ASTR 400B: Homework 5

Due on Feb 20, 2020

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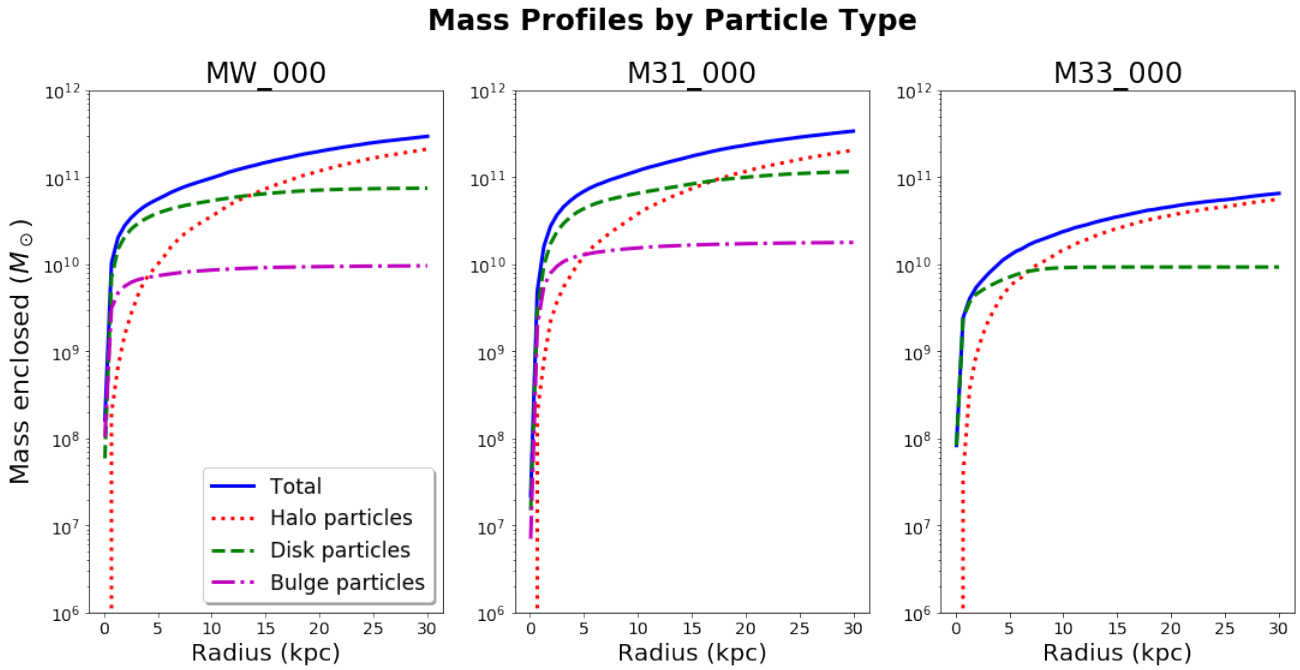
Calculations and plotting routines are in Homework5/Homework5.ipynb
The MassProfile class is defined in source/galaxy/massprofile.py
This document is just a summary of the results.

Mass profiles

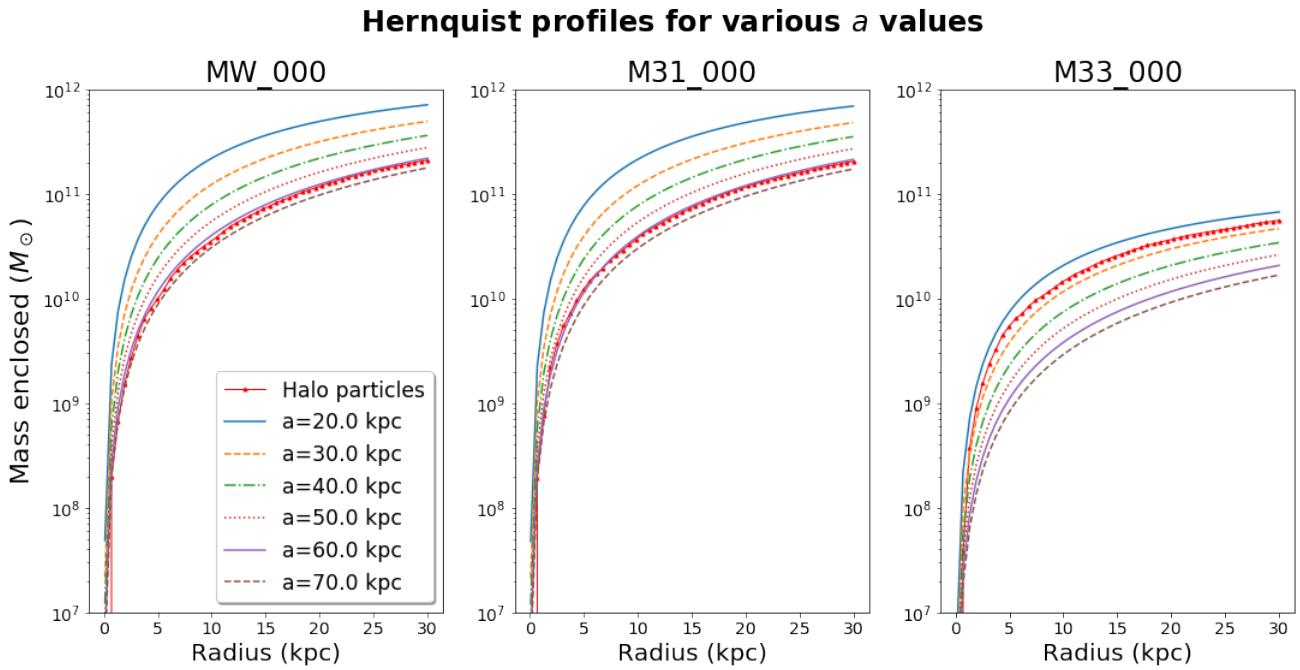
These are the profiles by particle type for each of the three galaxies:



Hernquist profiles

The graphs below are the theoretical DM profiles overlaid with our model data.
We can estimate approximate best-fit values for the scale length a, but fitting log(mass) with scipy.optimize.curve_fit() gives these more precise values:

name	a (best fit, kpc)
MW_000	63.0
M31_000	60.1
M33_000	25.7



Rotation curves

As expected, we can see that the baryonic particles give curves declining at large radius, where the dark matter halo dominates and keeps the total rotation curve fairly flat.

Fitting the Hernquist profile isn't perfect, but quite good.