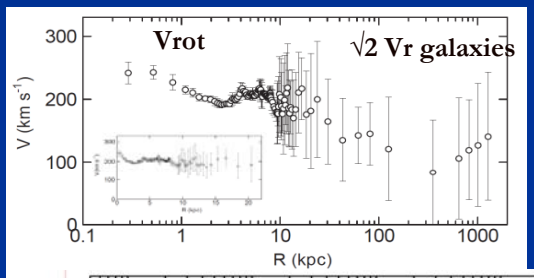
Dark Matter in the Galaxy, M31 and the Local Group

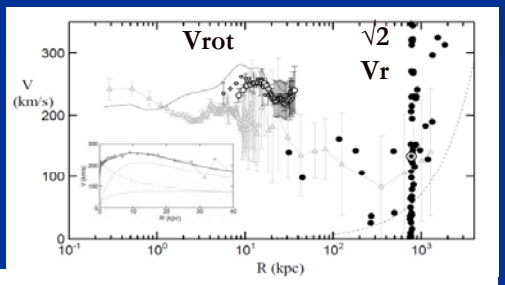
Yoshiaki SOFUE (Meisei-U & U-Tokyo) @ MW-ws Kagoshima 2012.09.06-07

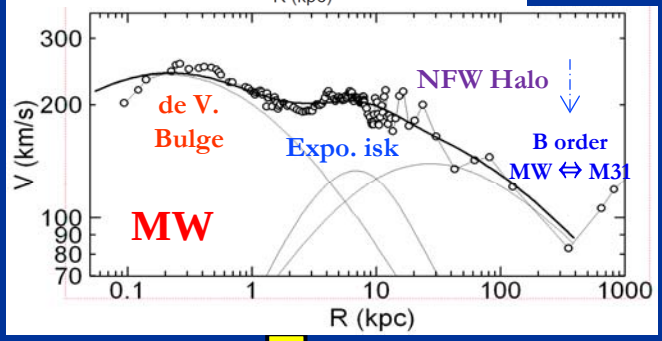
(1) **Grand rotation curves (*R*=100pc to 1 Mpc) of the Galaxy (MW) and M31 were constructed for (*R*0,*V*0)=(8 kpc, 200km/s).**
(2) **Fitting by de Vaucouleurs(e^(-$r^{1/4}$)) Bulge, Exponential Disk, and NFW Halo resulted in parameters listed in table.**
(3) **Local DM density at Sun is estimated to be 0.24±0.03 GeV cm^{-3} .**
(4) **Dark halos of MW and M31 are similar, well fitted by NFW profile .**
(5) **Local Group DM is ~5 times more massive than DM in the two big galaxy halos.**

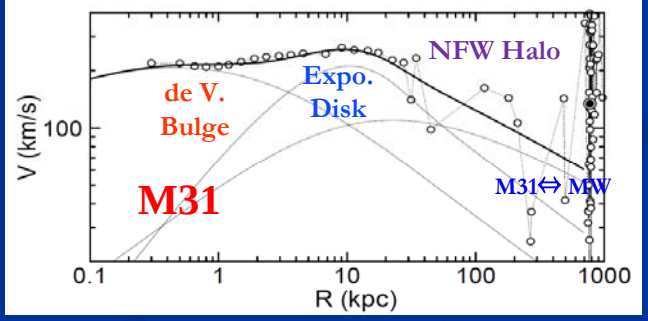
(Y.Sofue 2012, PASJ 64; 2013 in prepa.)



GRC
MW ≒ M31







Galactic Parameters

Table 1. Best-fit parameters for the mass components of the Galaxy

Mass component	Mass; Density	Scale Radius
Bulge param.	$M_b = (1.652 \pm 0.083) \times 10^{10} M_\odot$	$a_b = 0.522 \pm 0.037$ kpc
Disk param.	$M_d = (3.41 \pm 0.41) \times 10^{10} M_\odot$	$a_d = 3.19 \pm 0.35$ kpc
B+D Mass	$M_{b+d} = (5.06 \pm 0.97) \times 10^{10} M_\odot$	
B/D ratio	$M_b/M_d = 0.48 \pm 0.09$	
DH param.	$\rho_0 = (1.06 \pm 0.14) \times 10^{-2} M_\odot \mathrm{pc}^{-3}$ $= 0.403 \pm 0.051$ GeV cm^{-3}	$h = 12.53 \pm 0.88$ kpc
Local DM dens. at $R_0 = 8$ kpc	$\rho_0^\odot = (6.12 \pm 0.80) \times 10^{-3} M_\odot \mathrm{pc}^{-3}$ $= 0.235 \pm 0.030$ GeV cm^{-3}	
DH Mass‡	$M_h(R \leq 8\mathrm{kpc}) = (2.71 \pm 0.42) \times 10^{10} M_\odot$ $M_h^*(\leq h) = (5.05 \pm 0.78) \times 10^{10} M_\odot$ $M_h(\leq 20\mathrm{kpc}) = (8.87 \pm 1.37) \times 10^{10} M_\odot$ $M_h(\leq 385\mathrm{kpc}) = (6.52 \pm 1.01) \times 10^{11} M_\odot$	
Galaxy Mass	$M_{b+d+h} = (7.03 \pm 1.01) \times 10^{11} M_\odot$	($R \leq 385$ kpc)
Baryon Fraction	$M_{b+d}/(M_{b+d+h}) = \mathbf{0.072 \pm 0.018}$	

Galactic Roche Lobes:
MW-M31 = Binary
Or
Local Group DM satellites?