ASTR400b Homework3

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1 Results

Table 1: Mass Distribution of Local Group.

Galaxy Name	Halo Mass ($10^{12} M_\odot$)	Disk Mass ($10^{12} M_\odot$)	Bulge Mass ($10^{12} M_\odot$)	Total Mass ($10^{12} M_\odot$)	fbar
Milky Way	1.975	0.075	0.010	2.060	0.041
M31	1.921	0.120	0.019	2.060	0.068
M33	0.187	0.009	0.000	0.196	0.047
Local Group	4.083	0.204	0.029	4.316	0.054

2 Questions

1. The total mass of the Milky Way and M31 are virtually the same. In both galaxies the halo holds the most mass.

2. M31 has $0.139*10^{12} M_\odot$ in the bulge and disk, and the Milky Way has $0.085*10^{12} M_\odot$. Based on stellar mass M31 is more massive and would expected to be more luminous.

3. The ratio of dark matter in the Milky Way and M31 is 1.028. There is slightly more dark matter in the Milky Way than in M31. Given that M31 has more stellar mass, this helps to explain why their total mass is equivalent to each other.

4. The baryon fraction (fbar) is listed in the far right column of Table 1. For the galaxies in the Local Group fbar ranges from 4-7%. This is significantly lower than the average fraction in the universe, 16%. The universal fraction may be larger than that of the local group because there are other galaxies in the universe with more stars, or larger black holes at their center, or less dark matter which can increase the ratio.