

Updated kinematic constraints on a dark disk

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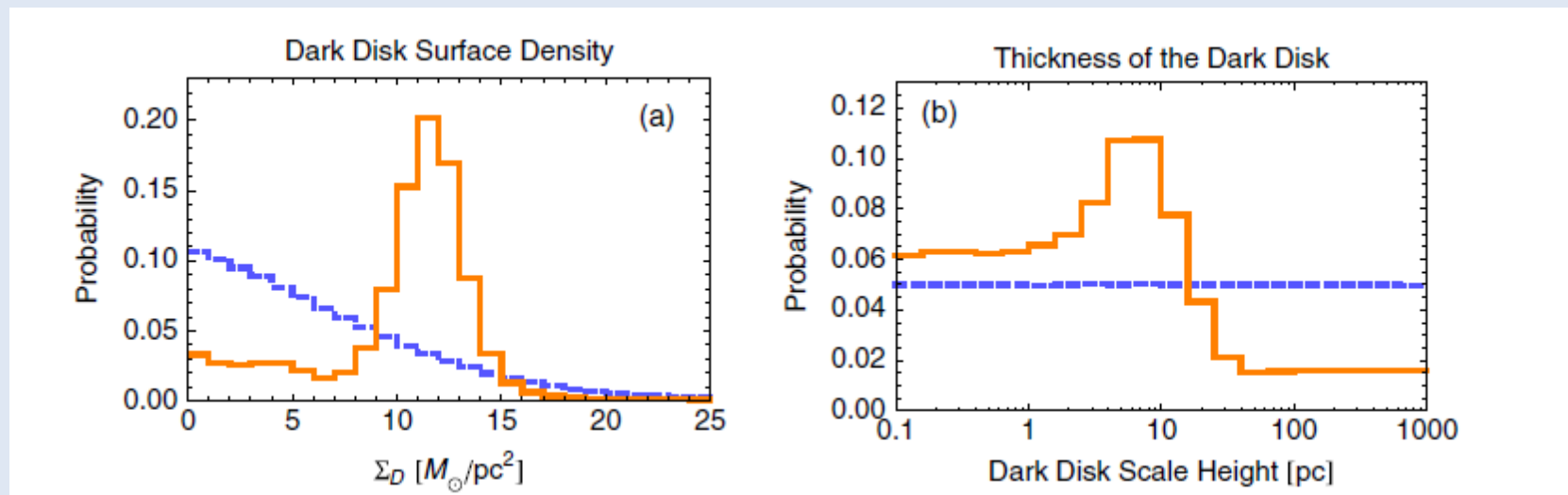


Disk Dark Matter

- Jan Oort 1932, 1960
- JiJi Fan, Andrey Katz, Lisa Randall, Matthew Reece study DDDM (1303.3271, 1303.1521)
 - Current bounds only imply that majority of DM is collisionless
 - Fraction ε of total dark matter could be dissipative
→ DDDM

Explain comet impacts?

