The polar ring galaxy NGC4650A (MUSE/ESO)

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3D Visualisation of gas and stars in galaxies

Dr. Bärbel Koribalski
CSIRO Astronomy and Space Science
Australia Telescope National Facility
3D2014 – 11 March 2014

CSIRO

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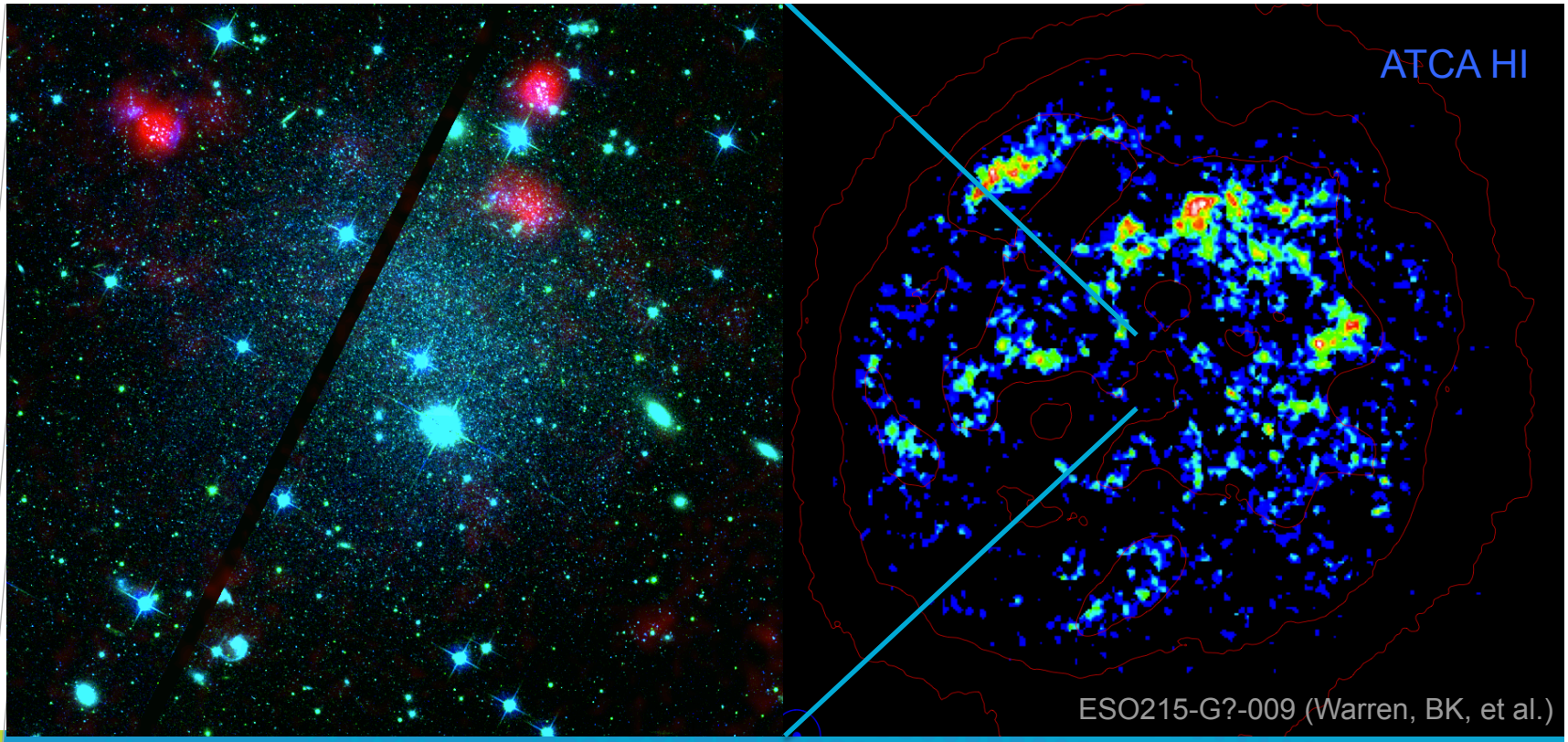

