The Effect of Improved Feedback Recipes on a GASOLINE Galaxy Simulation

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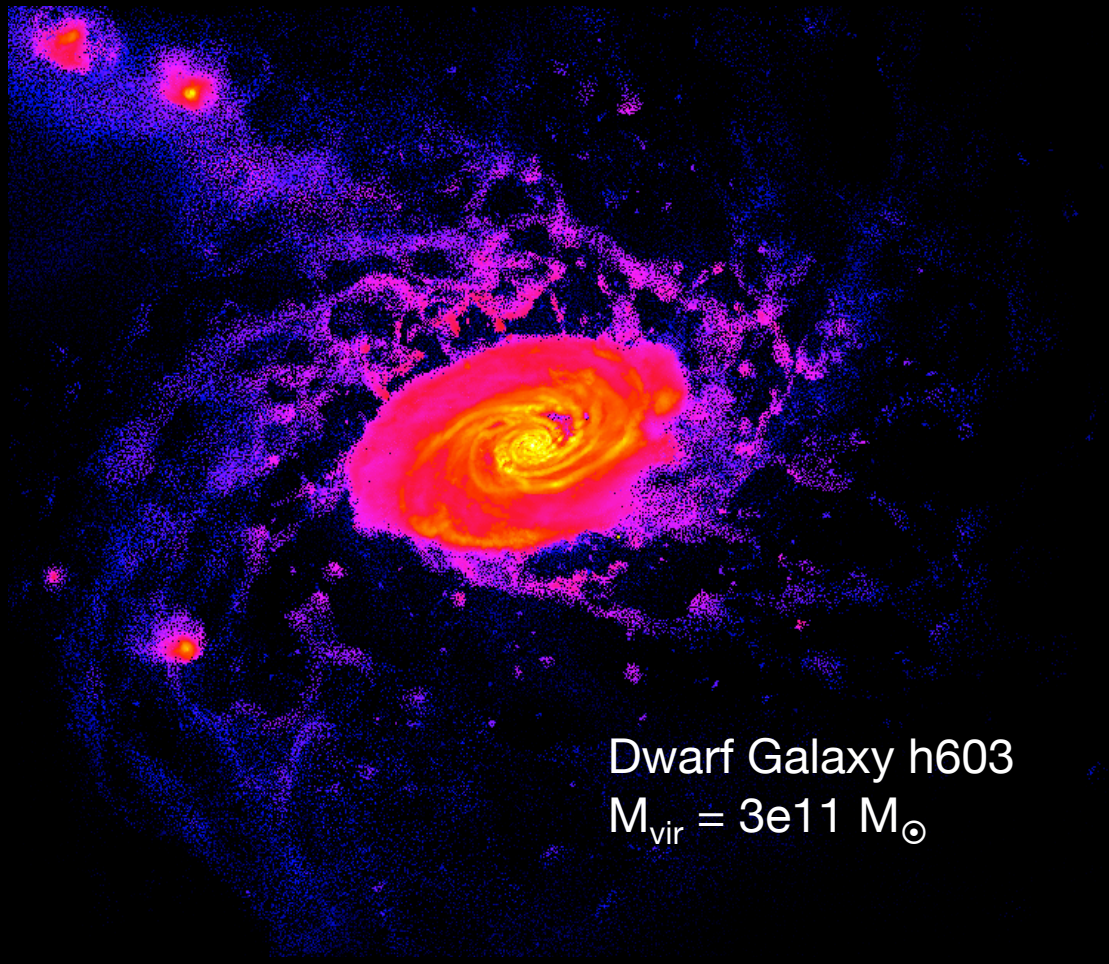
Cosmological Galaxy Simulations in GASOLINE



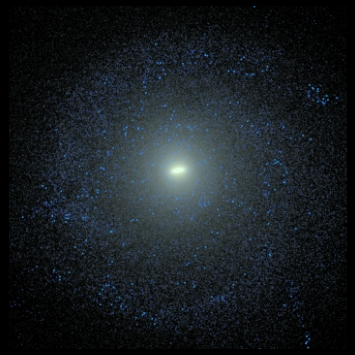
Dwarf Galaxy h603
M_{vir} = 3e11 $M_{\odot}$

What's New in the Newest Run?

