

PHANGS-MEERKAT & MHONGOOSE HI OBSERVATIONS OF NEARBY GALAXIES:

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The physical drivers of the molecular gas fraction, R_{mol}

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PHANGS (Physics at High Angular Resolution in Nearby Galaxies) &

MHONGOOSE (MeerKAT HI Observations of Nearby Galactic Objects

- Observing Southern Emitters) collaborations



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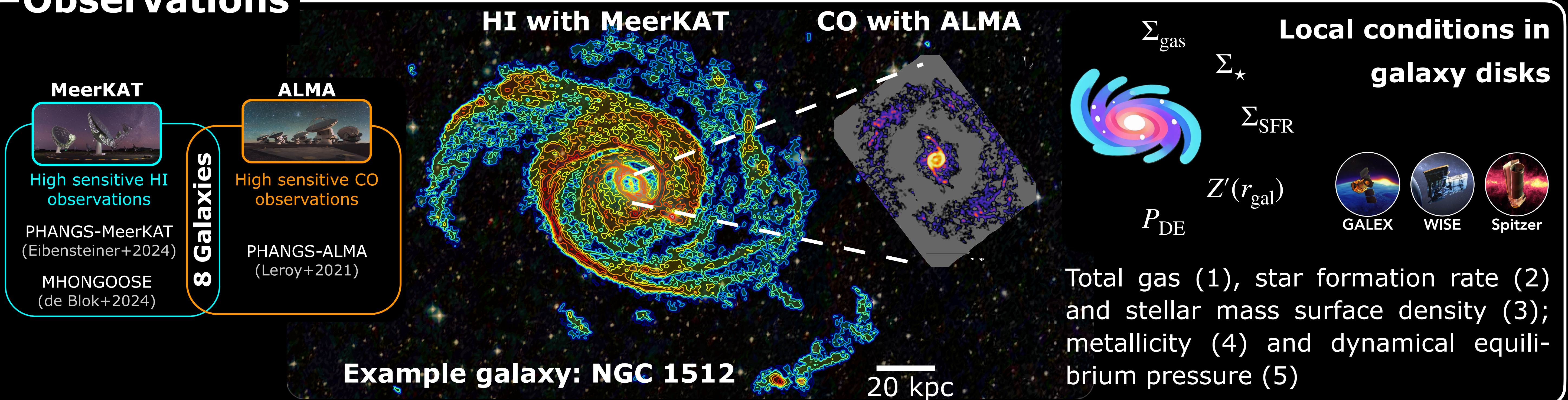
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Context: The accretion of cold gas from the circumgalactic medium is an important driver in the formation and evolution of galaxies. This cold gas first forms **atomic hydrogen** (HI) and then **molecular hydrogen** (H_2), some of which eventually collapses under gravitational instability and forms new stars

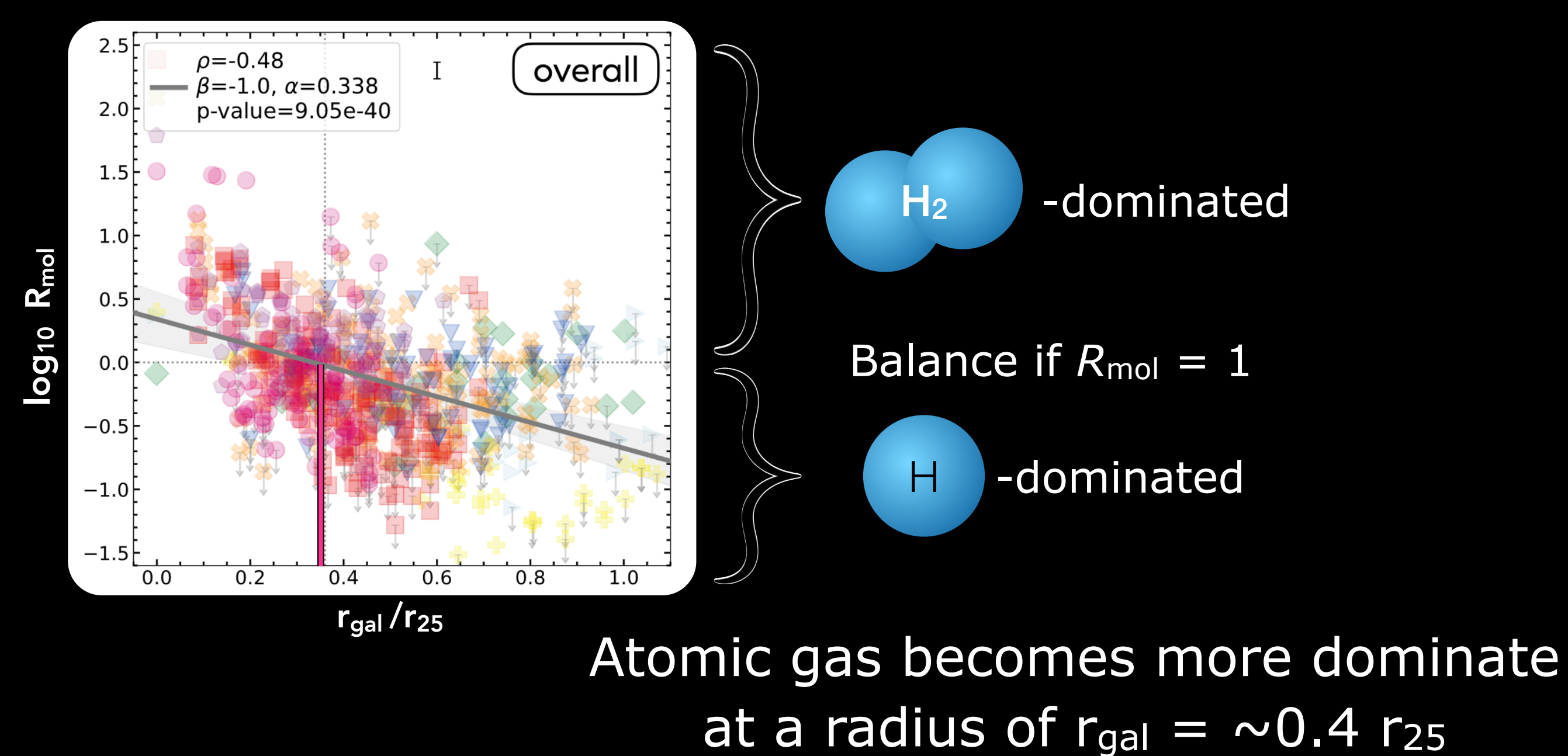
Understanding what regulates the balance between atomic and molecular gas (R_{mol}) is the key to understanding where stars form and how galaxies evolve.

