Using RAVE to constrain the pattern speed of the Galactic bar

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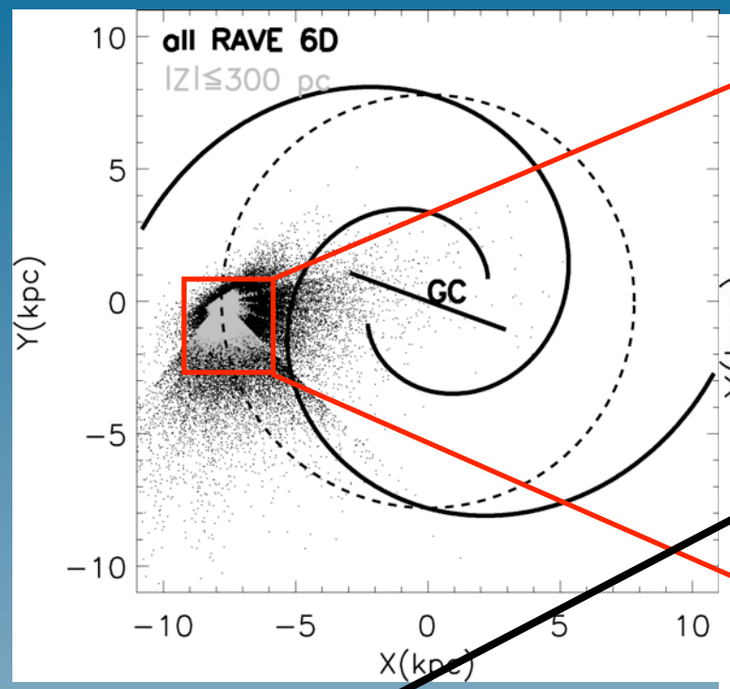
Beyond the Sun

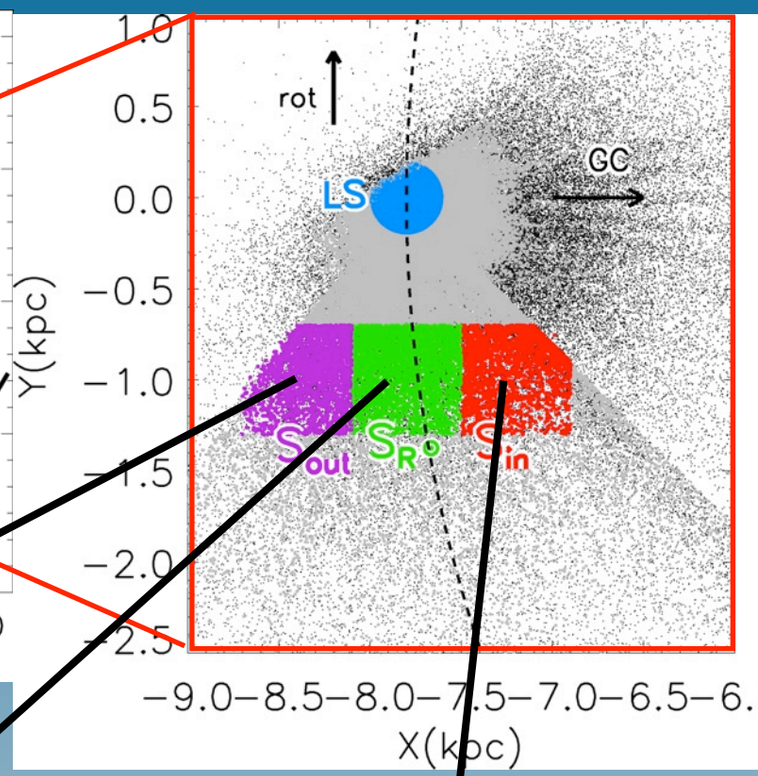
Antoja et al. 2012

✦ Radial Velocity Experiment (RAVE) multi-fiber spectroscopic survey

DR3 (Siebert et al. 2012): $5 \cdot 10^5$ spectra

- radial velocity e ~ 2km/s
- Proper motions: UCAC2, PPMX
- Spectro-photometric distances: Burnett & Binney 2010
- $2 \cdot 10^5$ stars
- $|Z| \leq 300$ pc : 10^5 stars