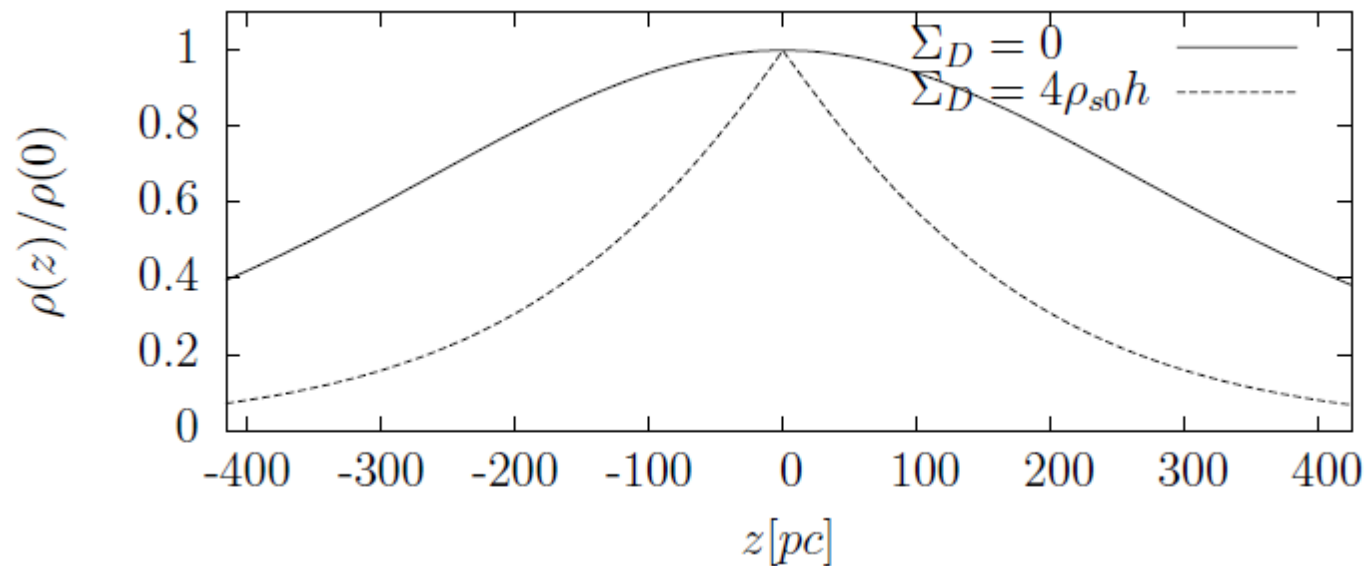
- More recently Recently, Randall and Reece show that DDDM can account for 35 My crater periodicity
 - $\Sigma_D \sim 10 M_\odot/\text{pc}^2$, $h_D \sim 10 \text{ pc}$



[PRL 112 (16), 2014]

Constrained by stellar distributions?

- For gaussian velocity distribution, a thin dark disk will 'pinch' the star distributions



Constrained by stellar kinematics?

- What are bounds on Σ_D , h_D from current data?
- Procedure:
 - Vertical kinematics of MW stars
- Studies claiming dark disk "ruled out":
 - Kuijken & Gilmore (1989) consistent with no DD
 - Holmberg & Flynn (2000) "
 - Bovy & Rix (2013)
 - Dynamics "leave little room for a dark disk component"