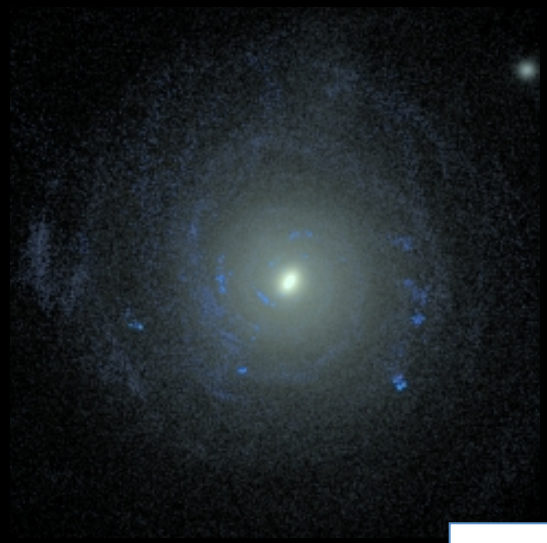
- Increased N_p so better mass/spatial res.
- Metal line cooling
- Improved SF Recipe:
  - Increase density requirement, lower max T
  - Increase SF efficiency C^* *locally*
- Stronger Feedback:
  - Energy injection into ISM more efficient, disrupts star formation globally
- Stars form in "star forming regions" in disk, don't just form in bulge

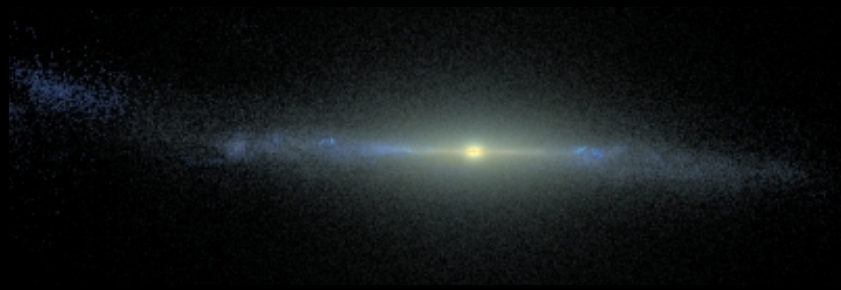
So… What happened?
Did these refinements generate
more realistic galaxies?