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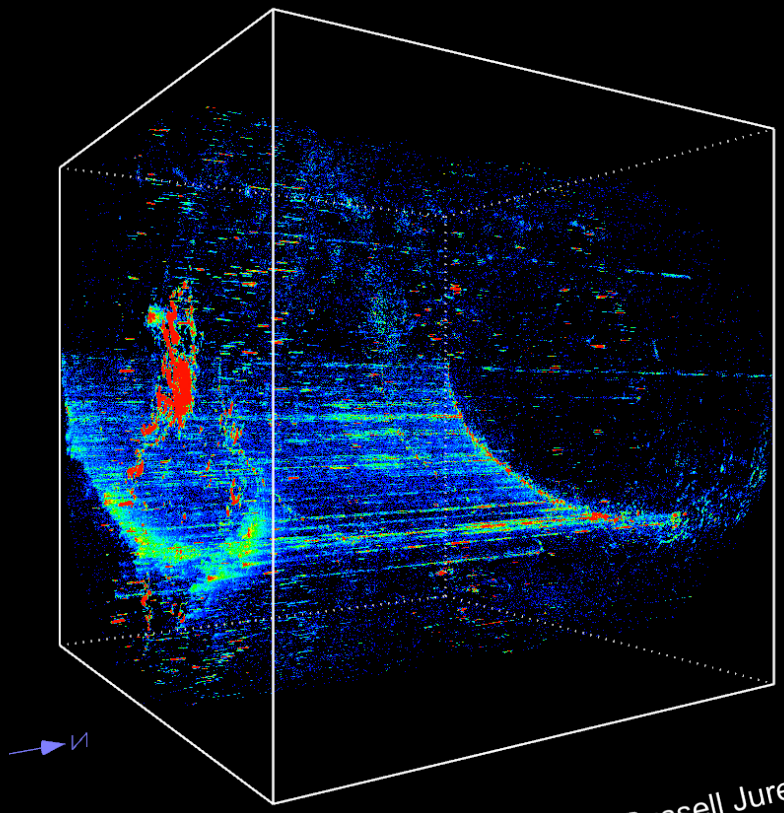
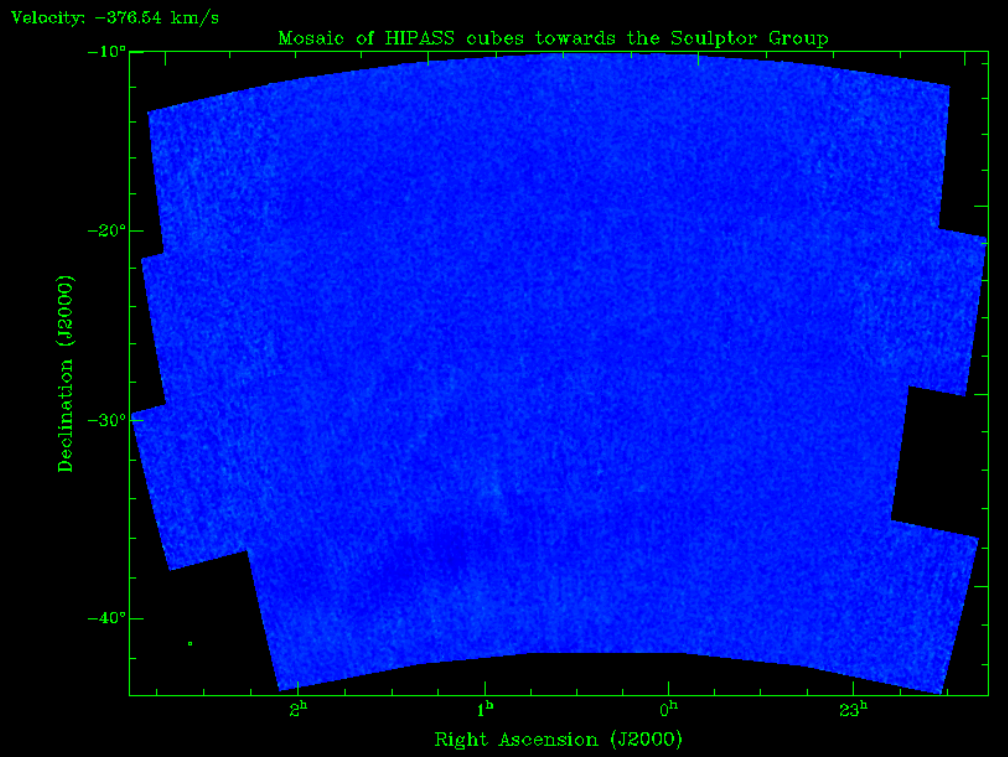
3D visualisation of data cubes

