

# The Role of Gas

M82



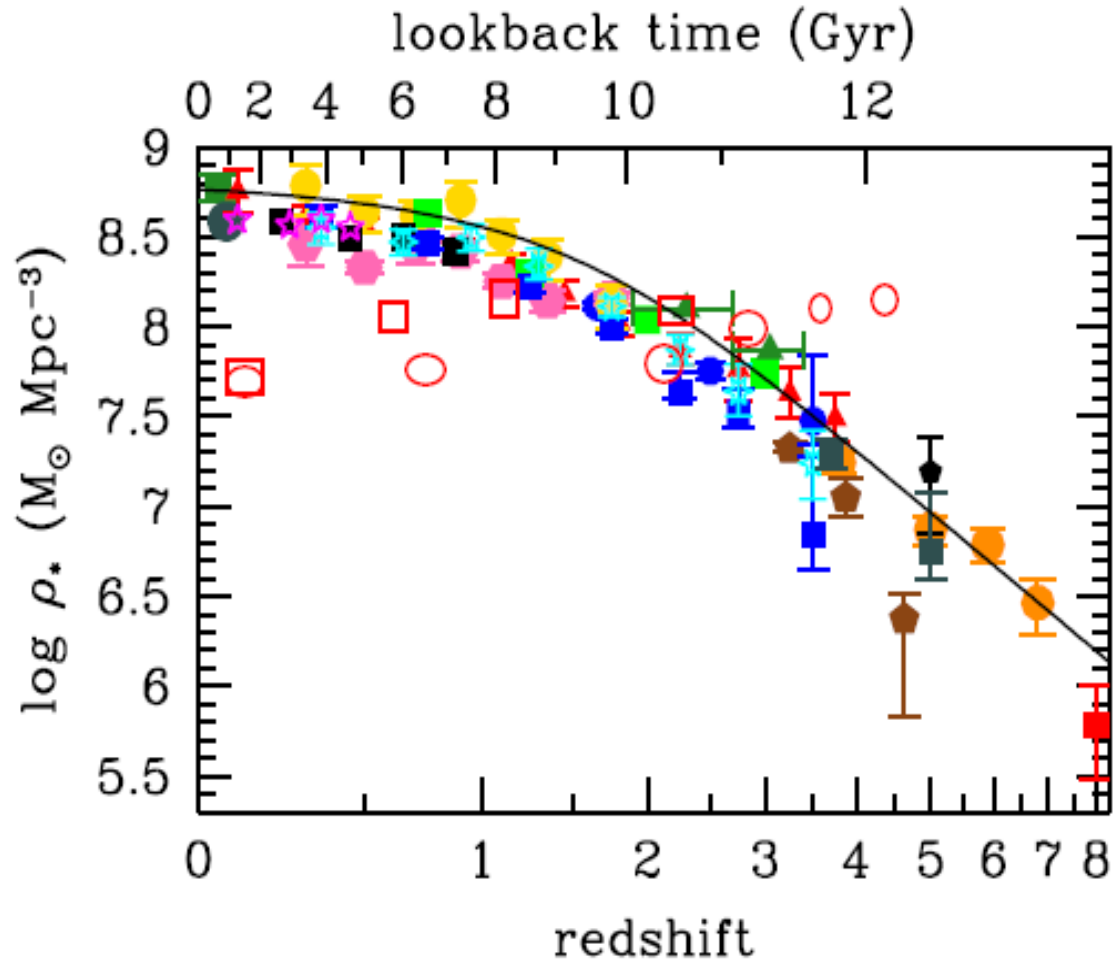
# The questions

1. How does gas get into galaxies?
2. Once inside a galaxy, what regulates the conversion of gas to stars (ionized to atomic to molecular to stars)?
3. How are these processes affected by feedback from massive stars and on what scales?
4. How are they affected by feedback from AGN?
5. (How) do these processes evolve with redshift?

