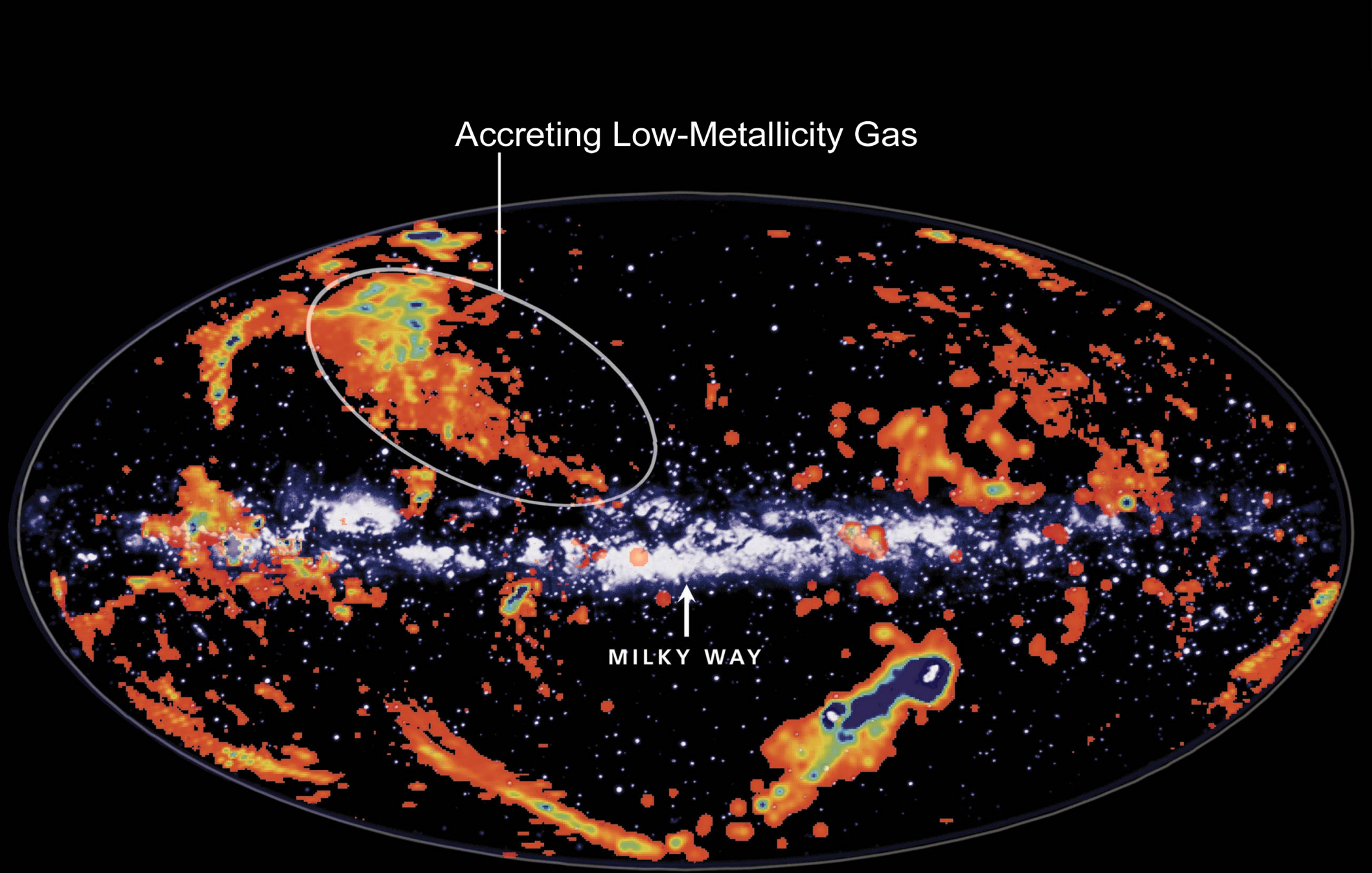
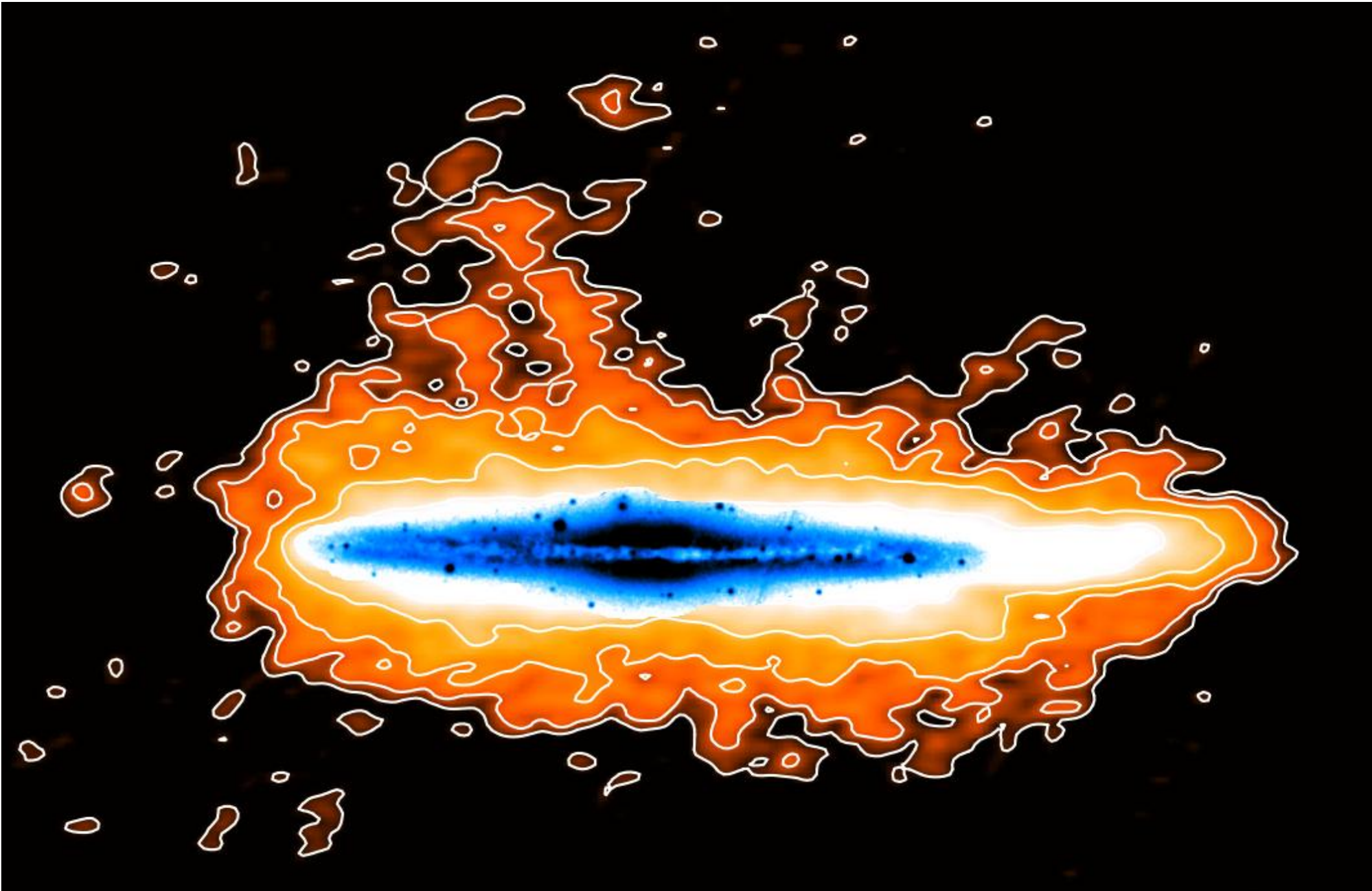
HOW DO GALAXIES FORM THROUGH GAS ACCRETION FROM THE COSMIC WEB?