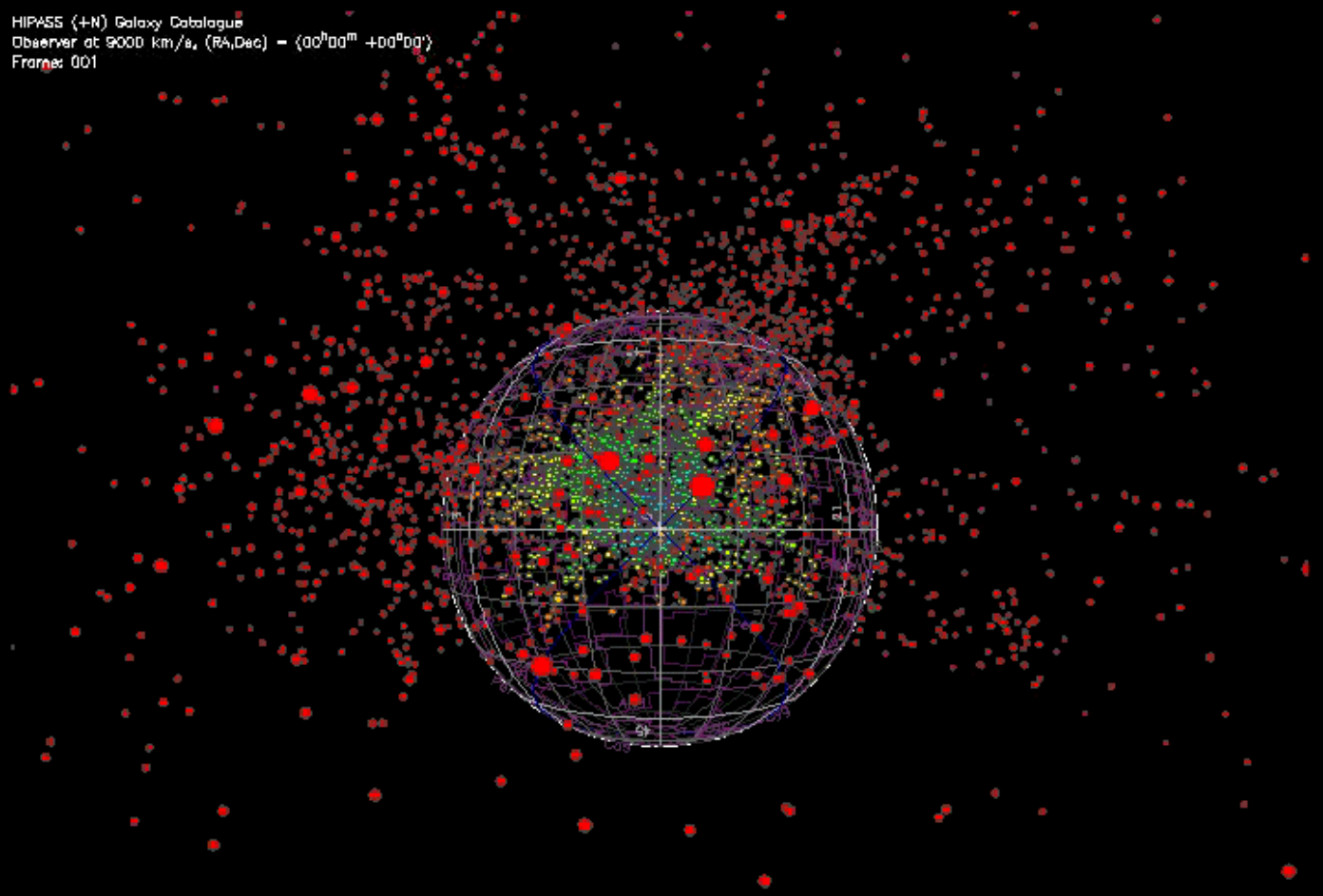


HIPASS supercube made by Russell Jurek,
3D visualisation by Amr Hassan & Chris Fluke