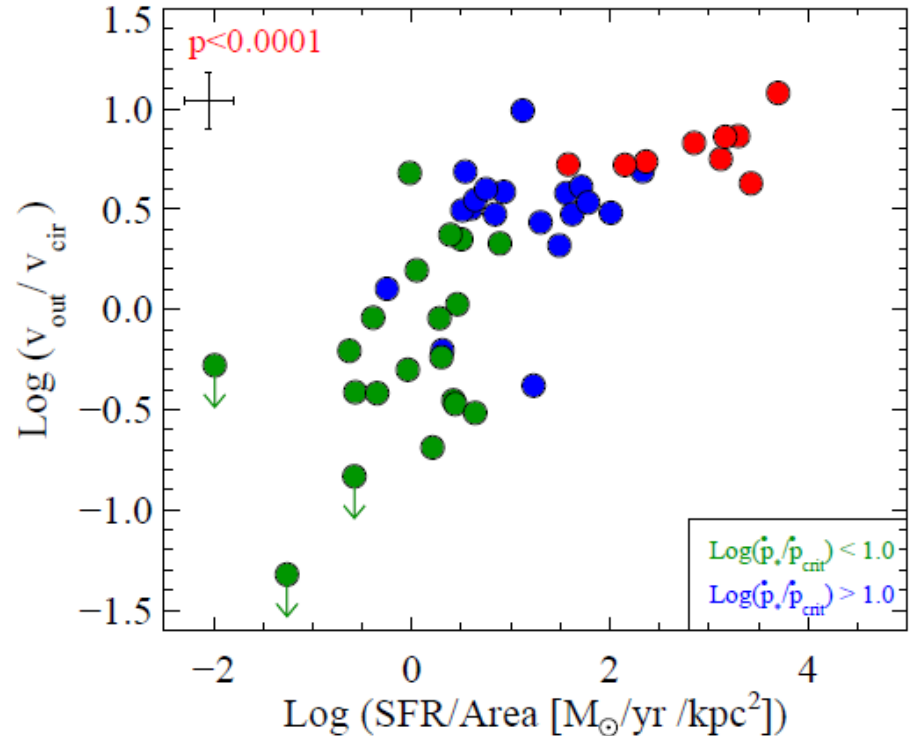
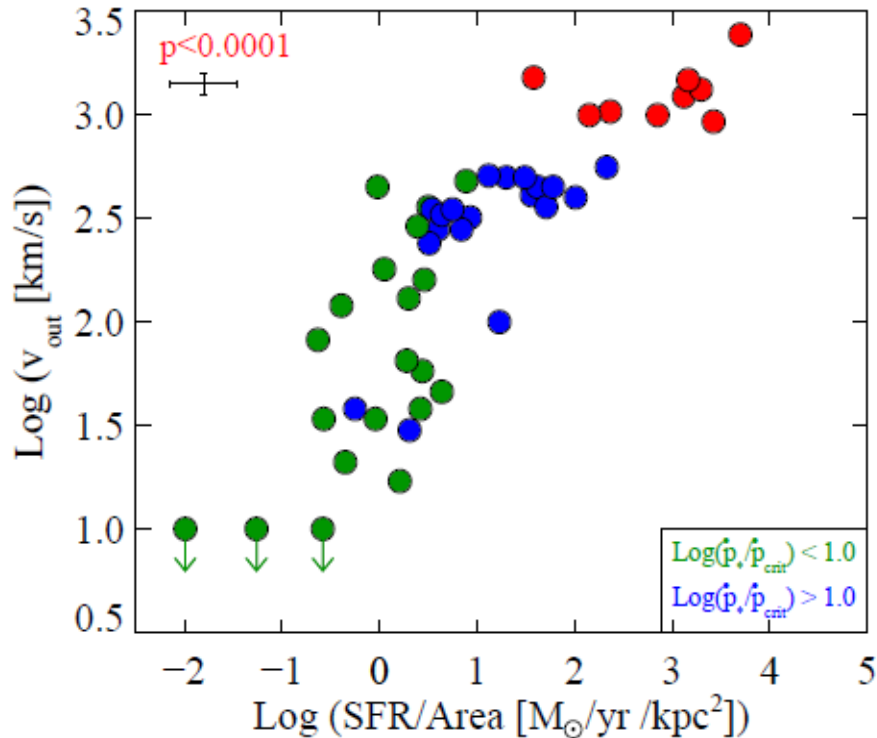
# Q1: Possibilities

