The DREAMS Project: The Relative Impact of Astrophysics and Halo-to Halo Variation on the Dark Matter Density Profiles

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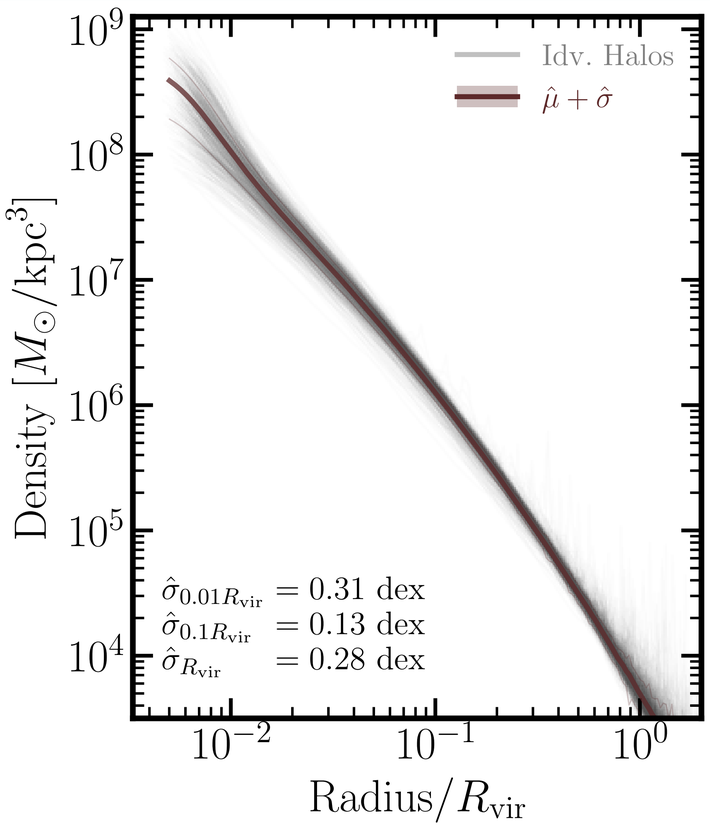
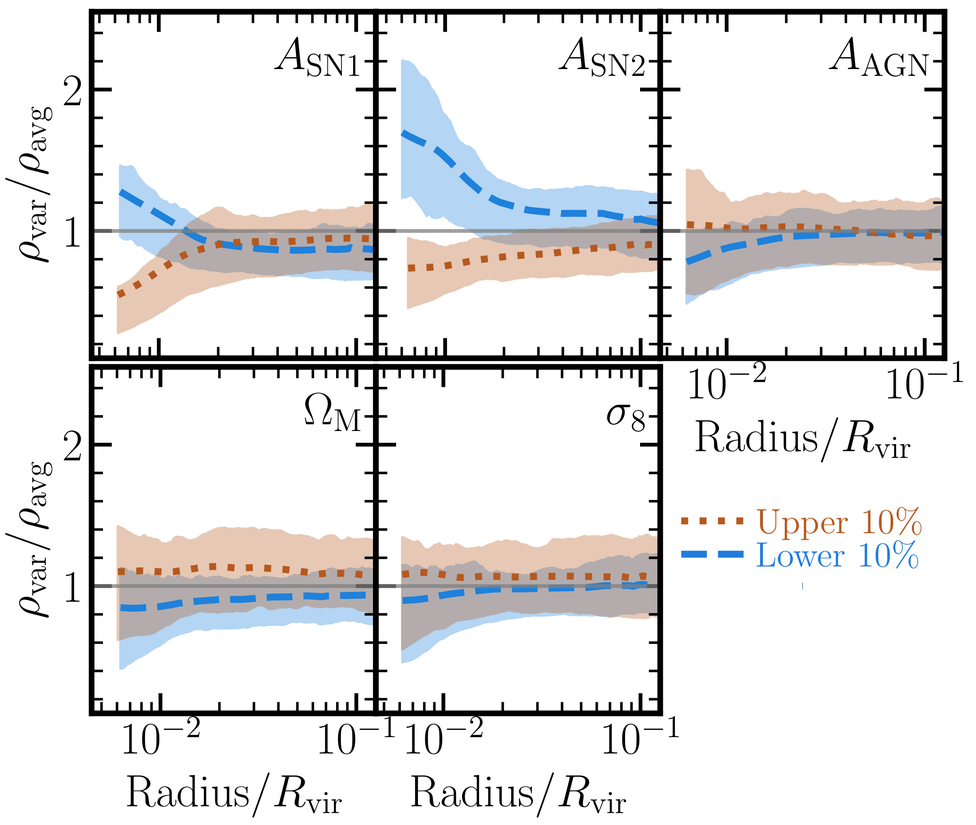
Background

- New Suite of 1024 Milky Way-Mass Halos using IllustrisTNG physics
- Simultaneous Variations in 2 supernova, 1 black hole, and 2 Cosmology Parameters