$$R_{\text{mol}} = \frac{\Sigma_{\text{H}_2} [\text{M}_\odot \text{pc}^{-2}]}{\Sigma_{\text{HI}} [\text{M}_\odot \text{pc}^{-2}]} \approx \frac{\text{Molecular gas}}{\text{Neutral atomic gas}}$$

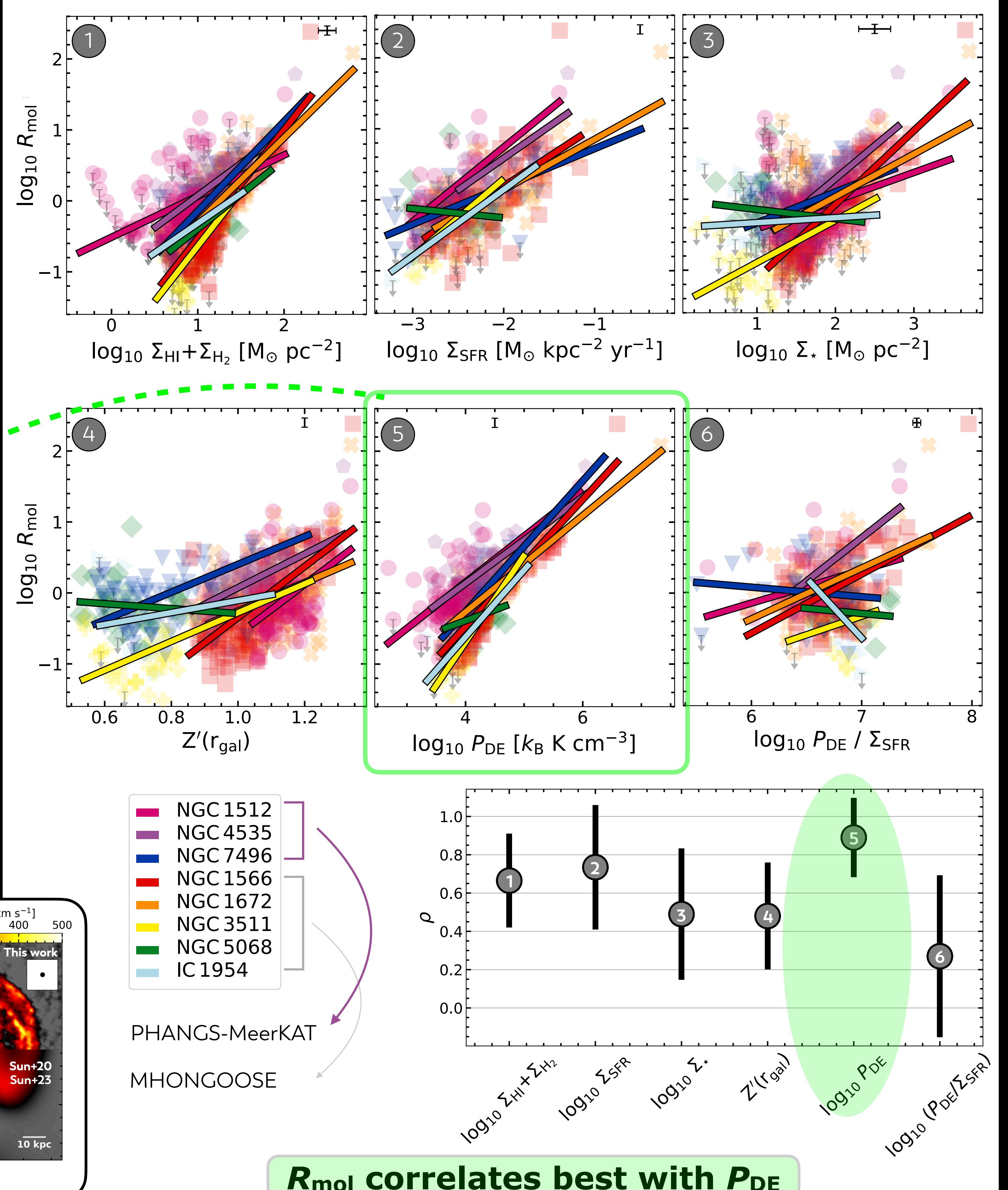
Observations



At which galactic radii does neutral atomic gas or molecular gas dominate?



How does R_{mol} depend on local conditions in galaxy disks?



P_{DE} : Expresses the pressure needed to balance the vertical gravity on the gas disk

Weight of ISM due to: **self-gravity** & **stellar gravity**

$$P_{\text{DE}} [\text{k}_B \text{K cm}^{-3}] = \left(\frac{\pi G}{2} \Sigma_{\text{gas}}^2 + \Sigma_{\text{gas}} \sqrt{2G\rho_{\star}} \sigma_{\text{gas},z} \right)$$