(one of the original key Science cases for SKA)



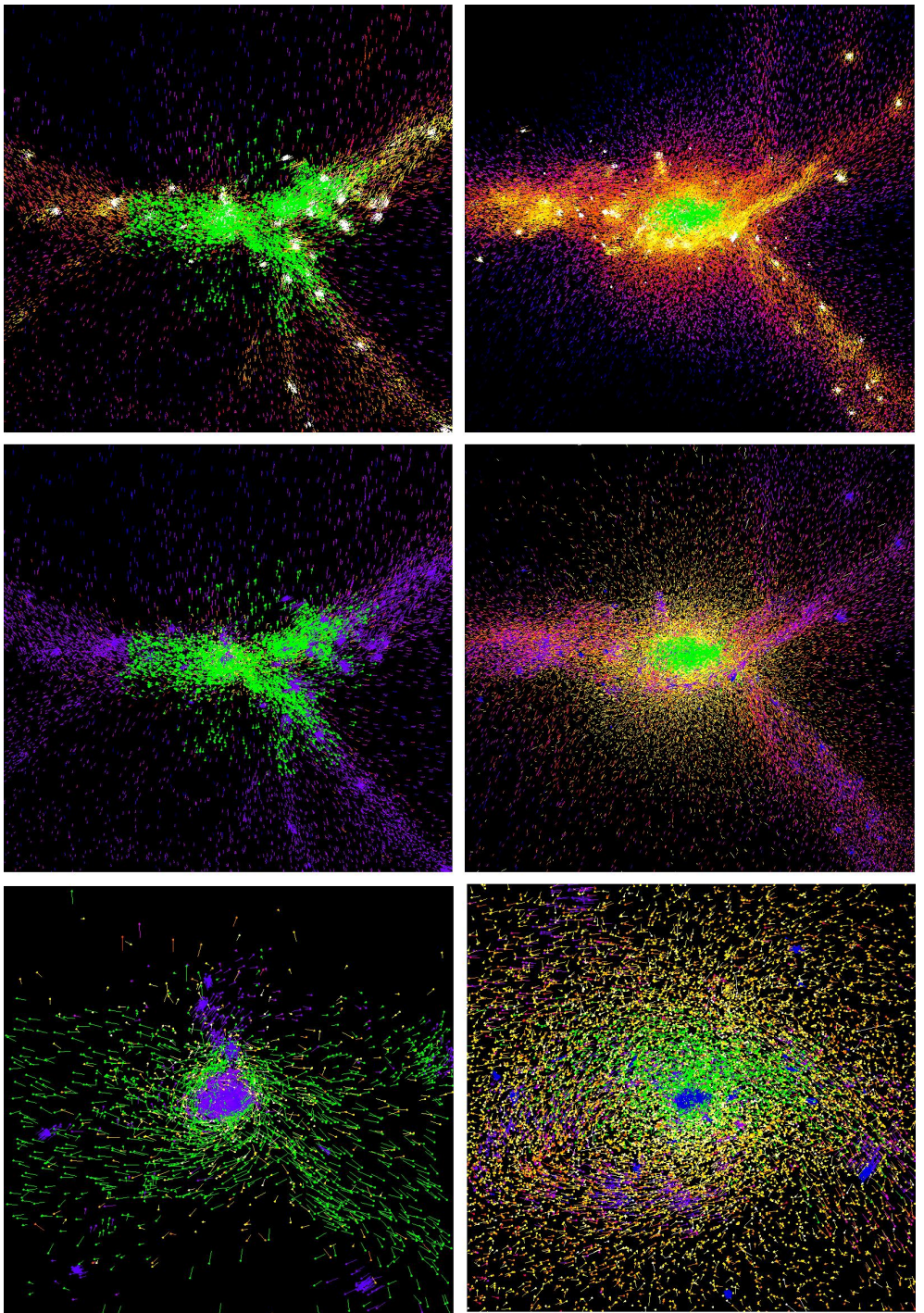
NASA and B. Wakker (University of Wisconsin-Madison) • STScI-PRC99-46

NGC 891



FORMATION: GAS ACCRETES IN TWO "MODES"