- Intermittent: inflow, then outflows driven by SF
- Geometrical I: inflow in disk w/ small solid angle and wide bi-polar outflow
- Geometrical II: very narrow streams
- Phase issue: inflowing gas is highly ionized

# Q2: An inventory

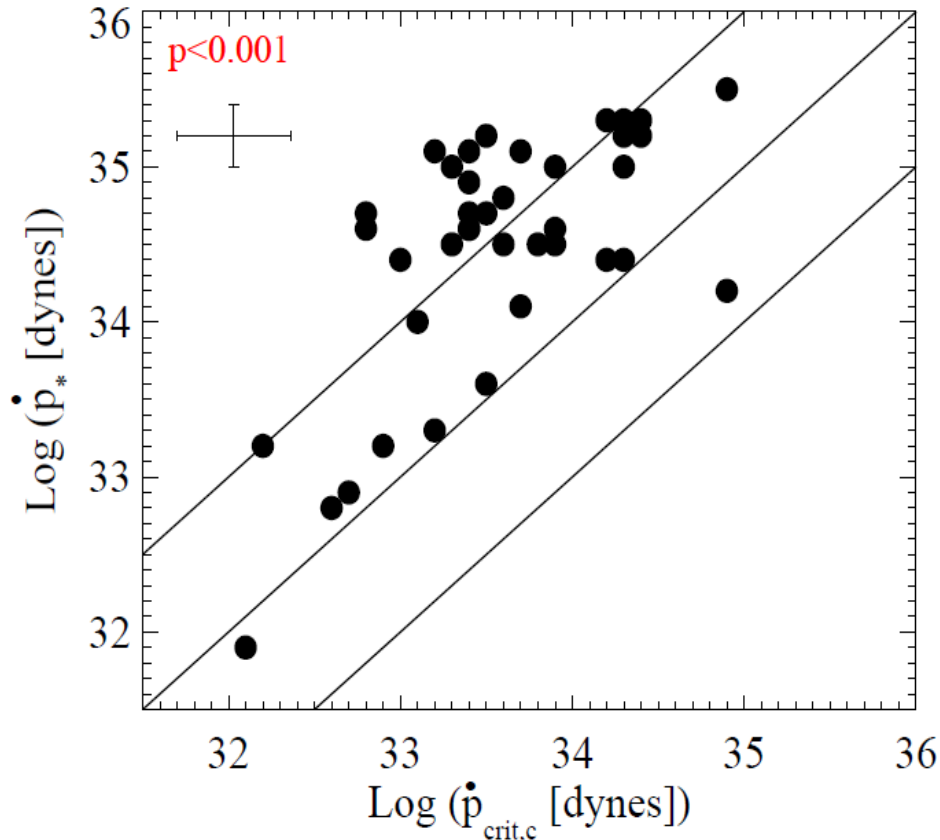


# Q3: Outflow Velocities



- > The best correlations are with SFR/area: Large outward pressure at launch point
- > The ratio ( $v_{\text{out}}/v_{\text{cir}}$ ) spans two orders-of-magnitude and correlates strongly with SFR/area