HIPASS channel maps
of the Sculptor Group

3D visualisation of HIPASS galaxies

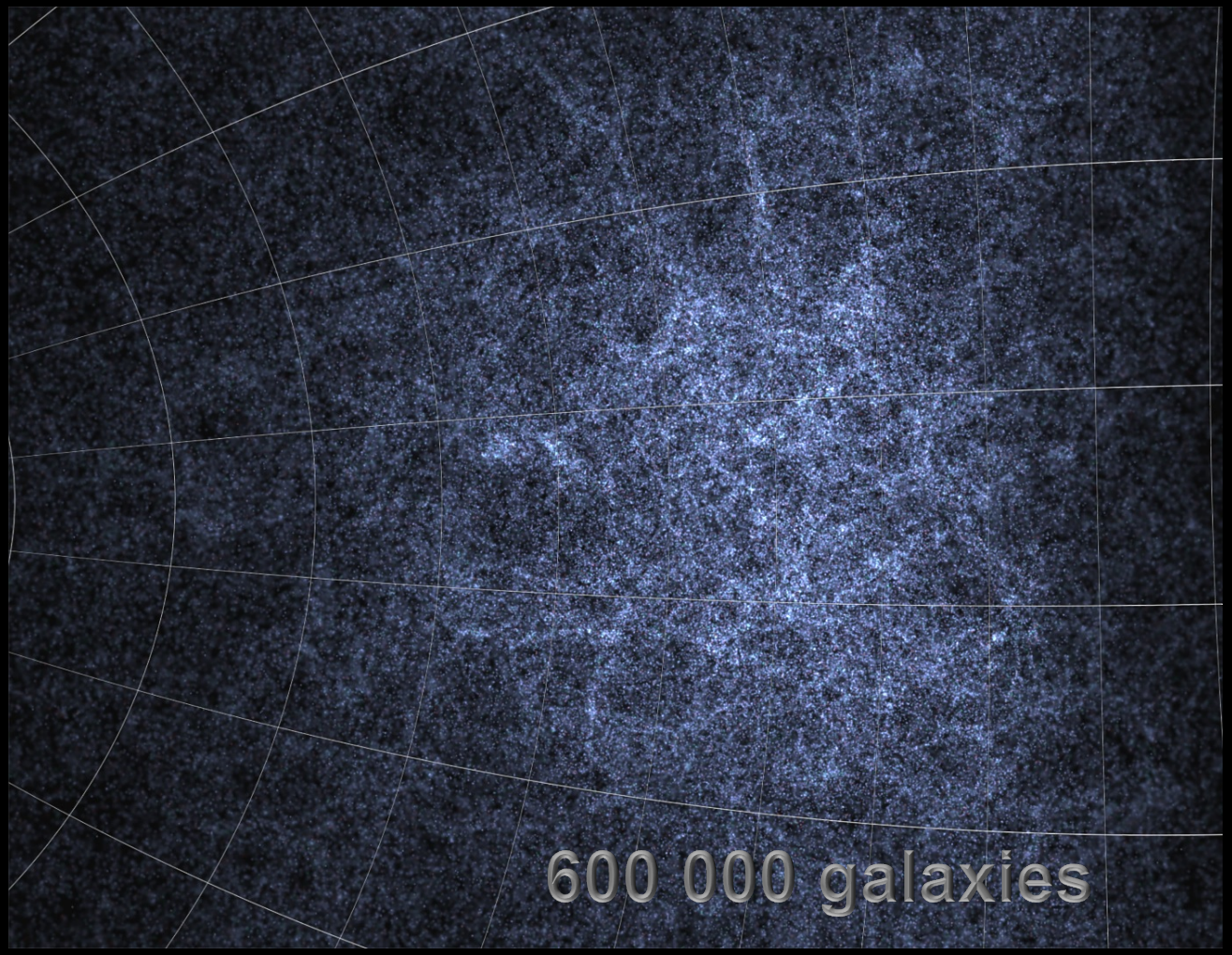


by Mark Calabretta

HIPASS references: Koribalski et al. (2004), Meyer et al. (2004), Wong et al. (2006).

WALLABY - the ASKAP HI All-Sky Survey

ASKAP =
36 x 12-m dishes
with “radio cameras”



(Duffy et al. 2012)

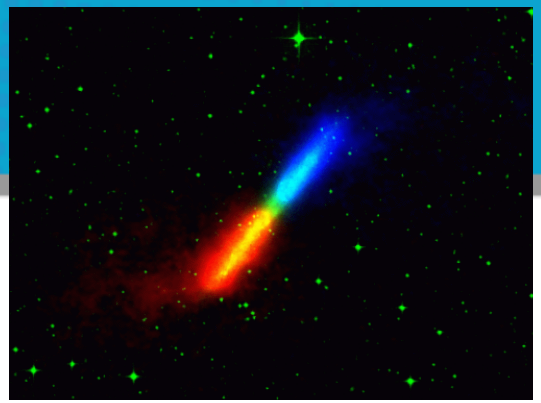
3D visualisation of a gas disk

NGC2403 THINGS data (Walter et al. 2009).