COLD MODE

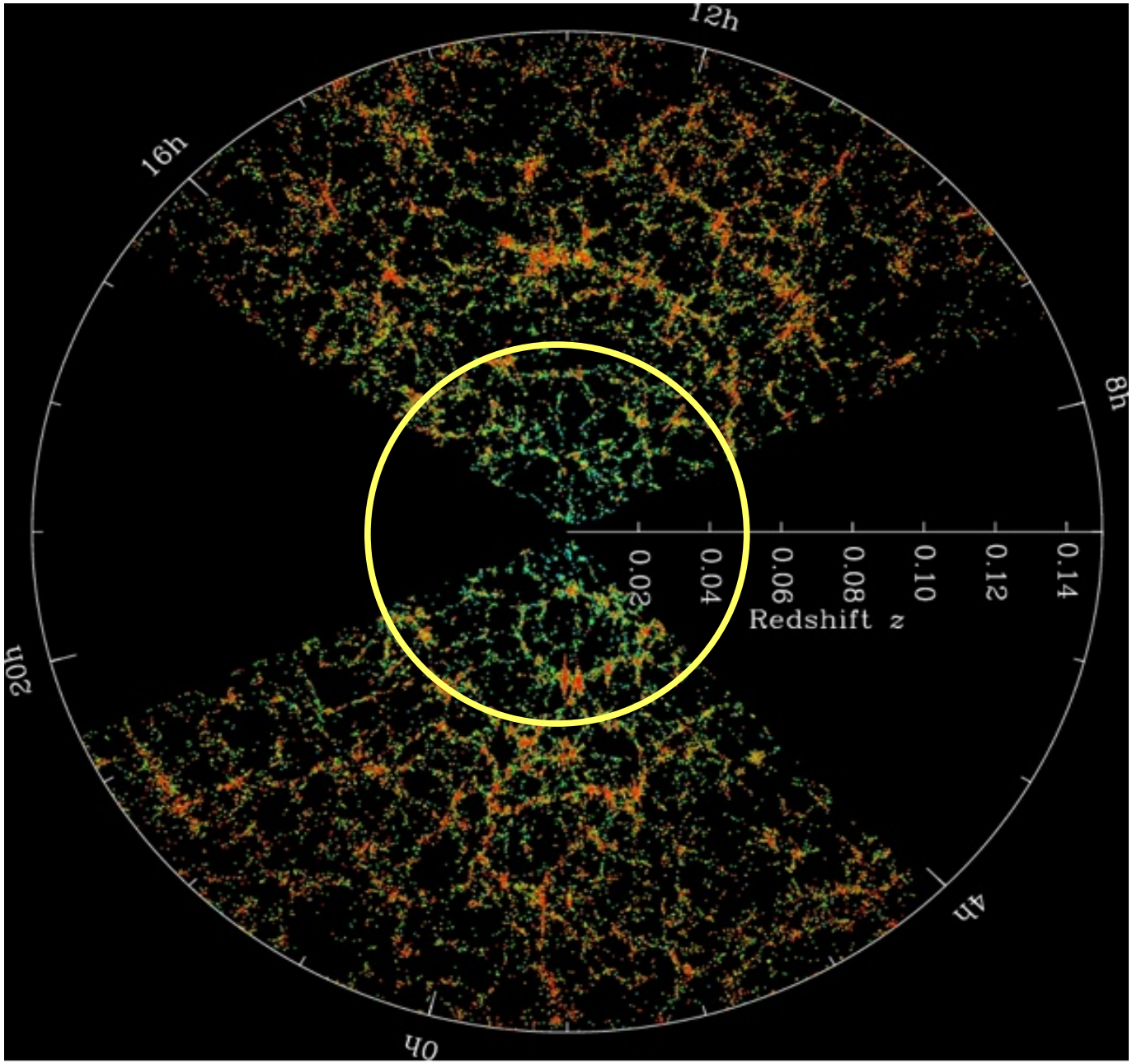


HOT MODE

Keres et al 2005

Sloan Digital Sky Survey

Mapping the Universe



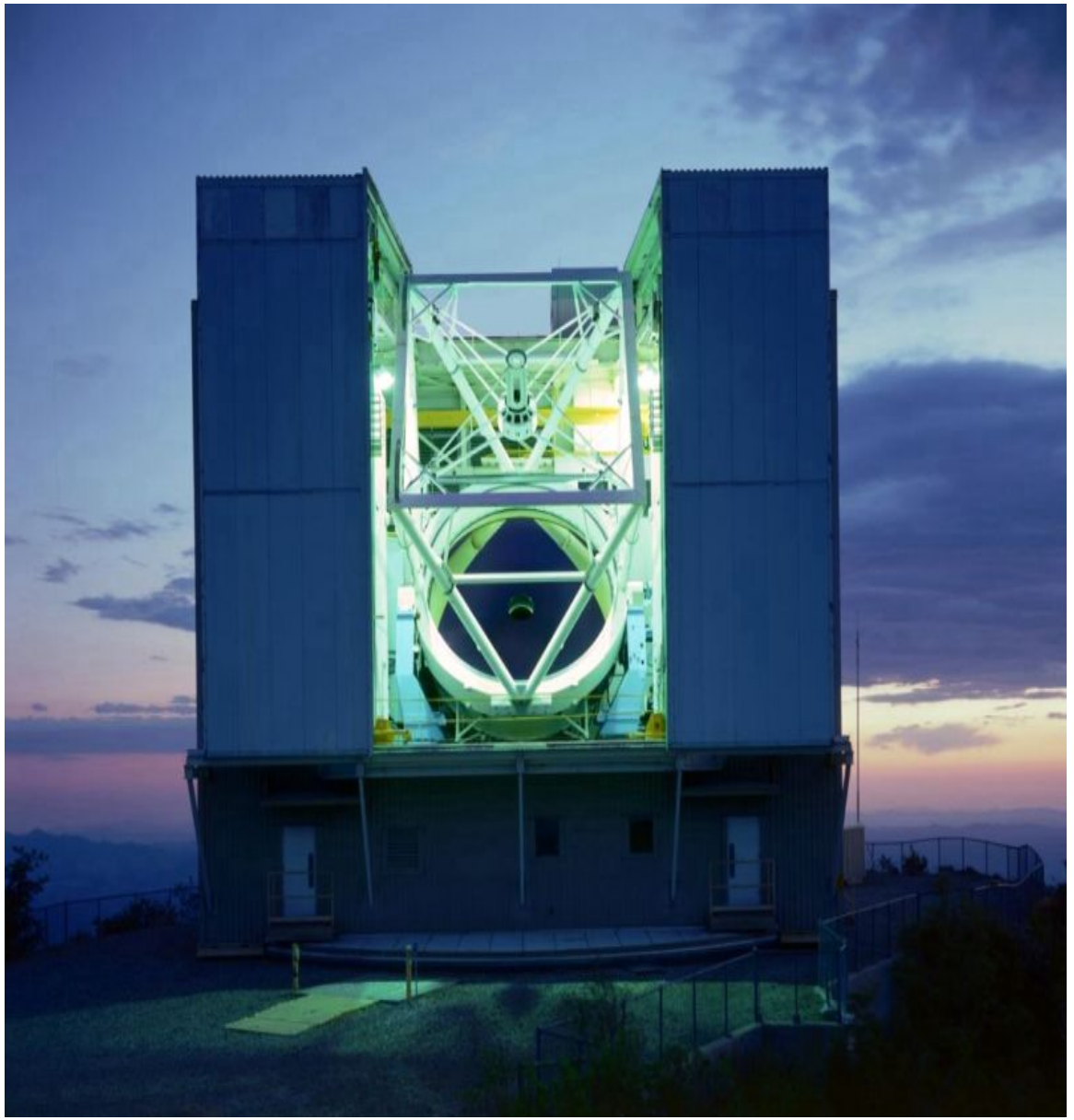
THE GALEX ARECIBO SDSS SURVEY (GASS)

Main People Science Status Data Links Publications Undergrads Non-experts News/Events ObservingTeam GASS_Team

David Schiminovich (PI)

Barbara Catinella

Program of long-slit spectroscopy on the MMT



Sean Moran (JHU)

GALAXY SELECTION

a) Redshift range : 0.025 < z < 0.05

Motivation:

1) We want to detect HI down to levels of a few percent in M(gas)/M* in about an hour of integration time.