Med-Res Run



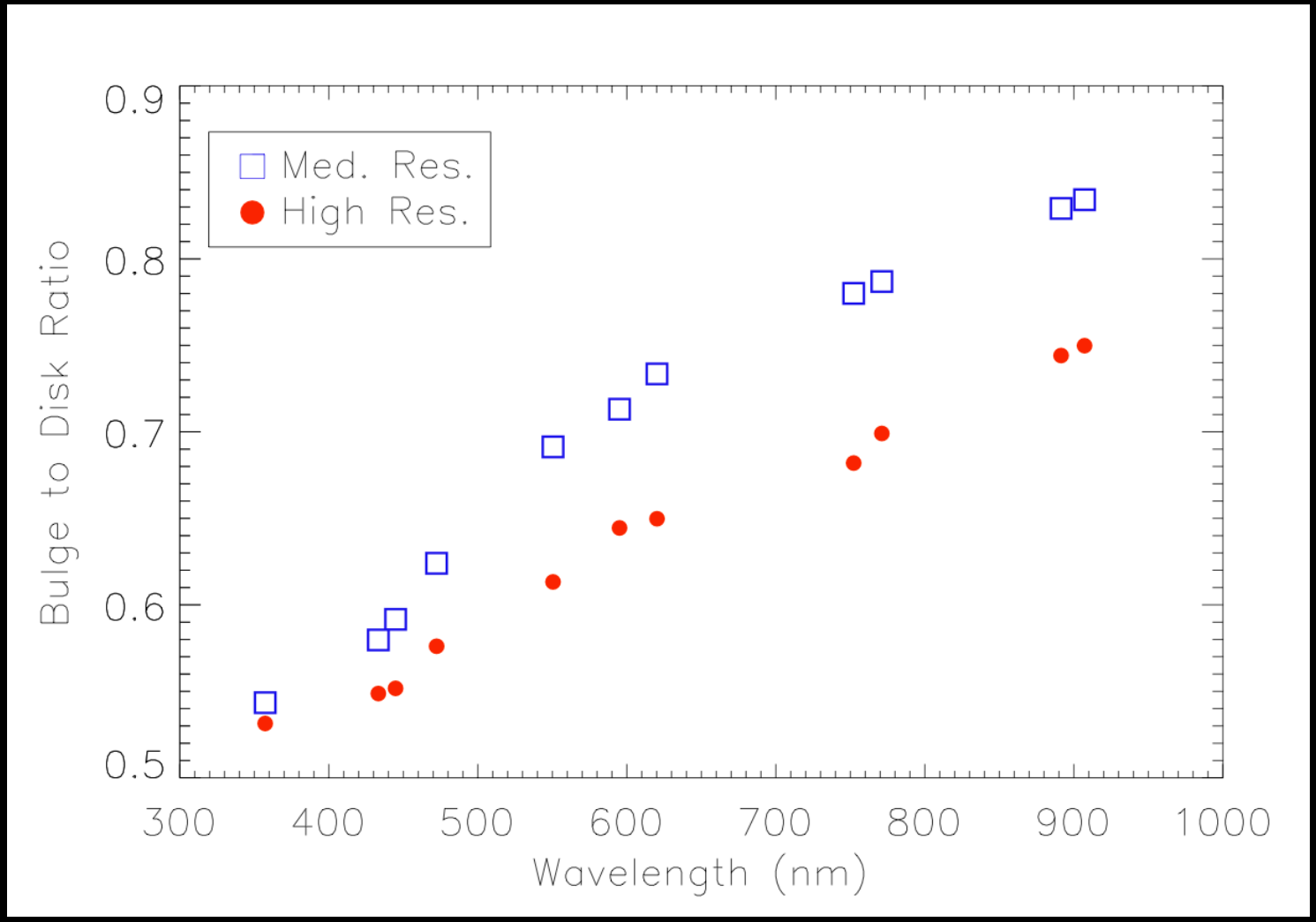
Hi-Res Run



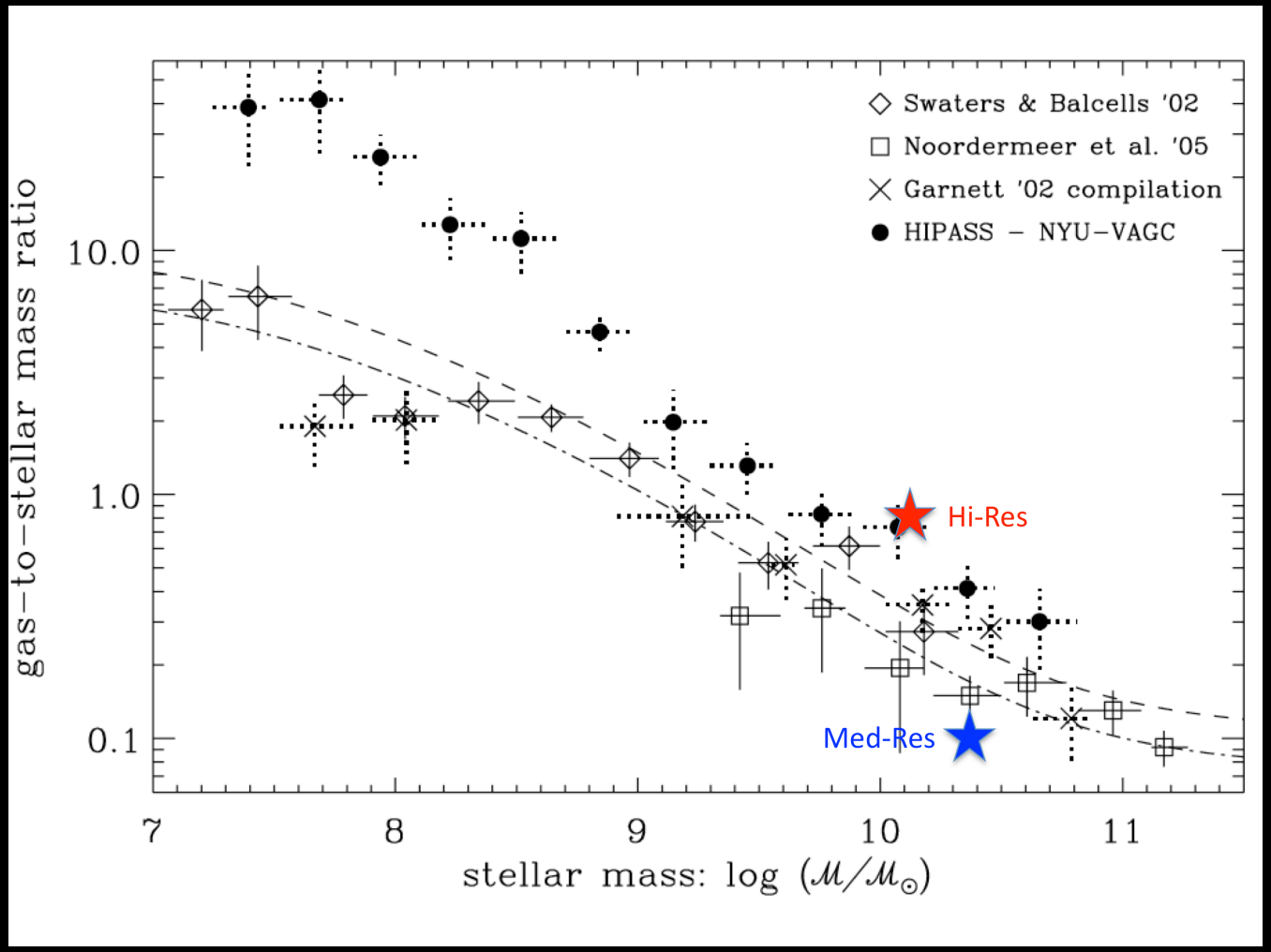


With improved recipe, stars form in localized “star forming regions”!