From cosmological simulations to nearby galaxies

First attempt at 3D Visualisation of gas and stars in galaxies
(with Claudio Gheller & Klaus Dolag)

3D Visualisation of Galaxies



The software:

SPLOTCH is a ray tracing algorithm for effective visualization of large-scale, point-like datasets using HPC resources.

"Splotch: Visualising Cosmological Simulations."
Dolag, K., Reinecke, M., Gheller, C., Imboden, S. 2008,
New Journal of Physics, Vol. 10, Issue 12

"High-performance astrophysical visualization using Splotch."
Jin, Z., Krokos, M., Rivi, M., Gheller, C., Dolag, K., Reinecke, M. 2010,
Procedia Computer Science 1,1775

My collaborators:

- **Claudio Gheller** (CSCS, Lugano, Switzerland)
- **Klaus Dolag** (Universitäts Sternwarte München, Germany)

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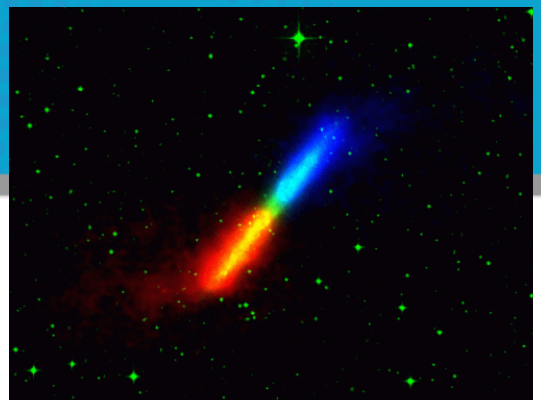
3D Visualisation of Galaxies

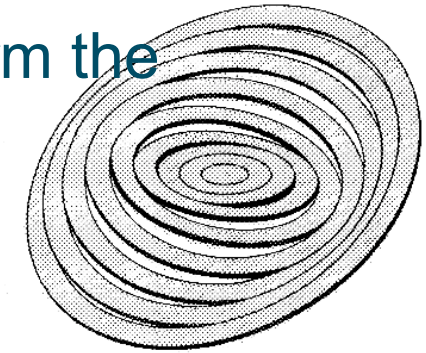


My Project

- **aim:** visualising the observed distribution (and kinematics) of gas and stars in galaxies

- **ingredients:** optical B- and R-band images, GALEX near- and far-UV images, HI intensity images at different spatial resolutions, (rotation curves)

- **3D modelling –** with TiRiFiC to inform the galaxy shape (warp properties, z-height)



(with help from Gyula Jozsa and Peter Kamphuis)

The galaxy M83

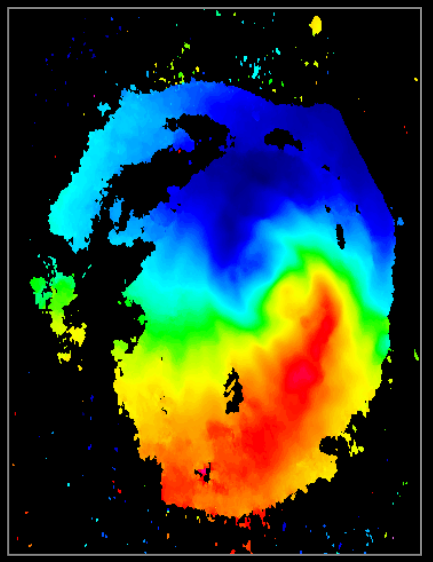
(Koribalski et al.)

GALEX NUV+FUV; Thilker et al.

Rotating stellar disk of M83 as informed by the measured rotation curve.

The galaxy M83

(Koribalski et al.)



GALEX NUV+FUV; Thilker et al.

XUV ➔ 2X-HI ✔

ATCA + Parkes HI mosaic

The galaxy M83

(Koribalski et al.)