2) We want to get an accurate estimate of the **total** cold gas mass with a single pointing of both the Arecibo telescope.

b) Stellar mass range: log M* > 10

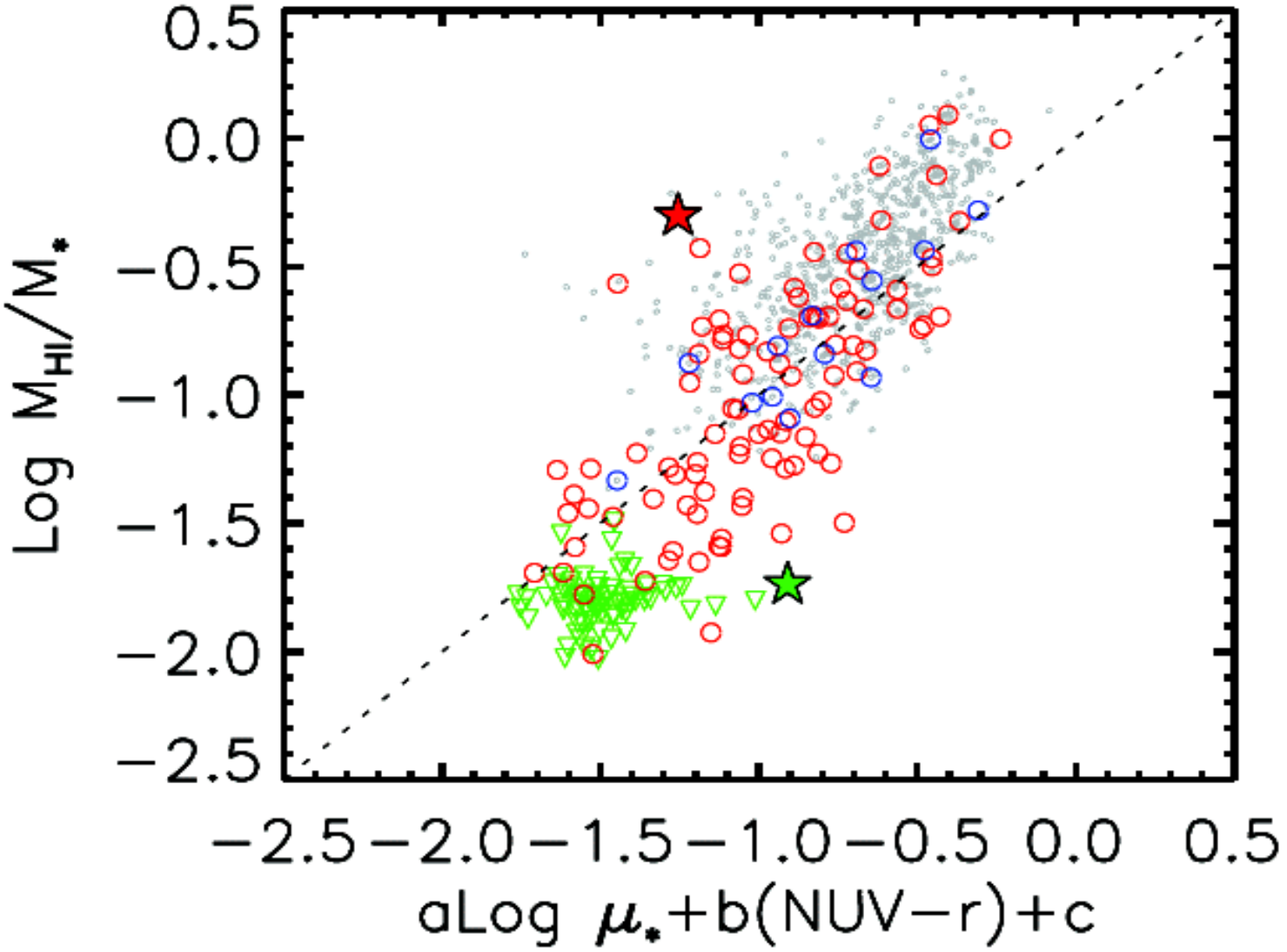
Motivation:

Span a range of stellar masses encompassing both “active” star-forming galaxies and “passive” systems => quantify how the transition between these two populations is reflected in their cold gas content. Avoid any selection on morphology, environment etc.

OBSERVING STRATEGY: Integrate until the galaxy is detected or a limiting HI mass fraction ~1.5-3% is reached.

THE STAR-FORMING POPULATION

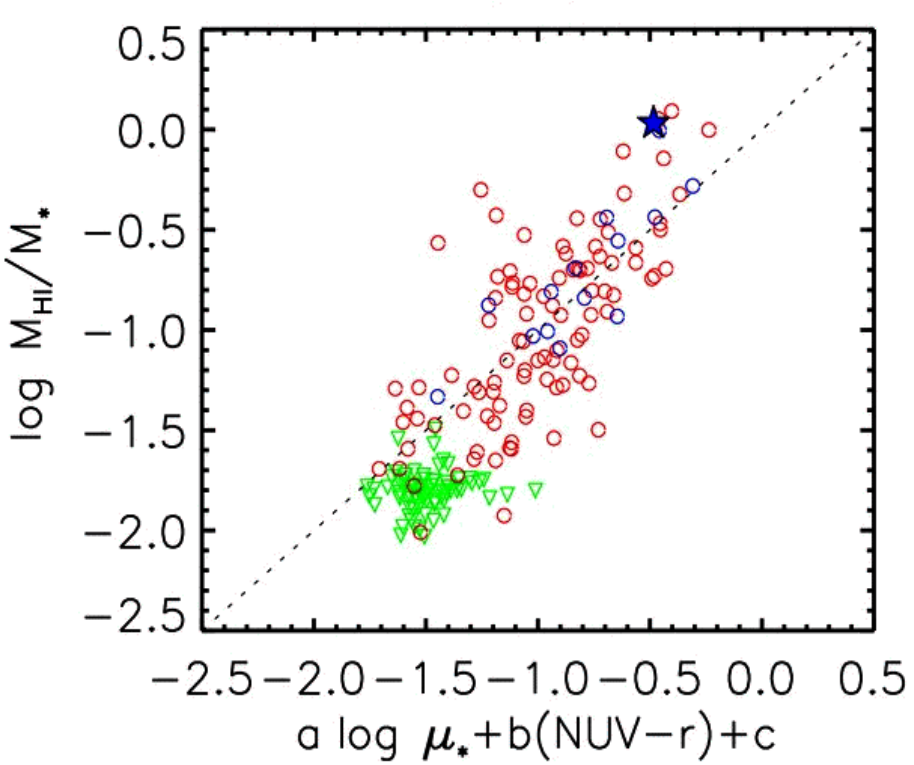
An empirical best-fit "plane" for predicting HI mass fraction (Catinella et al 2010)