Updates

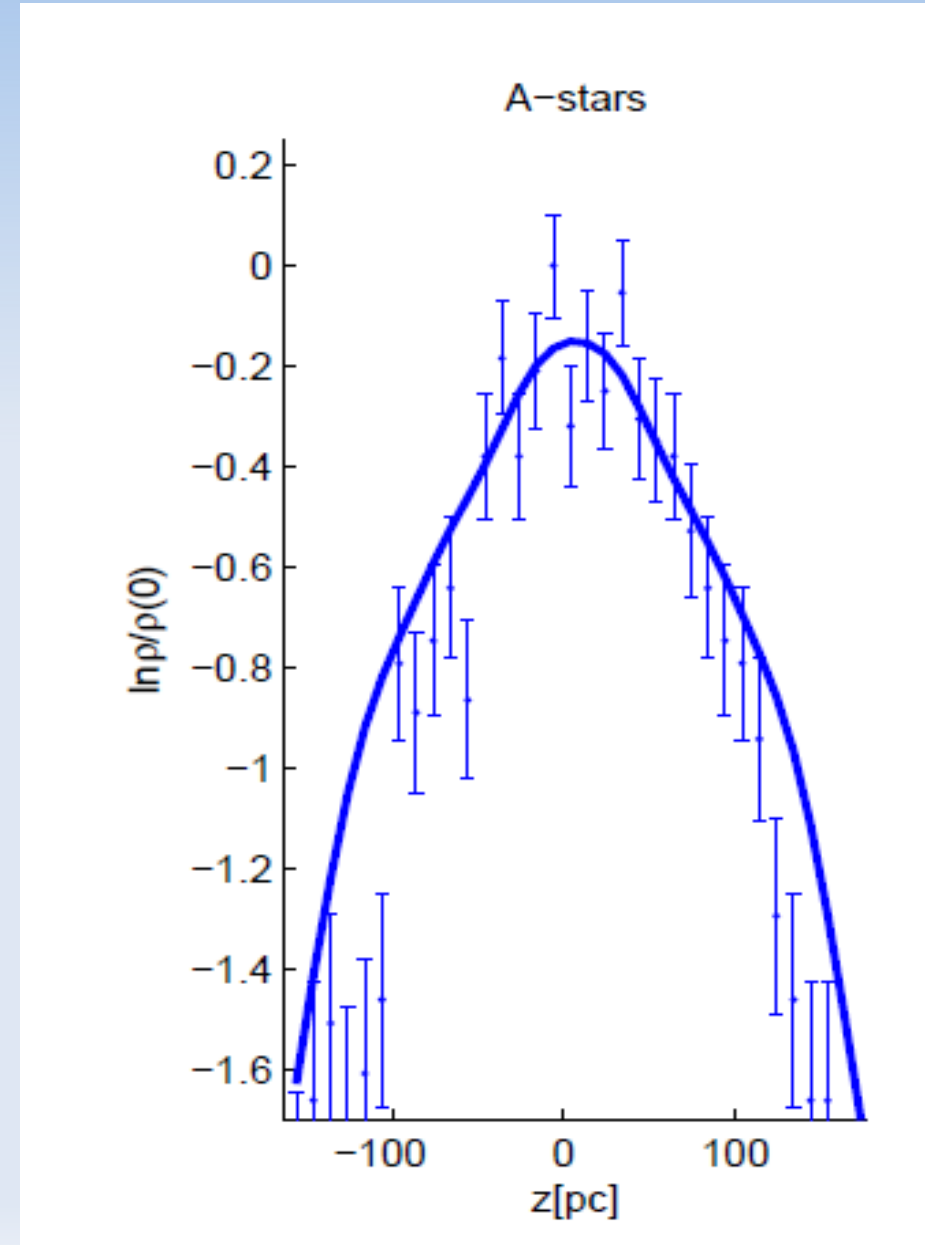
- **SELF-CONSISTENT APPROACH!**

Updates

- SELF-CONSISTENT APPROACH!
- Kinematics
 - Hipparcos new reduction (van Leeuwen, 2007)
 - Radial velocities (Barbier-Brossat & Figon, 2000)
 - Updated extinction corrections (Schlafly *et al*)
- Model
 - Updated gas parameters (1987-2010)
- Statistics
 - Monte carlo

