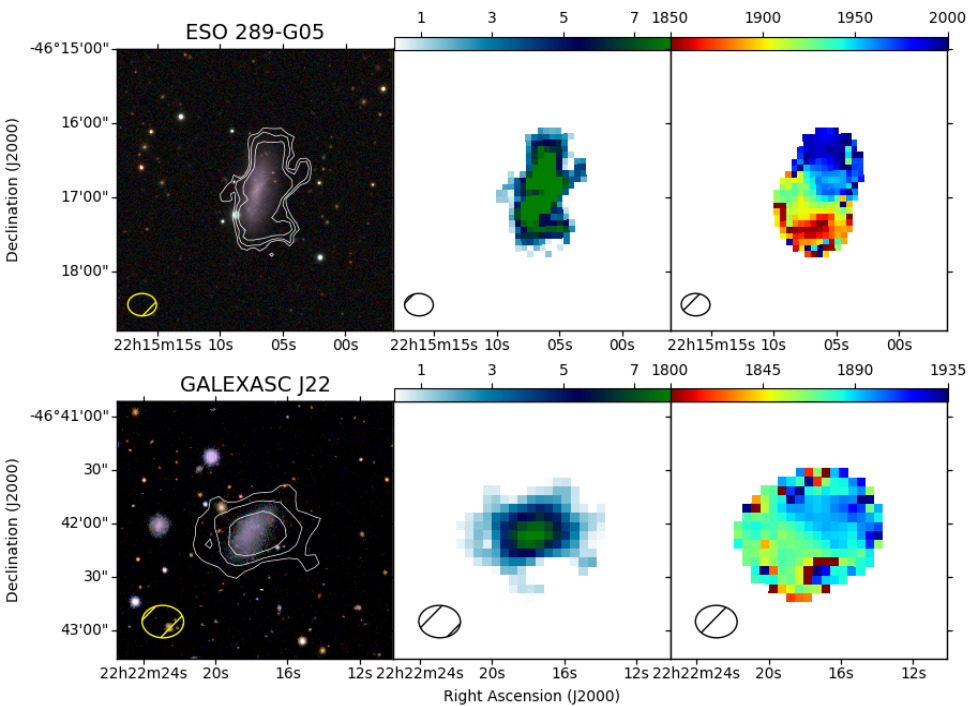
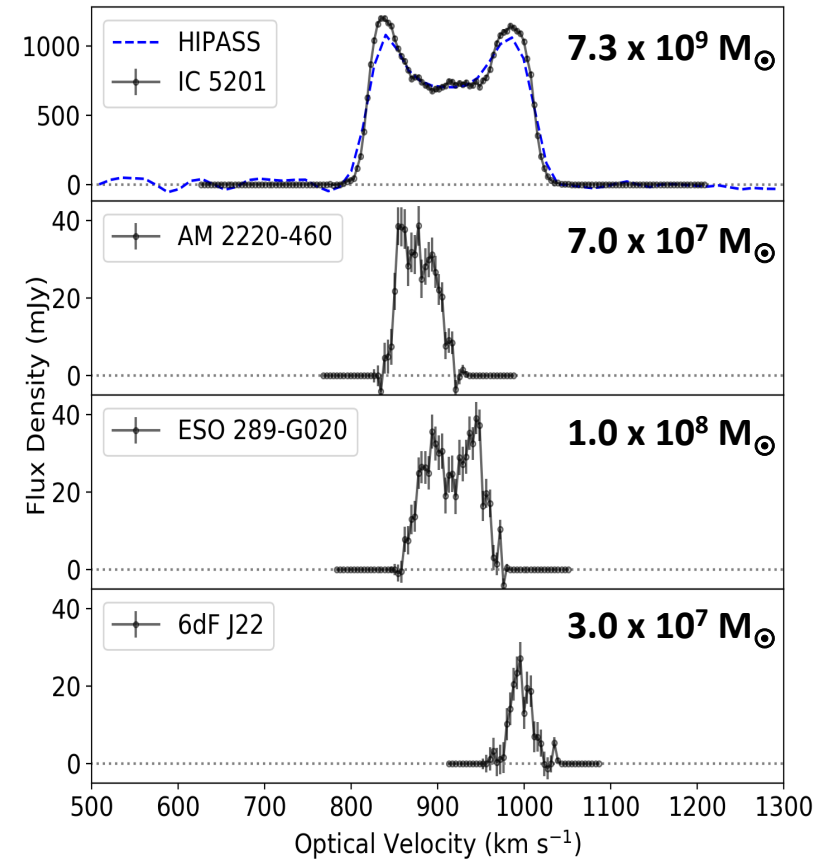
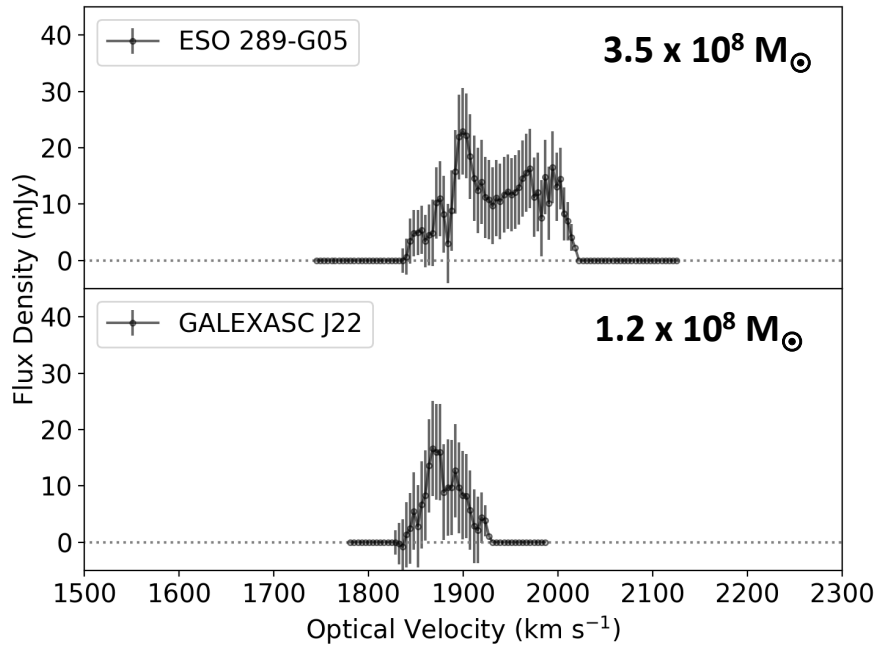


Lee-Waddell et al. (submitted)



# My galaxy – IC 5201

Kleiner et al. (in prep)



# My galaxy – IC 5201

Kleiner et al. (in prep)