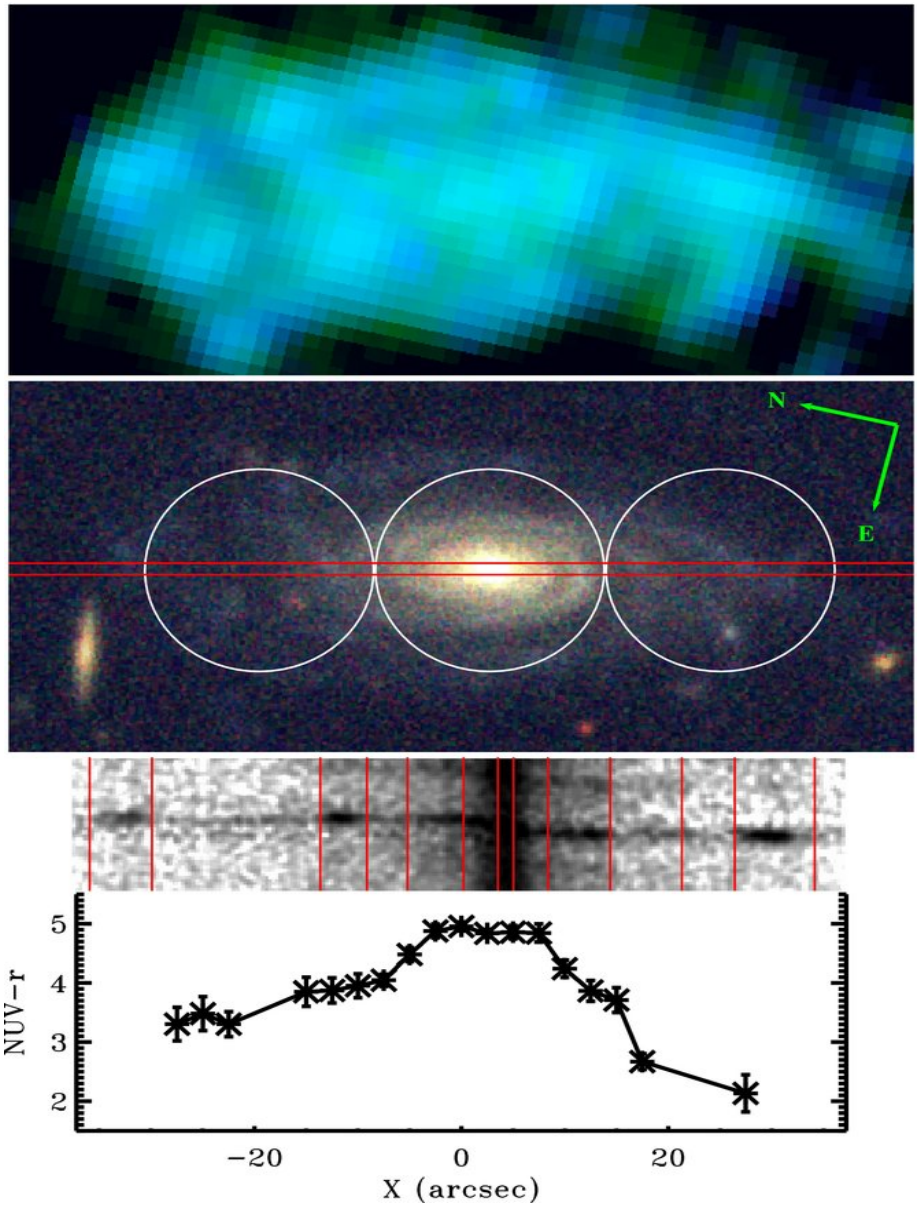


$$\Sigma_{\rm SFR} \propto \Sigma_{\rm gas}^{n} \;\Longrightarrow\; {\rm SFR}/M_* \propto (G/S)^n \mu_*^{n-1} \;\Longrightarrow$$

$$\log G/S = \log M_{\rm gas}/M_* = a \log \mu_* + b \log {\rm SFR}/M_* + c$$

UGC 8802: A Case Study of a Star-Forming Outlier from the HI "plane"