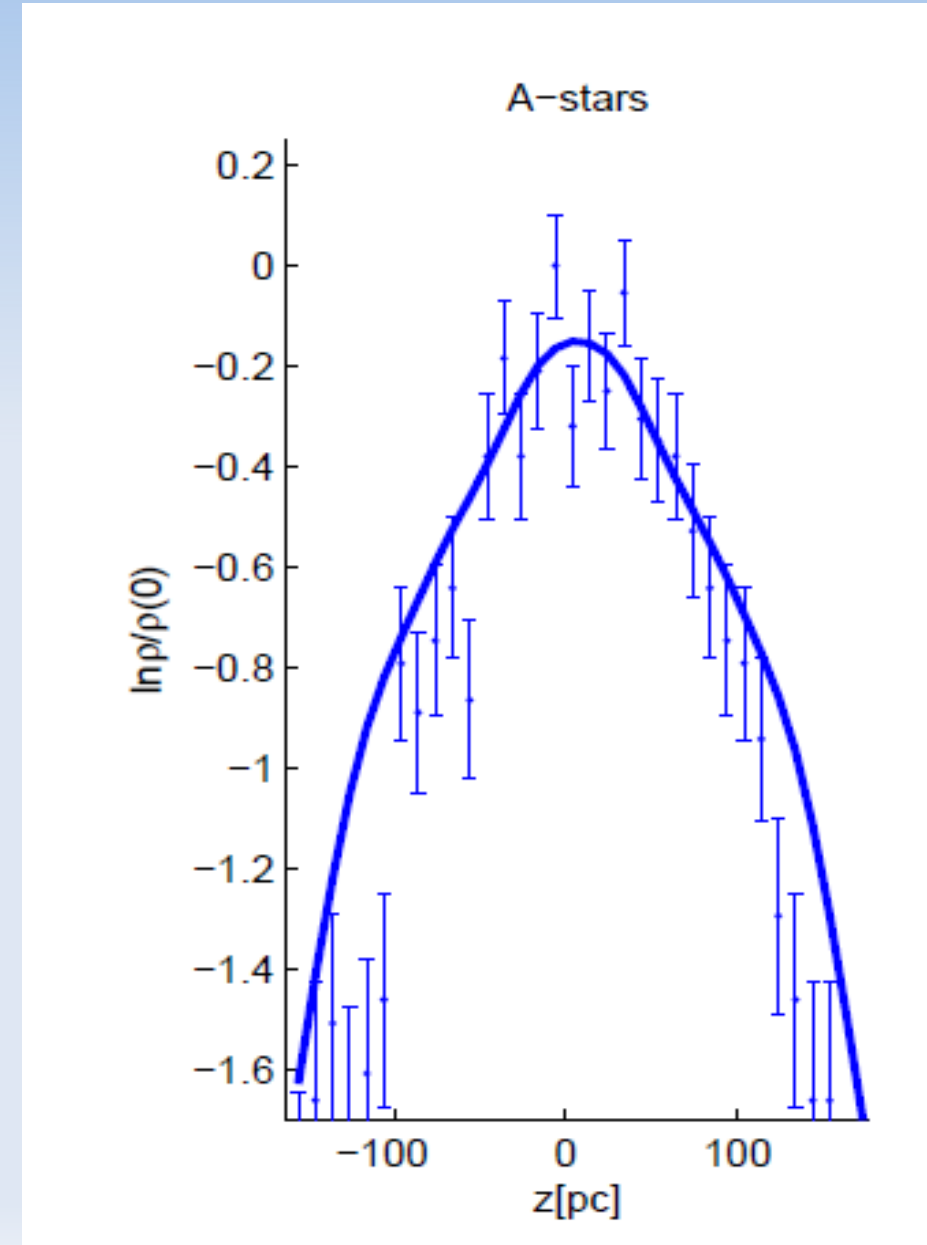
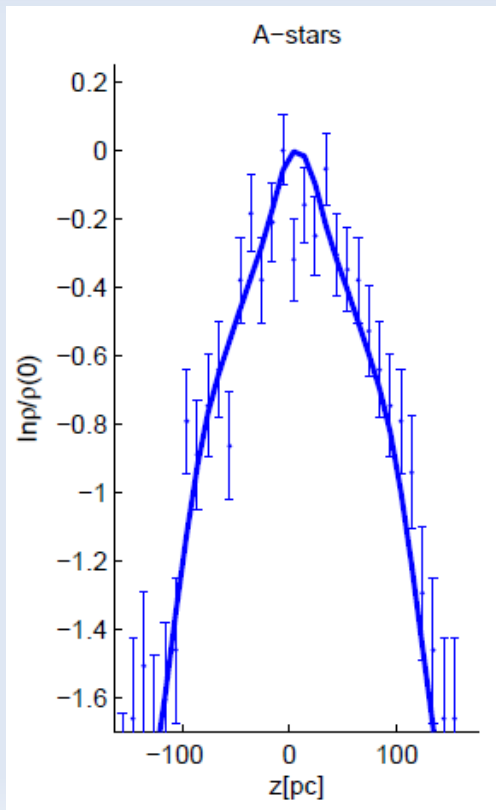
HF2000

- Updated study:
 - Still a good fit?

