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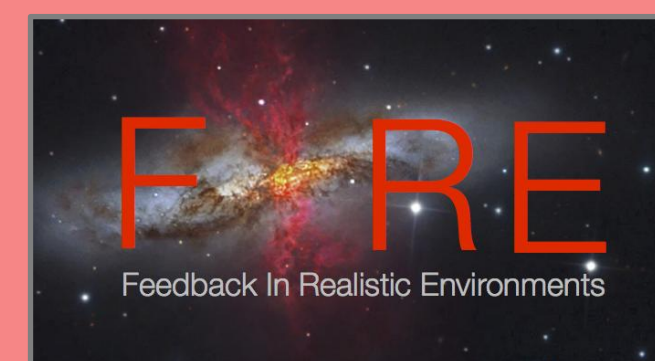
Dusty Sightlines

Constraining Dust Evolution with Milky Way Depletions and Extinction Curves

Dr. Caleb Choban



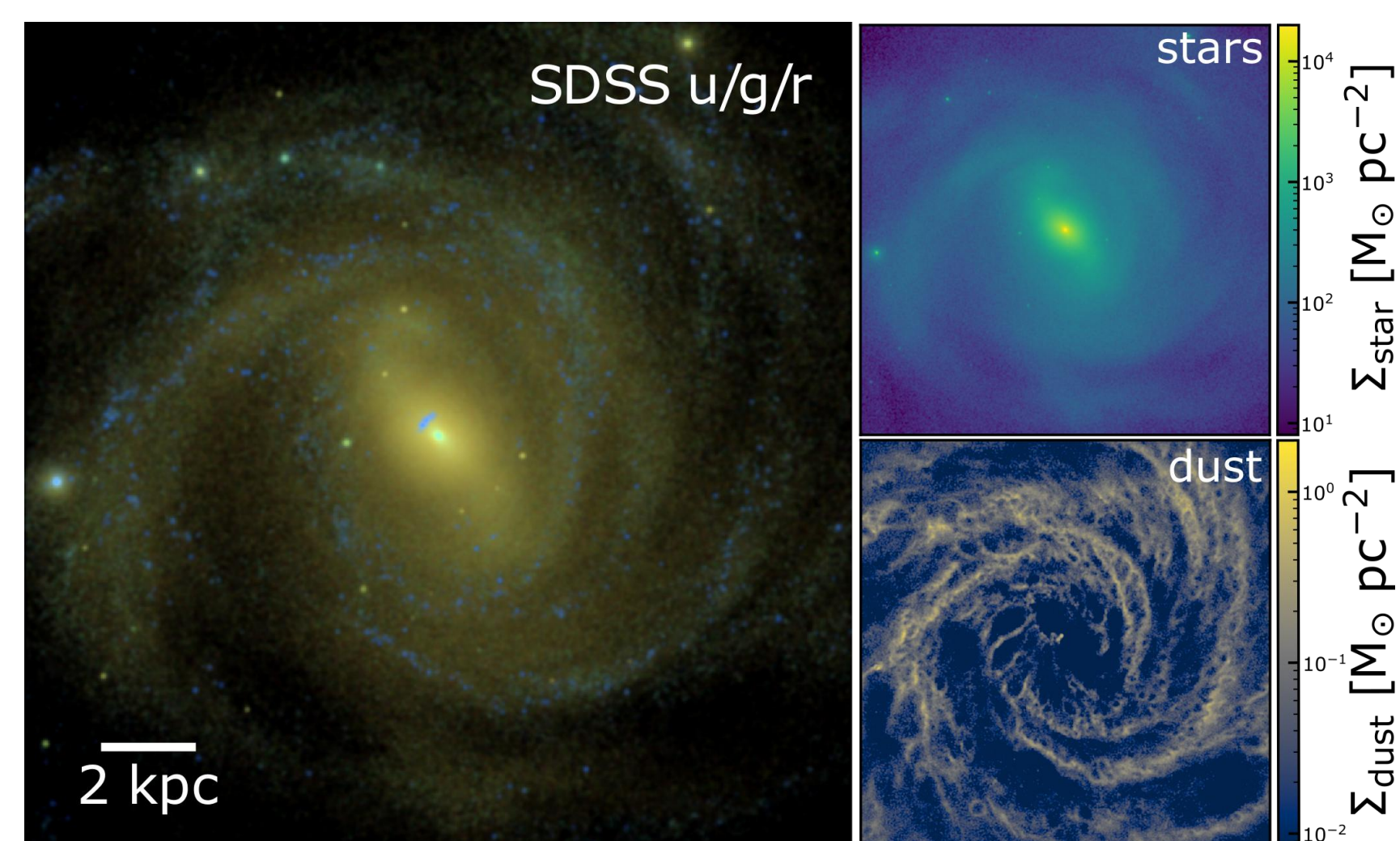
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Background