Bulge/Disk Ratio

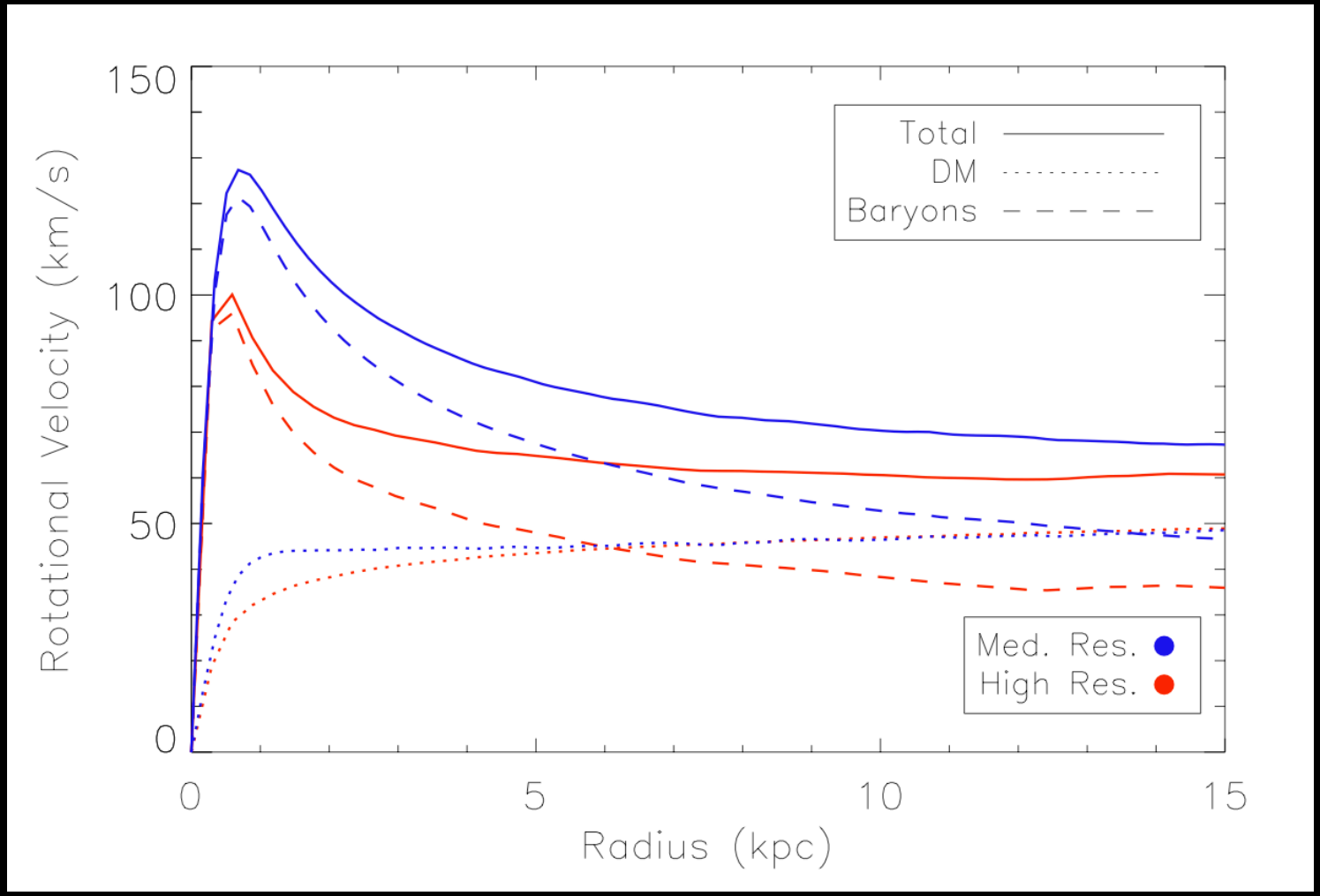


Gas-to-Dust vs. Mass