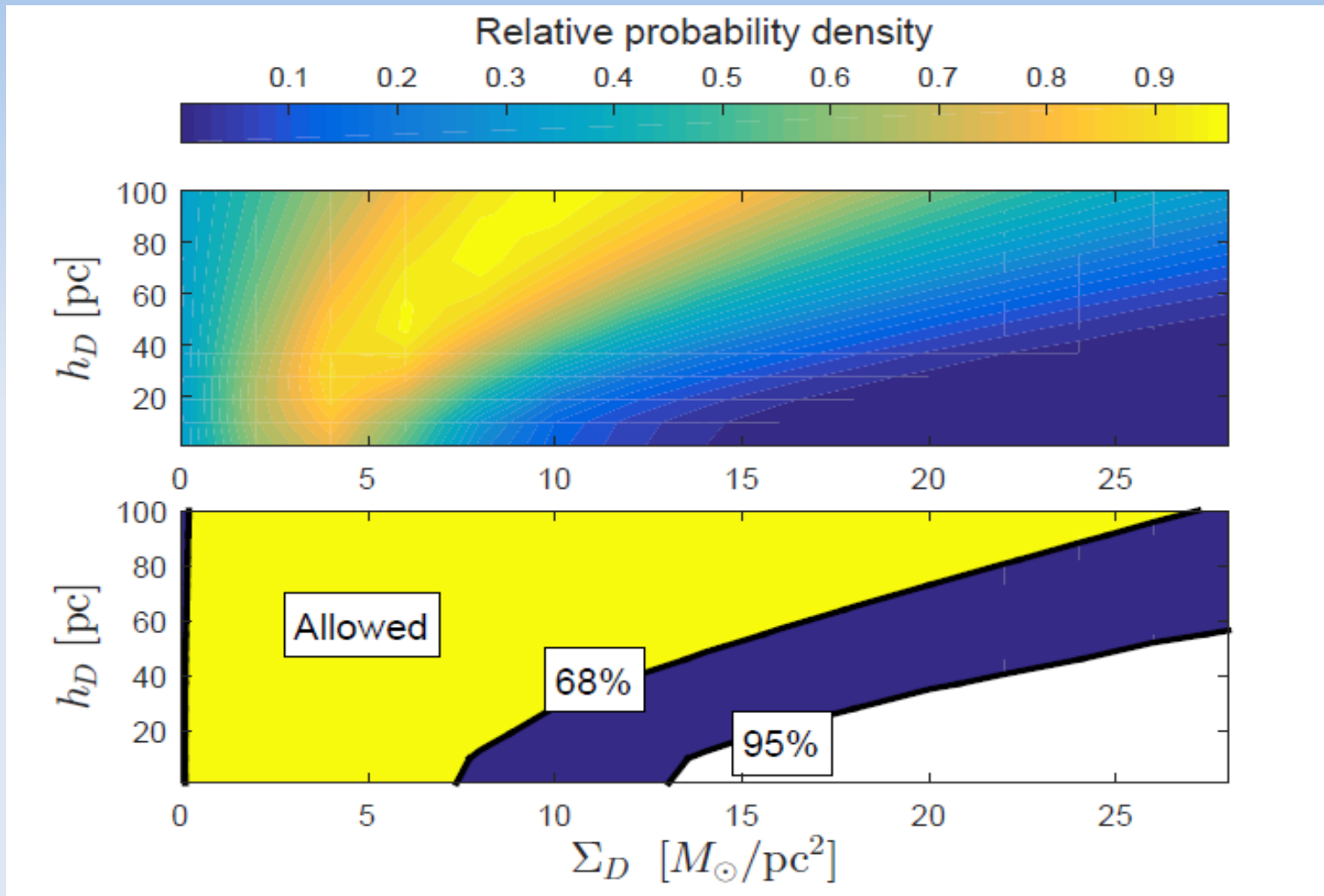


HF2000