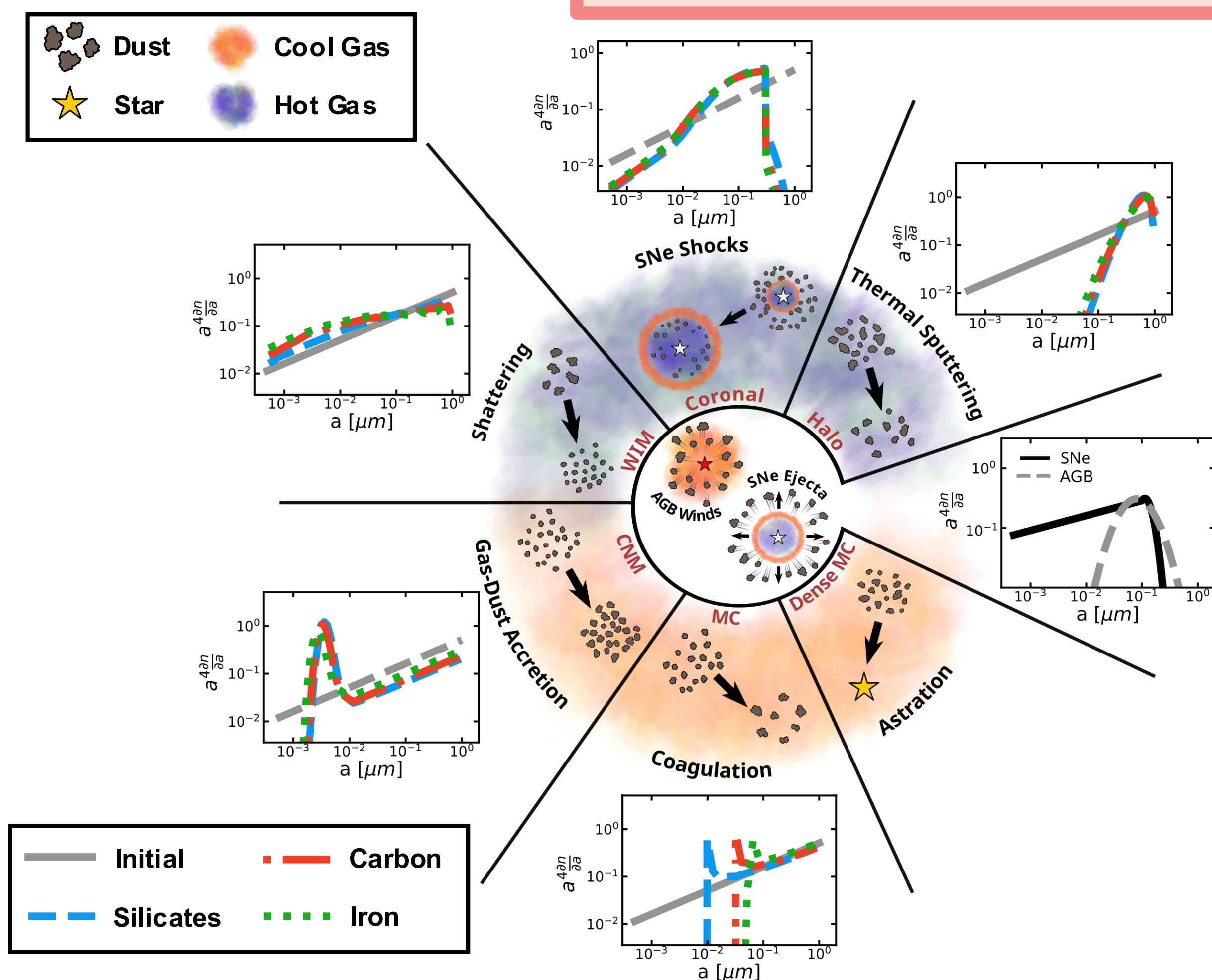
- ▶ The Milky Way reveals strong element depletion trends and a variety of steep/flat extinction curves.
- ▶ What dust processes are constrained by element depletion trends?
- ▶ What dust processes are constrained by the steepness/flatness of extinction curves?