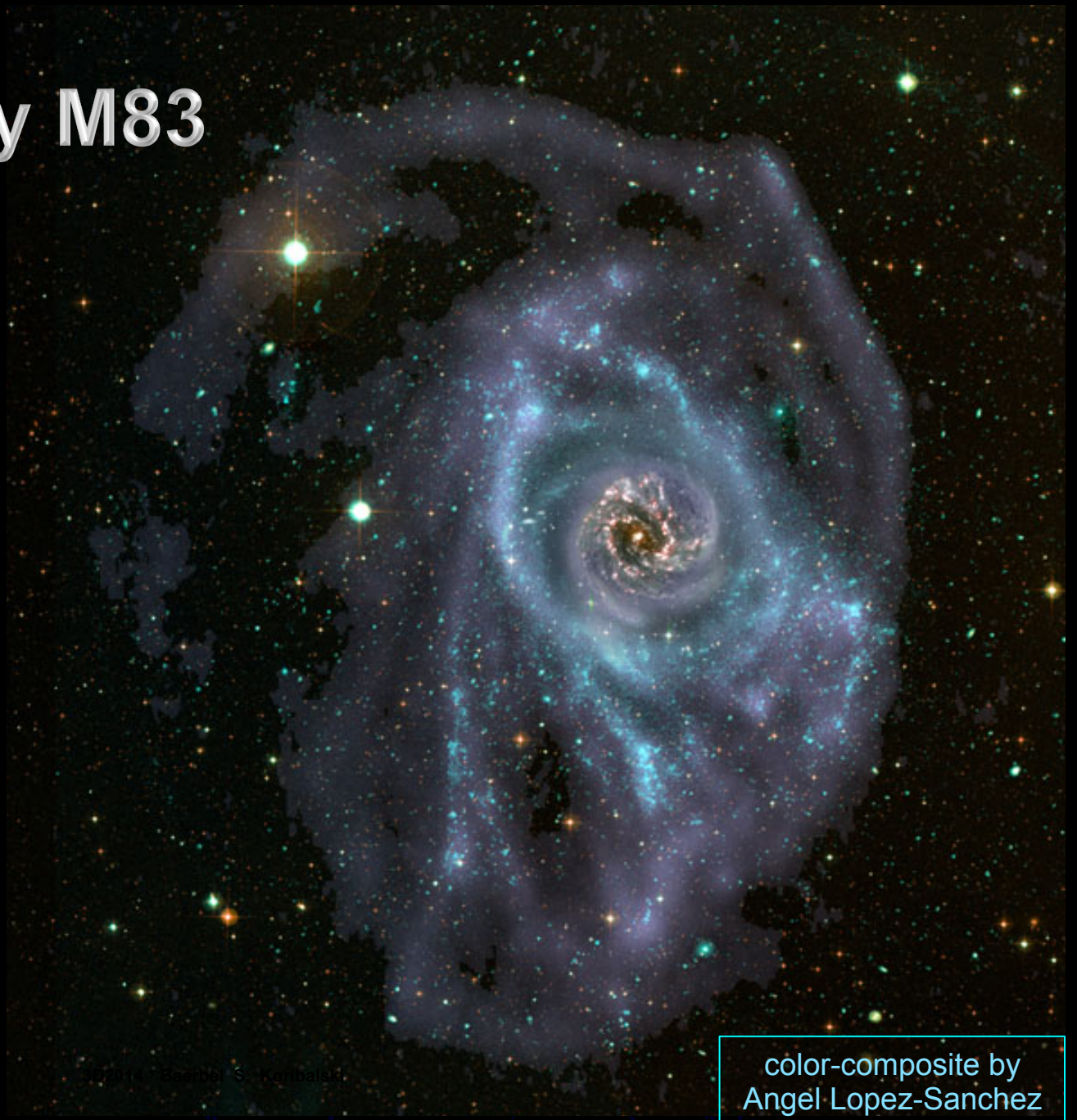
HIPASS J1336−29

D ≈ 4.5 Mpc

HI extent > 80 kpc

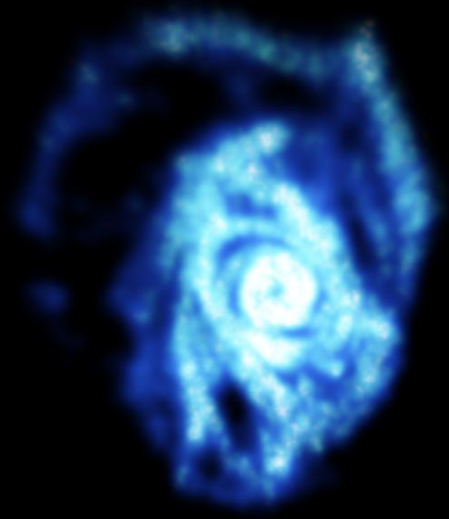
$M_{HI} = 8 \times 10^9 M_\odot$

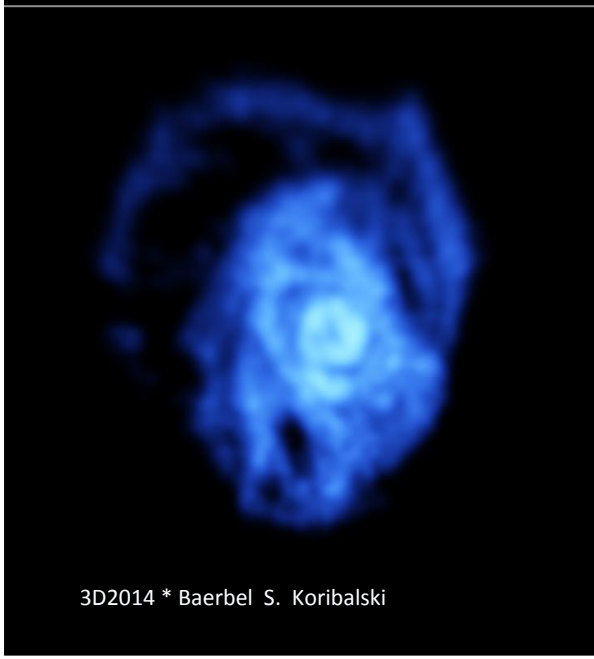
HI is an excellent tracer for SF in the outer disk