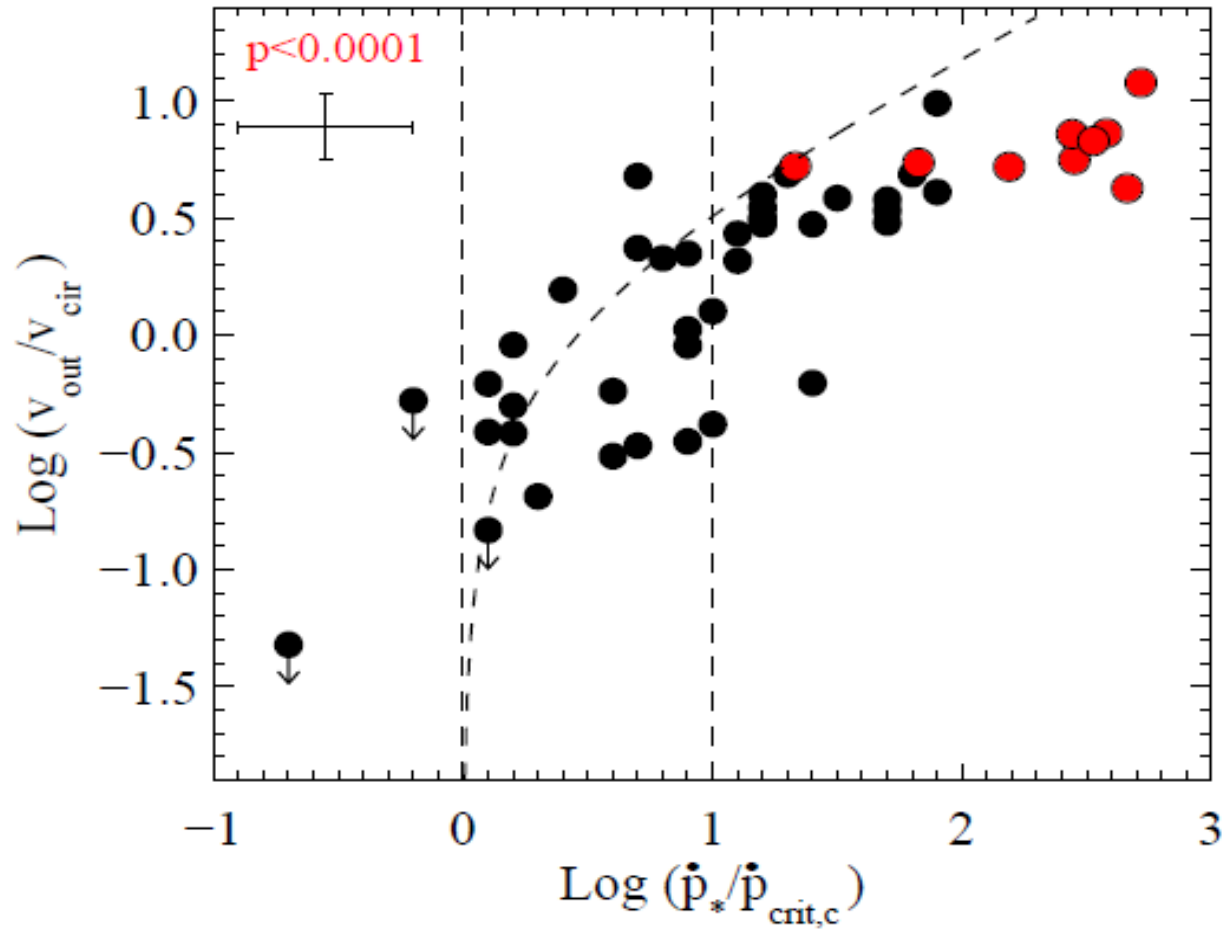
# What's the Physics?



$$\dot{p}_{crit,c} = 4\pi\beta r_* N_c \langle m \rangle v_{cir}^2$$

Consider a simple model of a population of ‘clouds’ being accelerated by a combination of wind-fluid + radiation pressure (outwards) and gravity (inwards)

# Outflow Velocity: Model vs. Data



A satisfactory match for such a simple model

# Q4: Quenching vs. Maintenance