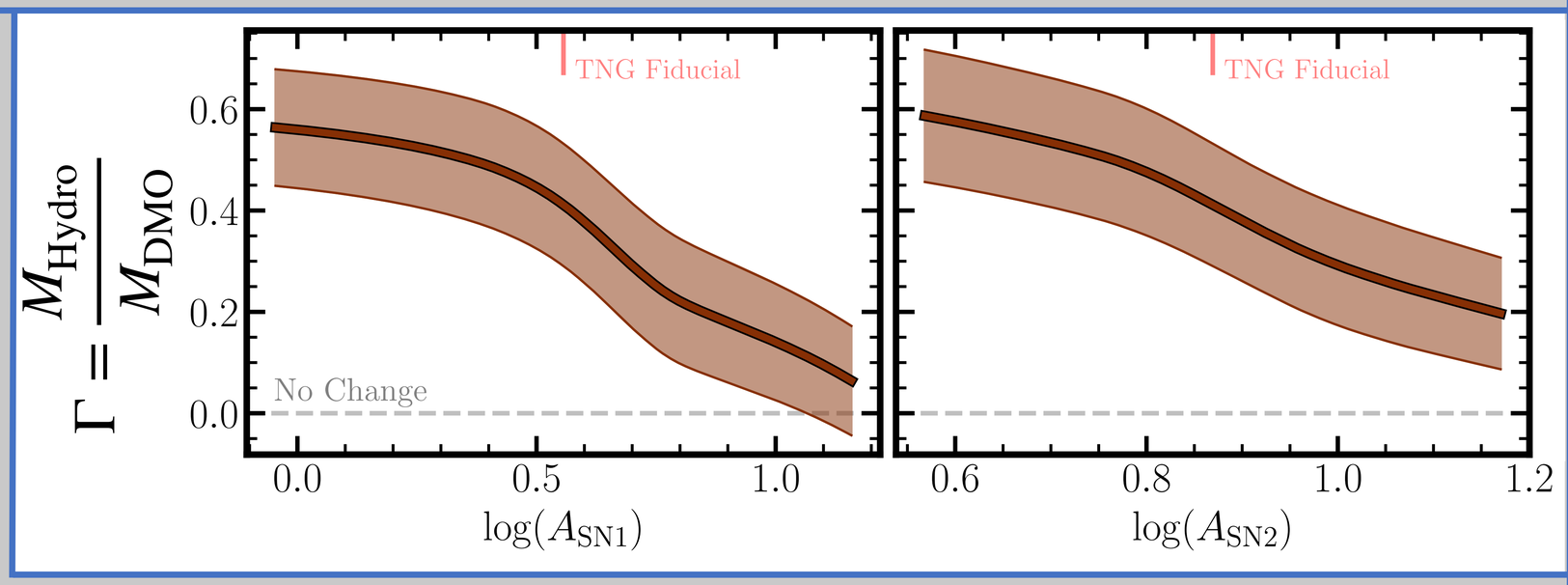


Results

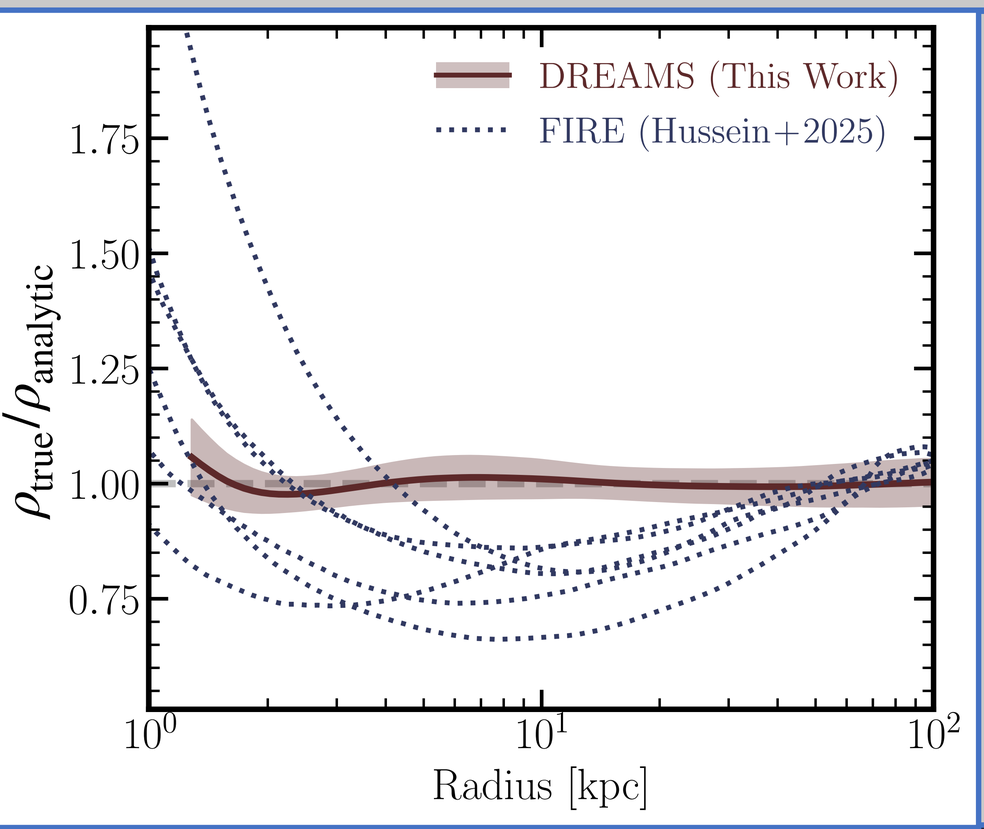
- We find That The dominant Driver of Scatter is intrinsic halo-to-halo Variation for Milky Way-Mass Halos (above)
- Supernova Wind Energy ($A_{\rm SN1}$) and Wind Speed ($A_{\rm SN2}$) can play a sub-dominant role in the inner regions ($\lesssim 0.02R_{\rm vir}$)

Discussion

- Use Neural Network Emulator to learn single Parameter dependencies
- Most extreme Supernova Physics Variations prevent stellar mass growth
- Simulations with highest feedback are effectively Dark matter only (DMO; Right)



- Despite this strong feedback, models with bursty (strong and time-variable) feedback Disagree more with simple analytical Models (below)



Conclusions

- New Simulation Suite of Milky Way-Mass Galaxies well-suited to Machine Learning analyses!
- Halos IllustrisTNG model robust to changes in Feedback Implementation
- Significant disagreement with bursty feedback models