Simulations



- ▶ Idealized MW spiral evolved for 1 Gyr
- ▶ Suite of reruns varying each dust process

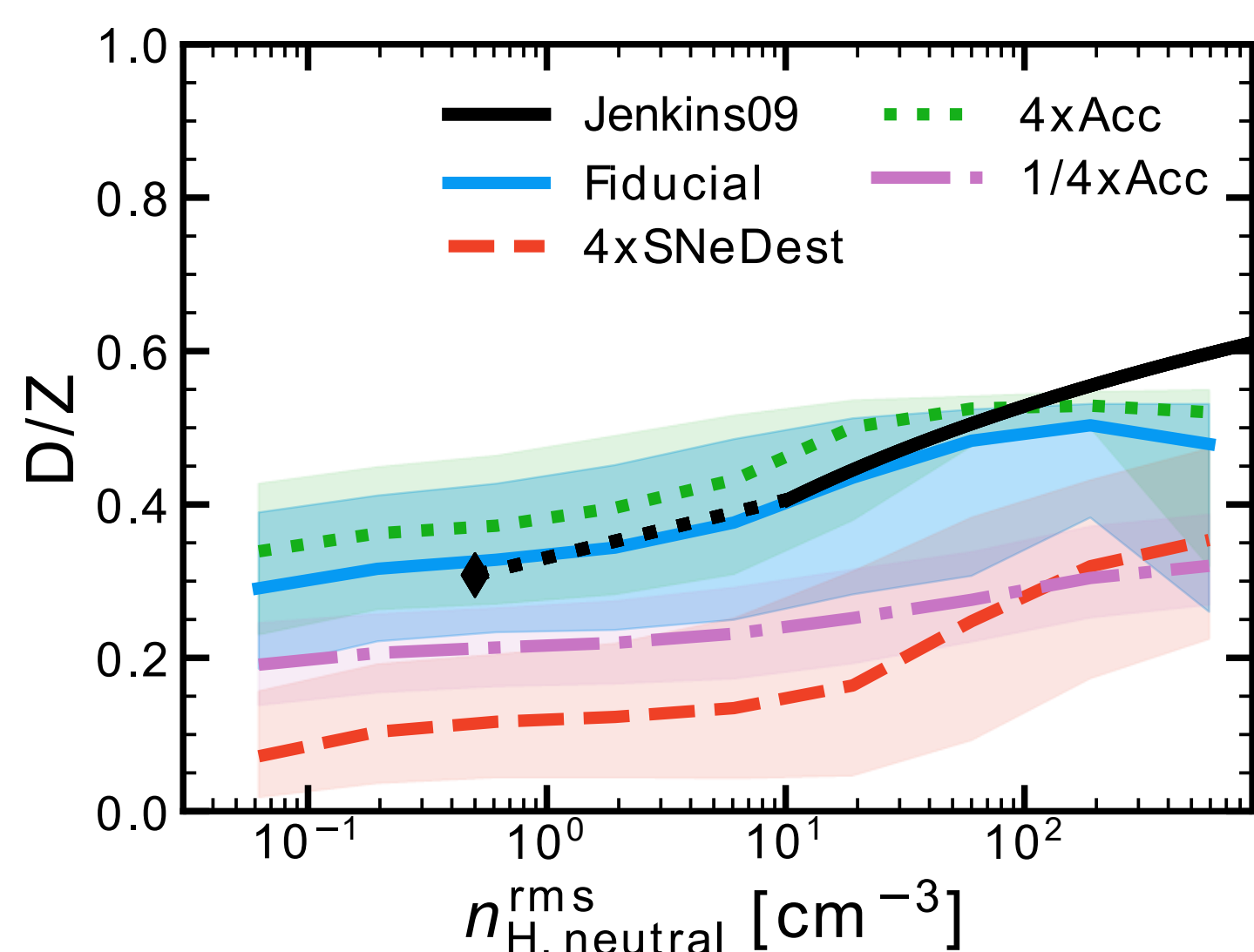
Grain Size Evolution in FIRE



- ▶ Updated dust grain size evolution model (C22/24/25) integrated with FIRE-3 ISM physics and feedback
- 1. Tracks size evolution of individual dust species
- 2. Models each dust process self-consistently*
- 3. Introduces new SNe destruction routine accounting for shattering