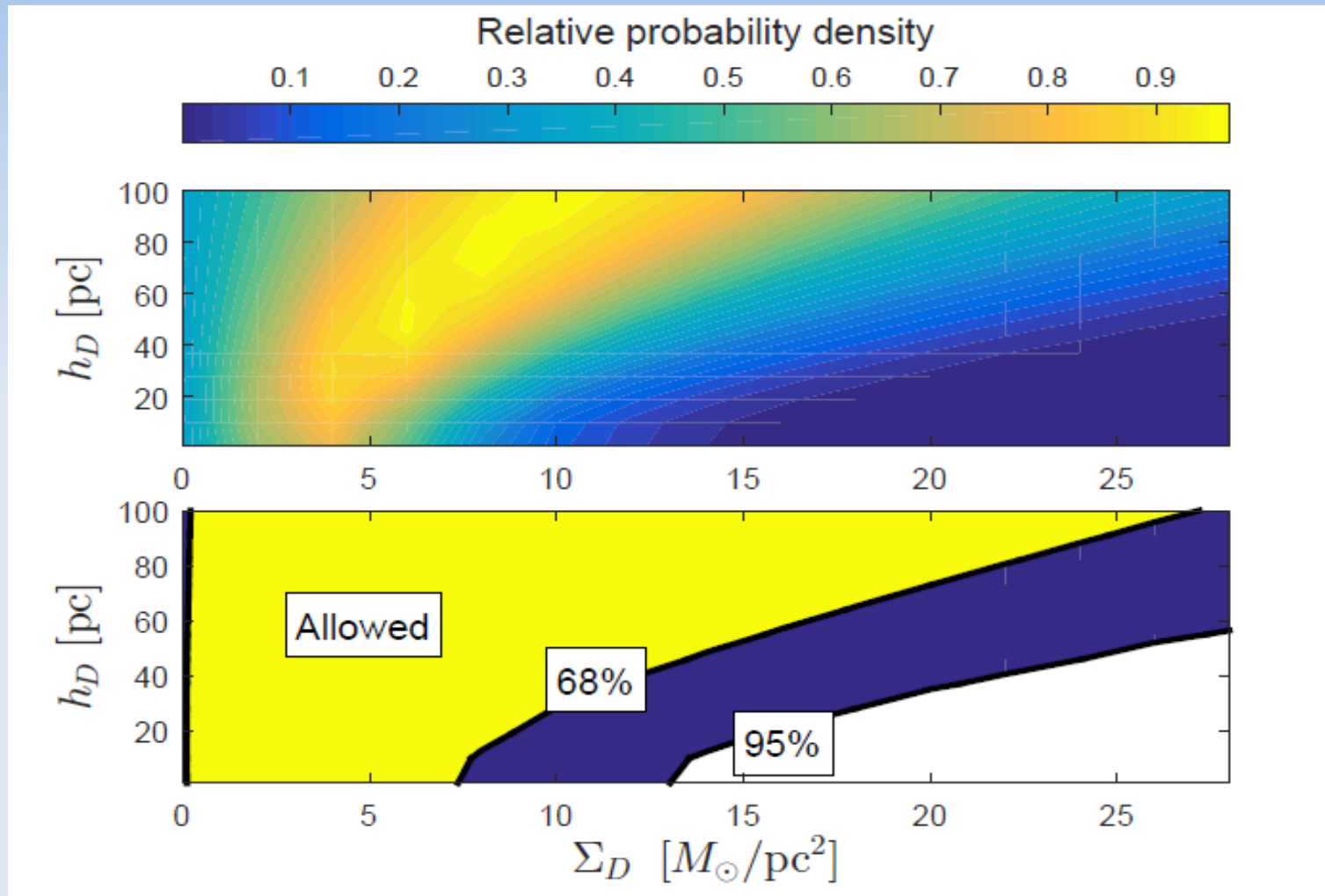
- Updated study:
 - Still a good fit?