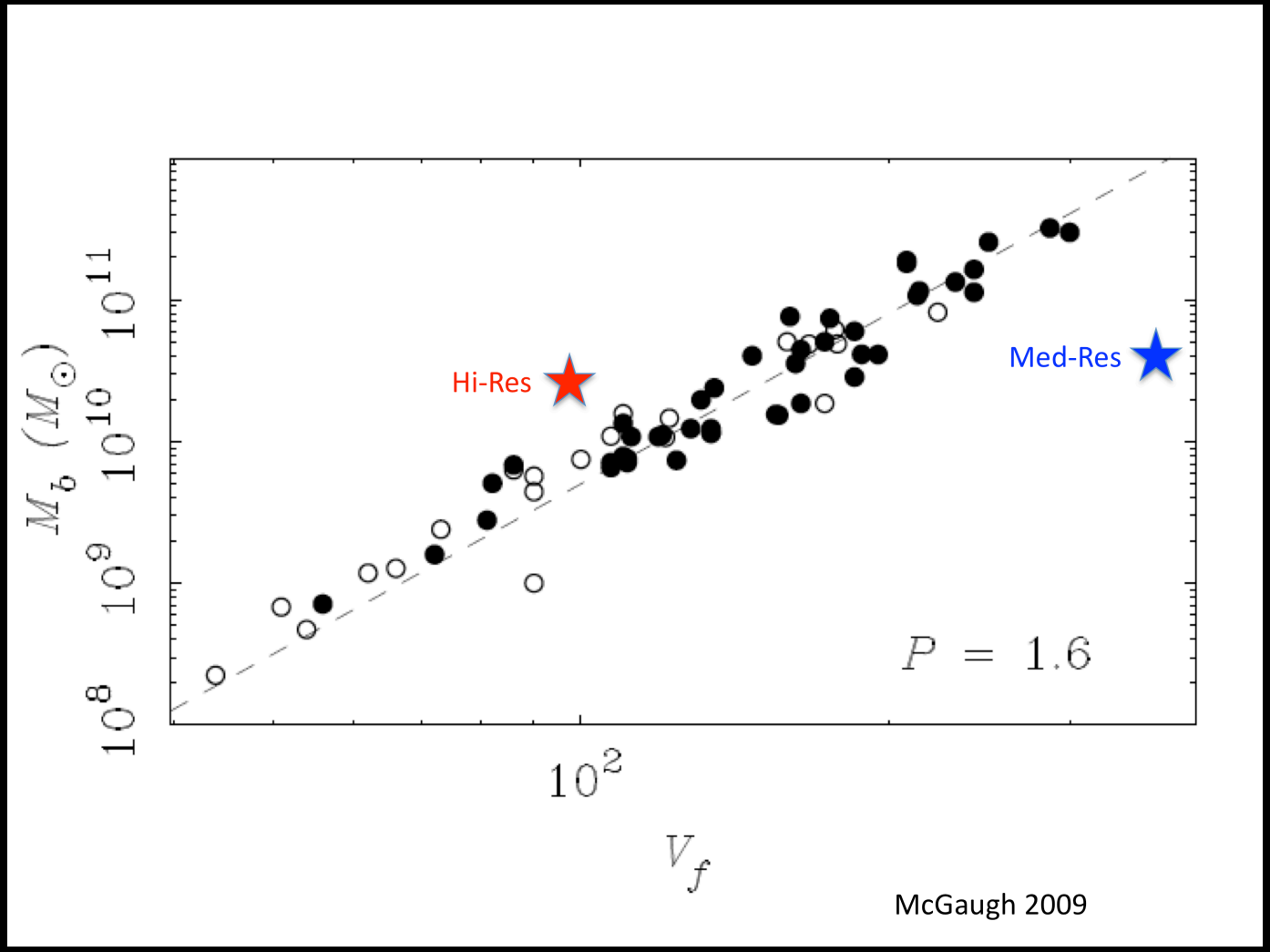


Baldry, I. K., Glazebrook, K., & Driver, S. P. (2008)