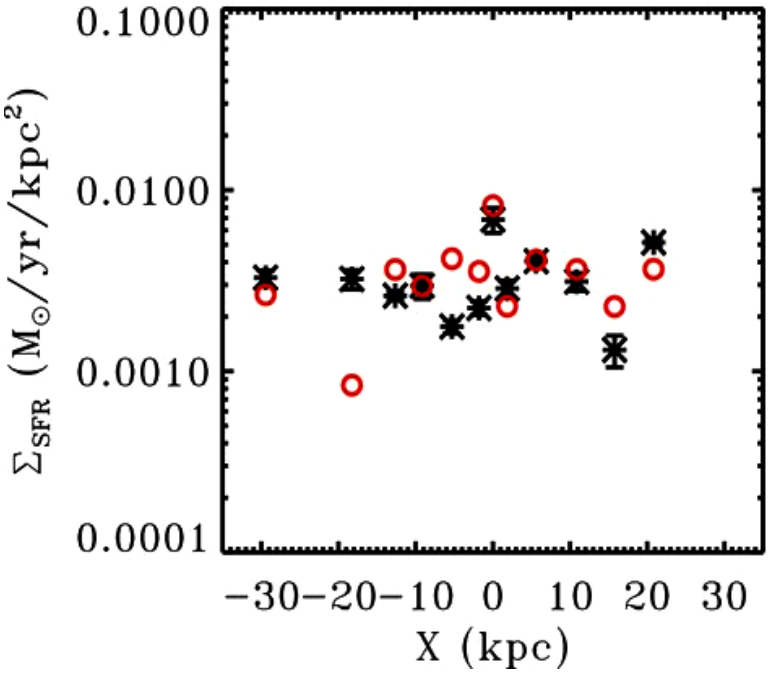


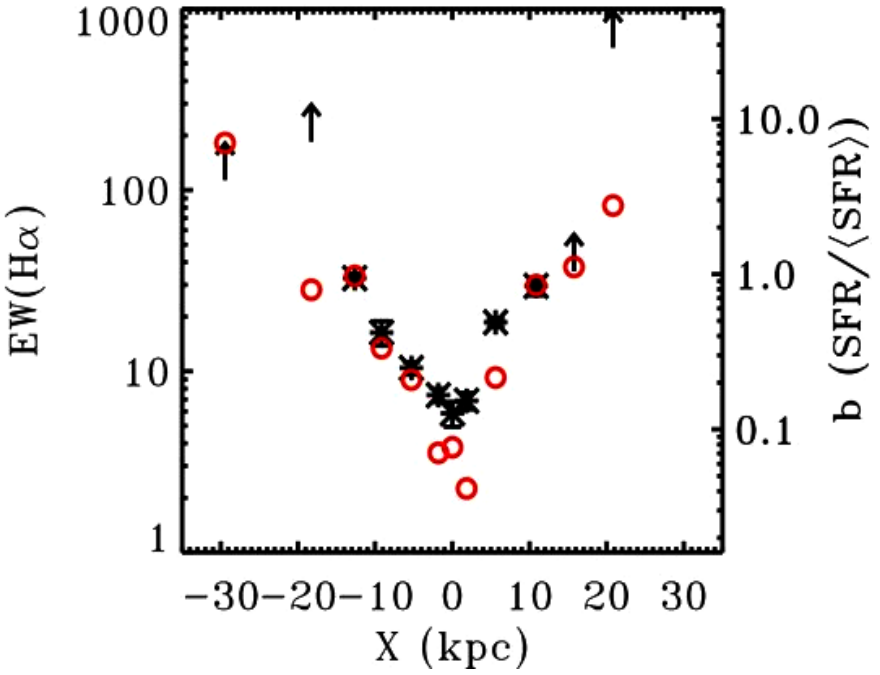


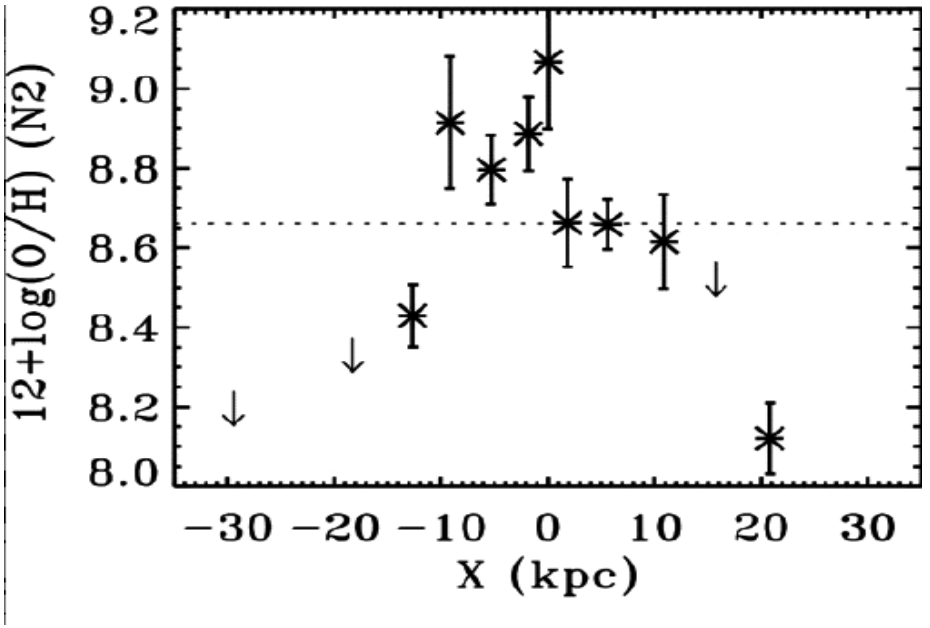
M(HI) = 2 x 10^{10} M_sol

Moran et al 2010

Star-formation surface density and b-parameter profiles