Bounds



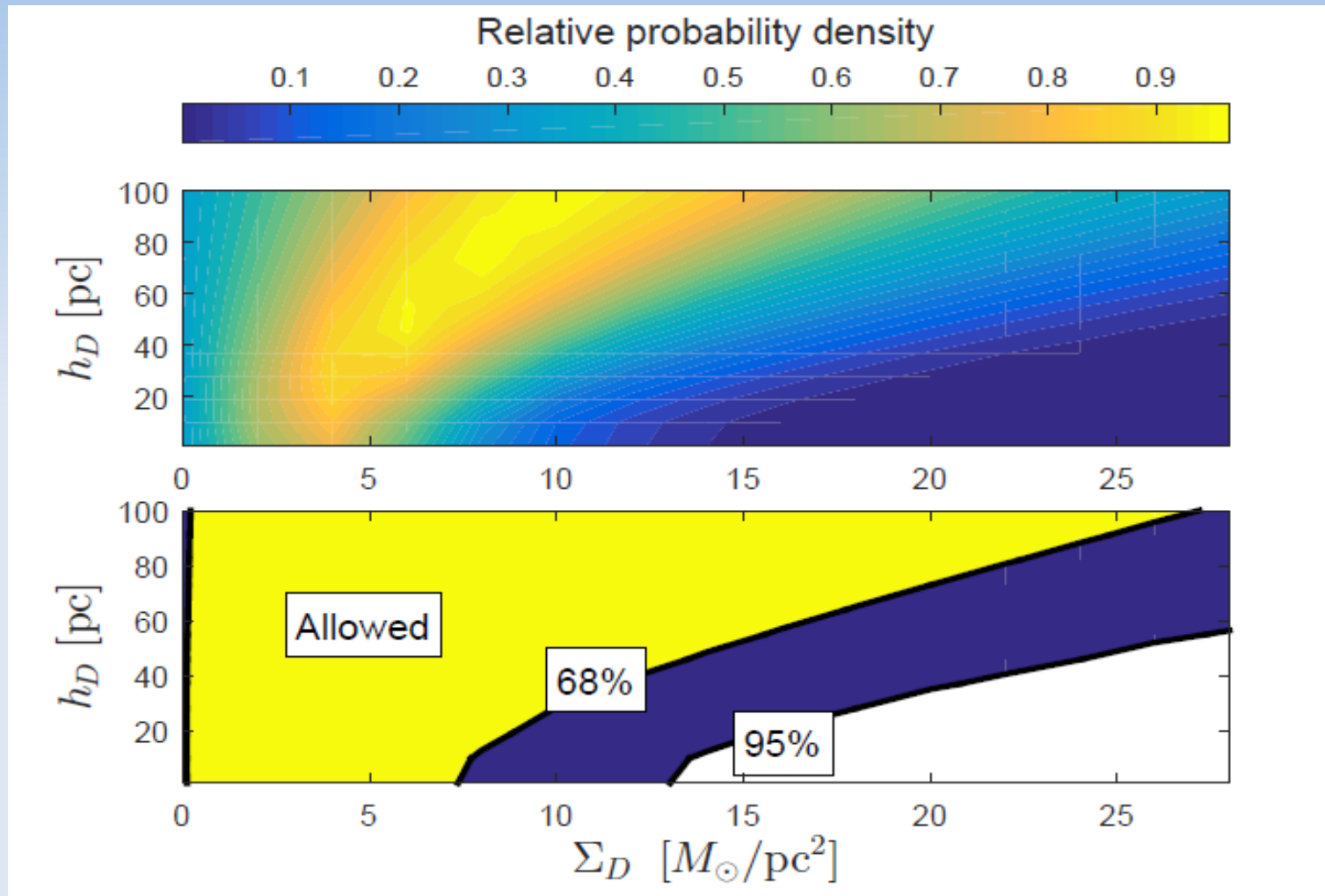
Bounds



- Unidentified disk matter:

$$\rho = 0.026^{+0.102}_{-0.025} M_\odot \text{pc}^{-3}$$

Bounds



- Unidentified disk matter:

$$\rho = 0.026_{-0.025}^{+0.102} M_\odot \text{pc}^{-3} > 3\rho_{\text{halo}}$$

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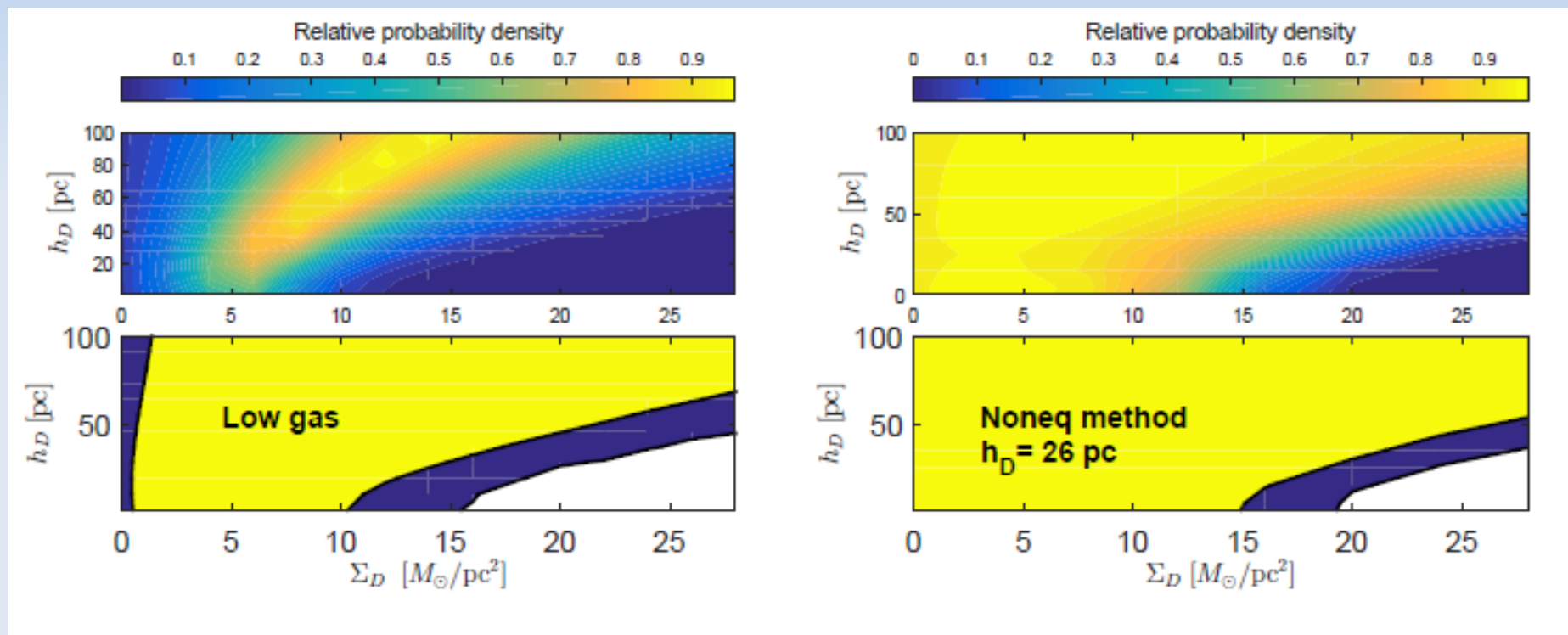
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Other bounds



Other bounds