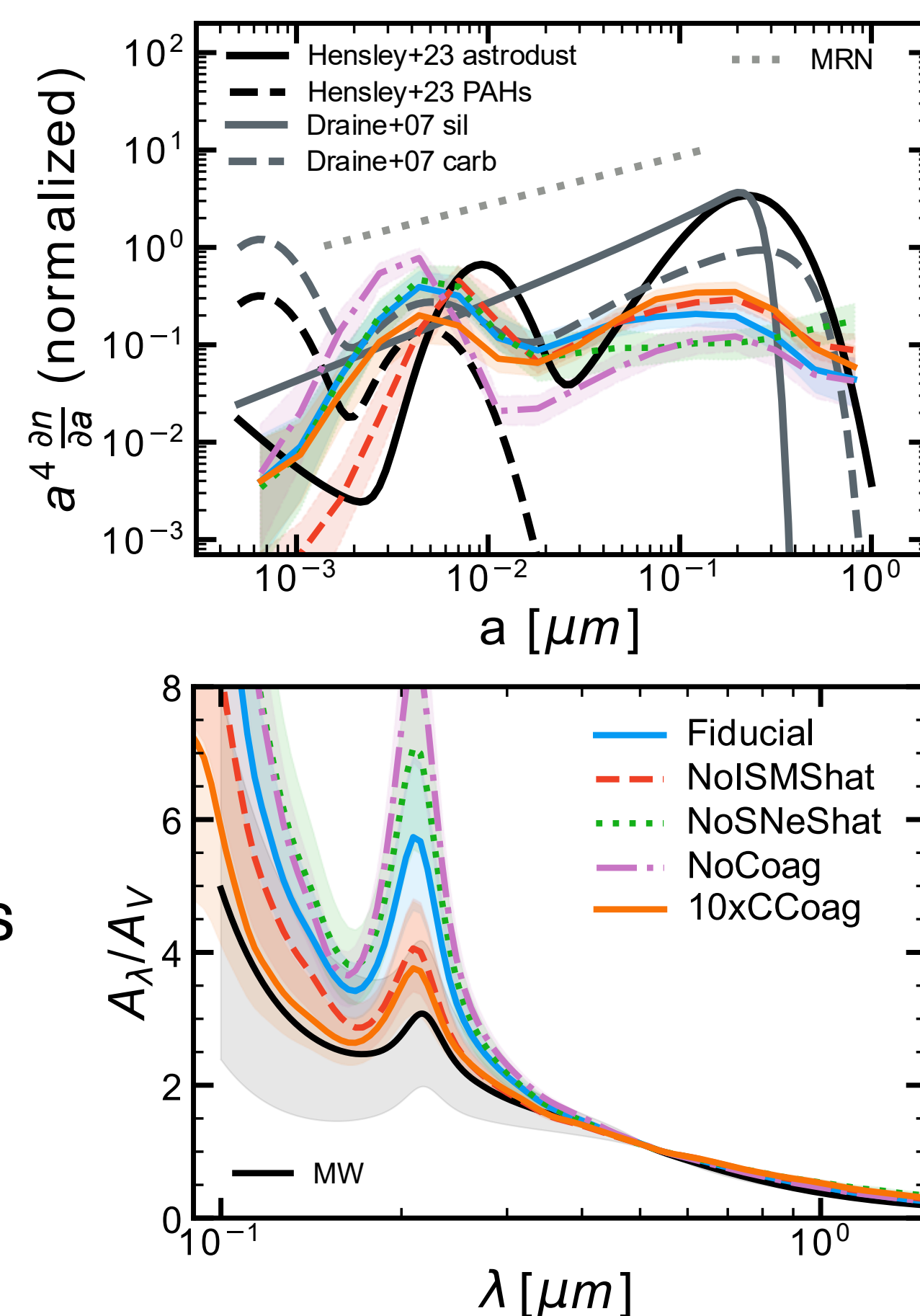
Depletion Trends

- ▶ Accretion and SNe destruction set MW depletion and D/Z trends but have little effect on extinction curve



Extinction Curves

- ▶ Dual “log-normal” size distribution at 5 nm and 0.2 μm due to accretion/coagulation
- ▶ Abundance of $>0.2 \mu\text{m}$ grains reduced by shattering in ISM and SNRs
- ▶ Strong coagulation in MCs needed for large grain mass but this process is not resolved



C22: <https://ui.adsabs.harvard.edu/abs/2022MNRAS.514.4506C>

C24: <https://ui.adsabs.harvard.edu/abs/2024MNRAS.529.2356C>

C25: <https://ui.adsabs.harvard.edu/abs/2024MNRAS.529.2356C>