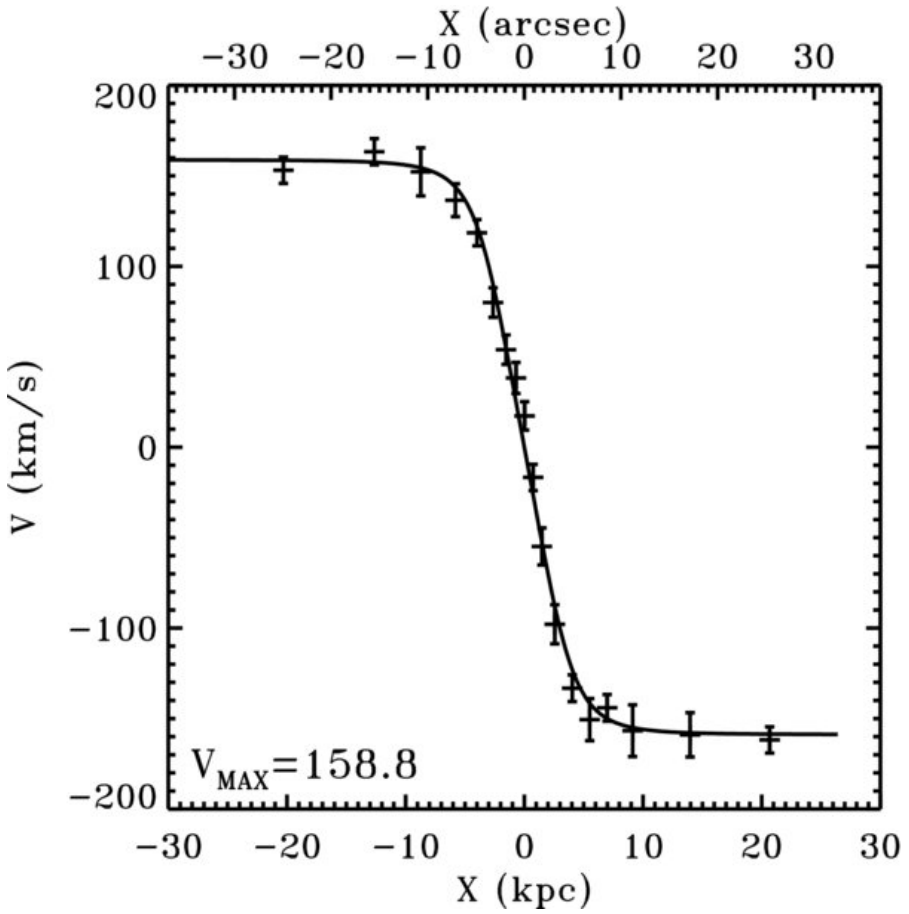




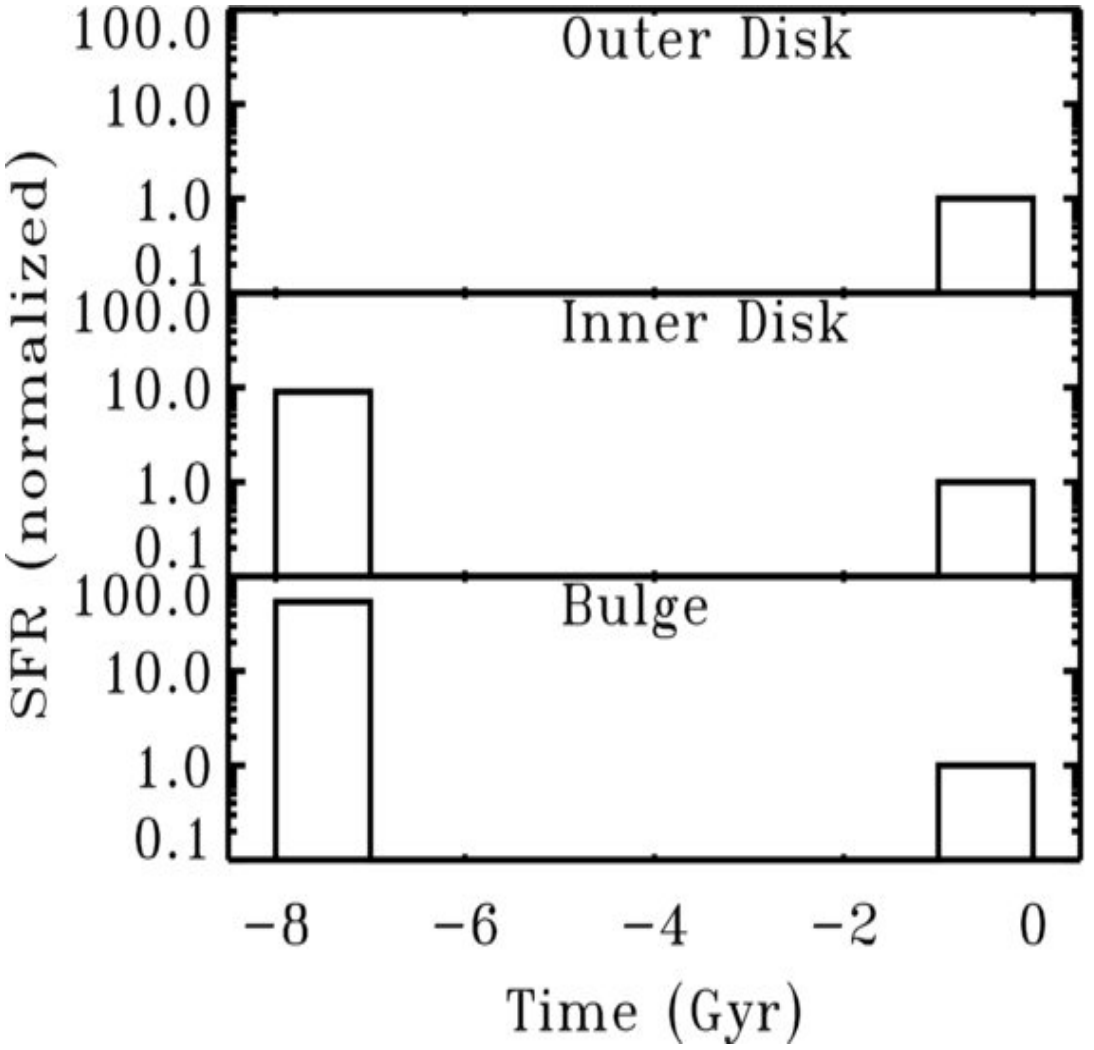


Gas-phase metallicity profile

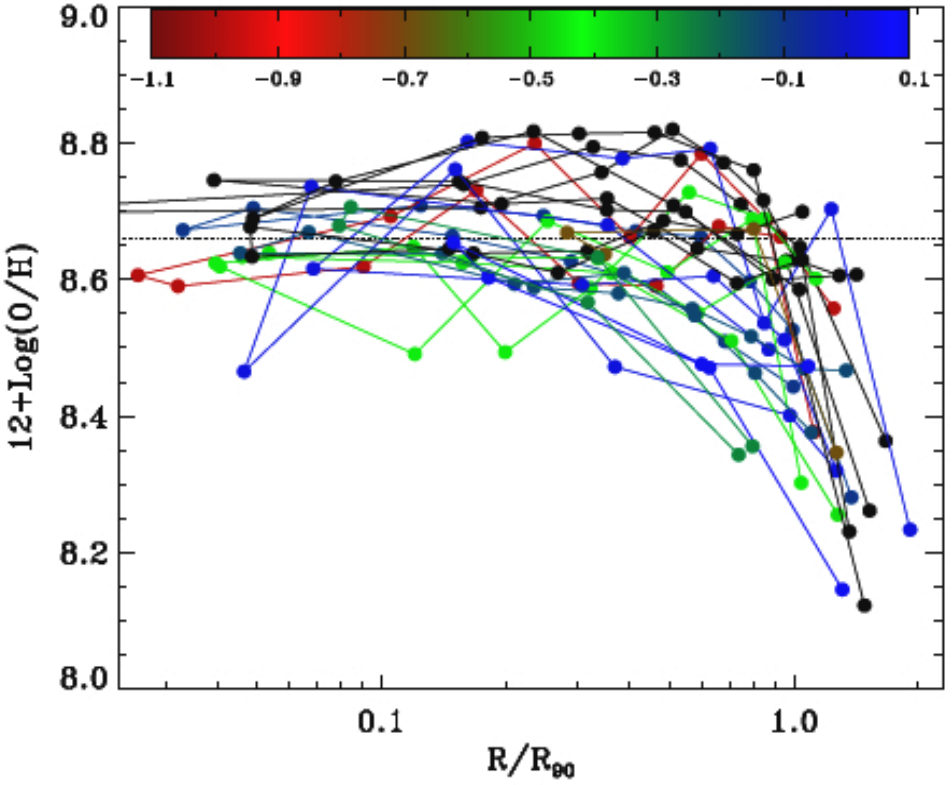
Very regular rotation curve!