Rotation Curve

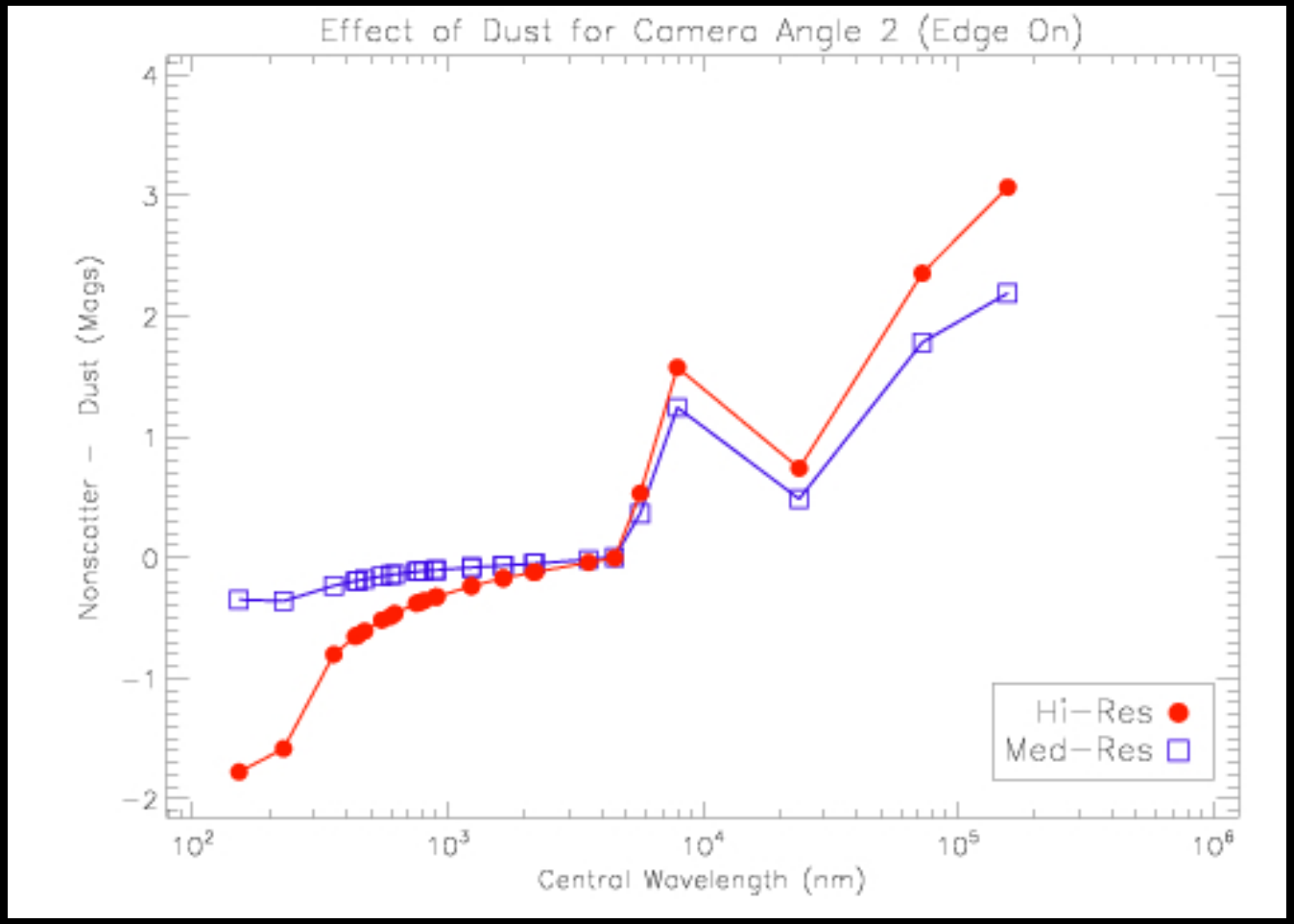


Baryonic Tully-Fisher



McGaugh 2009

Improved Dust



Conclusions

With new and improved SF/SN recipe,

h603 has:

- Higher gas-to-star ratio
- Shallower DM profile
- Bulge-to-disk ratio lowered
- Dust content in line with what's expected for a galaxy of that mass

All in all, a better match to observations

References

- F. Governato et al. 2010, *Nature*,463,203L
- Baldry, I. K., Glazebrook, K., & Driver, S. P. 2008, MNRAS, 388, 945
- Sunrise Documentation: http://code.google.com/p/sunrise/w/list
- McGaugh, S. 2009, in *Extreme Star Formation in Dwarf Galaxies* (USA: Ann Arbor, MI), http://www.astro.lsa.umich.edu/~ognedin/dwarf2009/talks/.

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