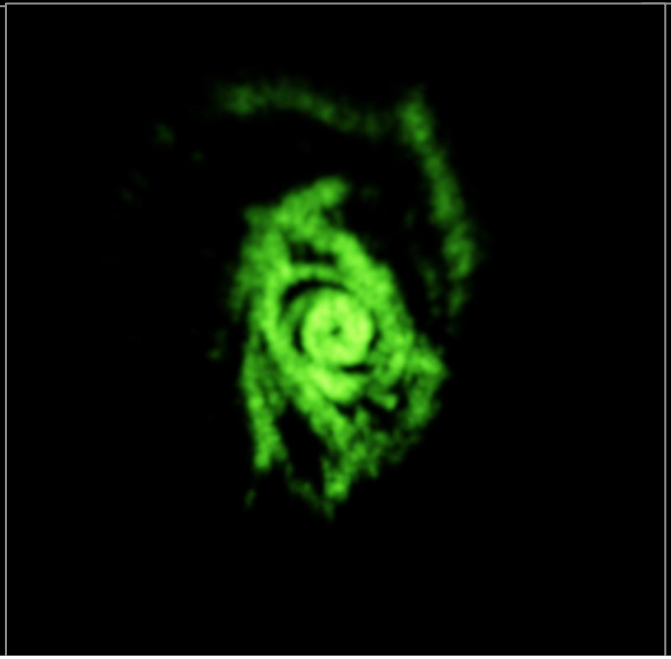


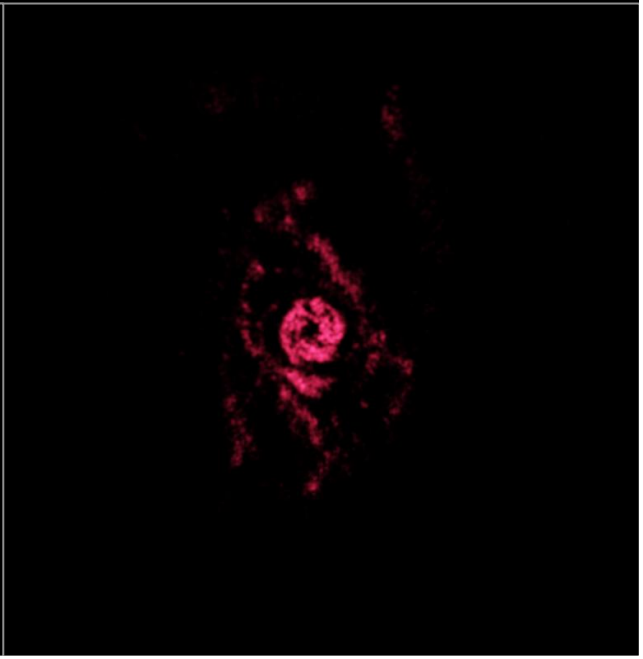
color-composite by Angel Lopez-Sanchez

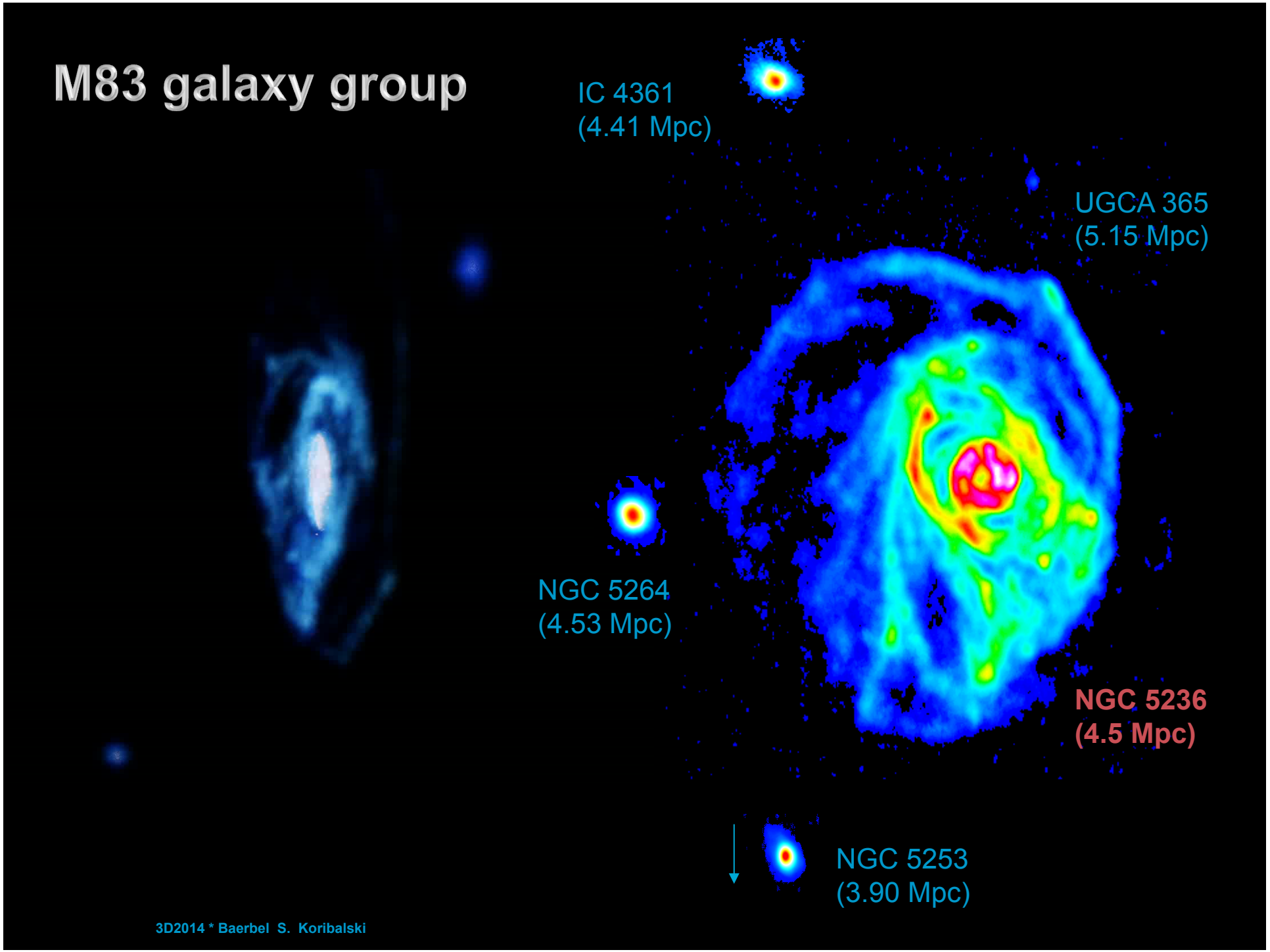
M83 HI maps at different spatial resolutions










M83 galaxy group
IC 4361
(4.41 Mpc)
UGCA 365
(5.15 Mpc)
NGC 5264
(4.53 Mpc)
NGC 5236
(4.5 Mpc)
NGC 5253
(3.90 Mpc)
3D2014 * Baerbel S. Koribalski


Thank you