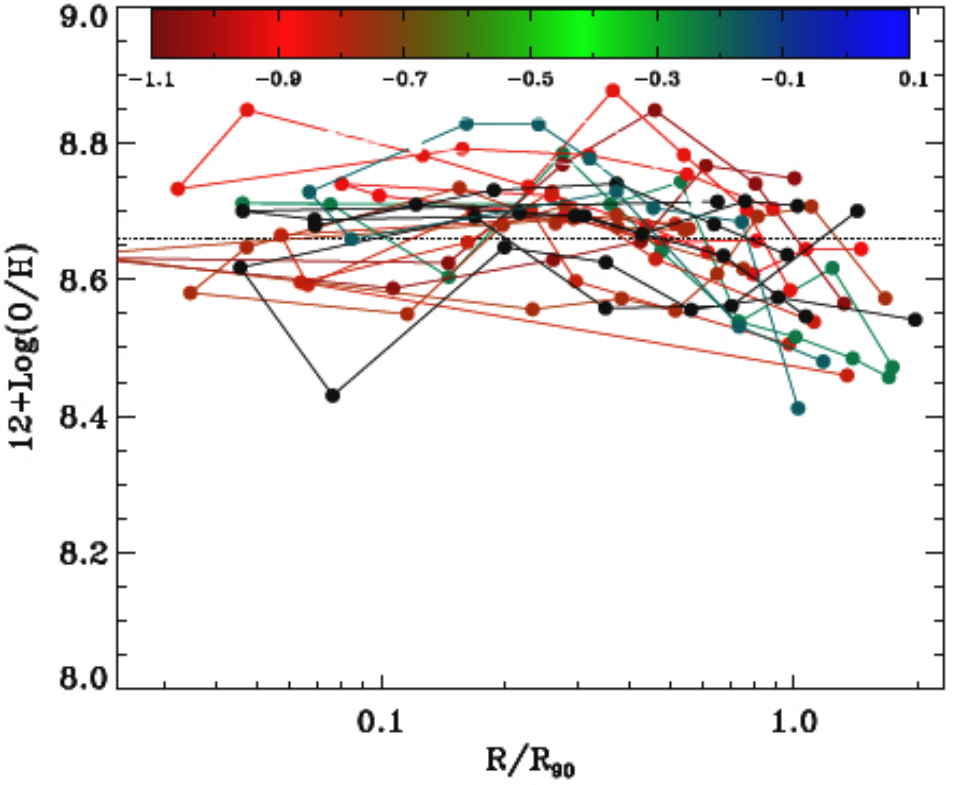
Summary of our Understanding of the Star Formation History of this System

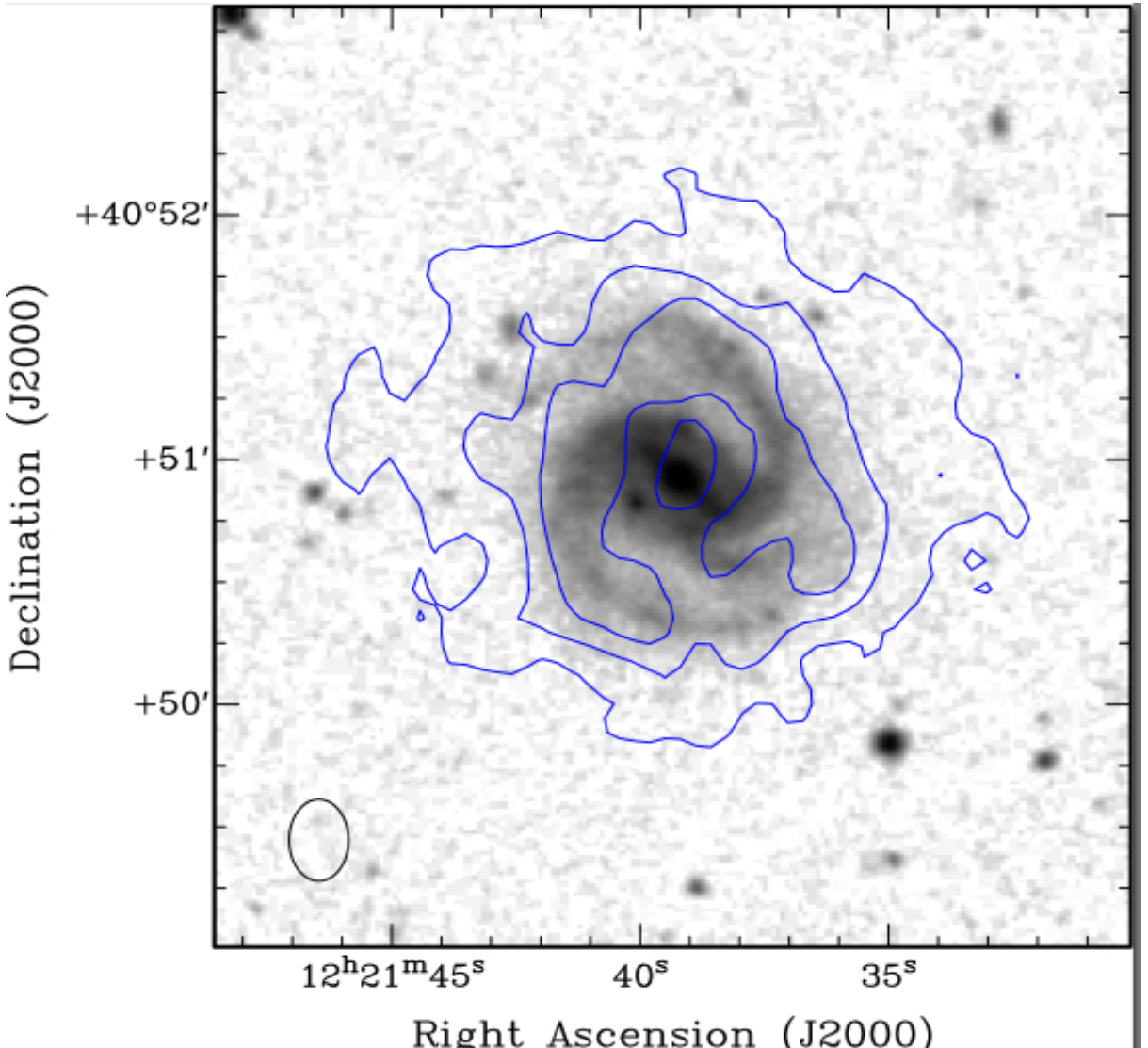


HI – RICH



HI - NORMAL





PILOT PROGRAM for Apertif, the SKA Precursor

With Gyula Jozsa, ASTRON