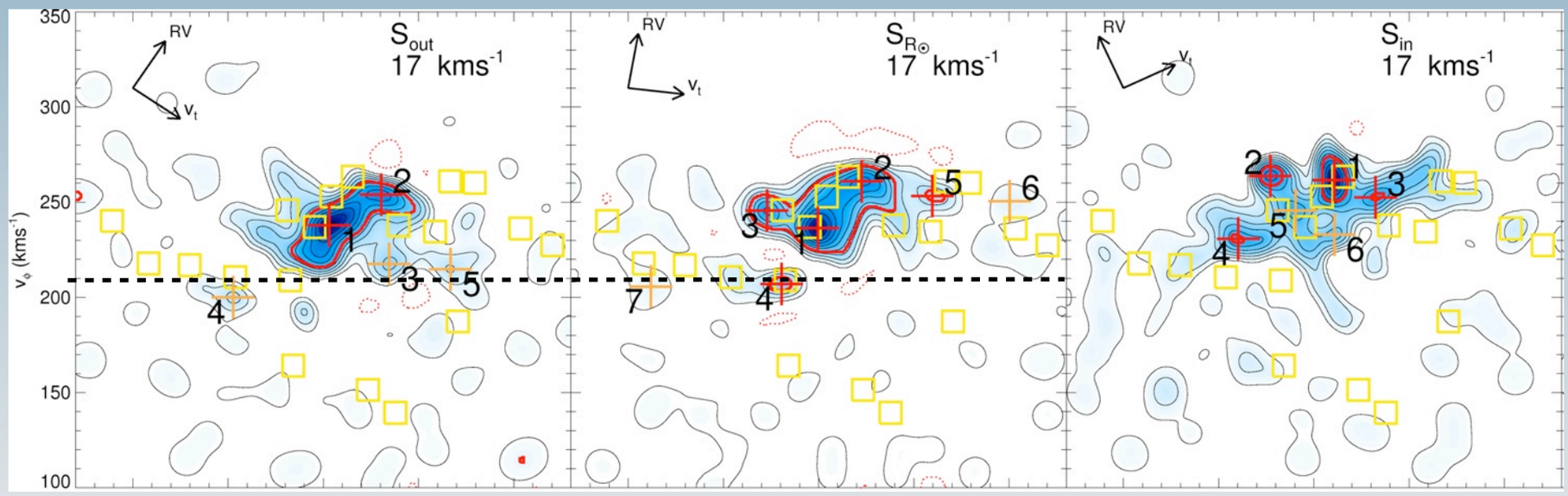


R~8.4 kpc

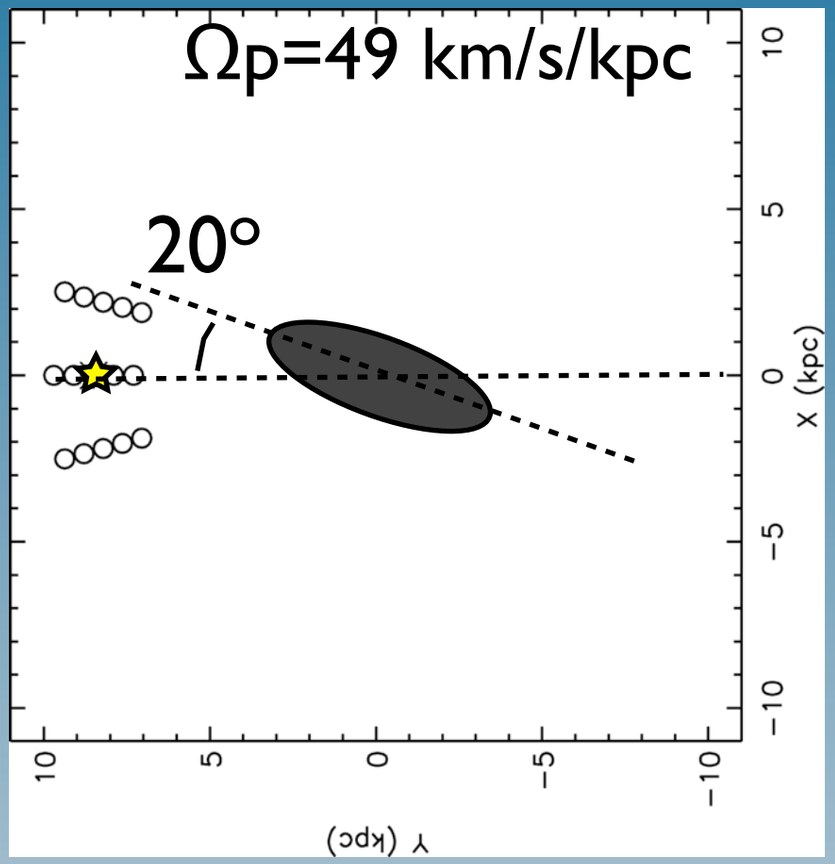
R~7.8 kpc

R~7.2 kpc

Hercules



Bar effects: Hercules across the disc



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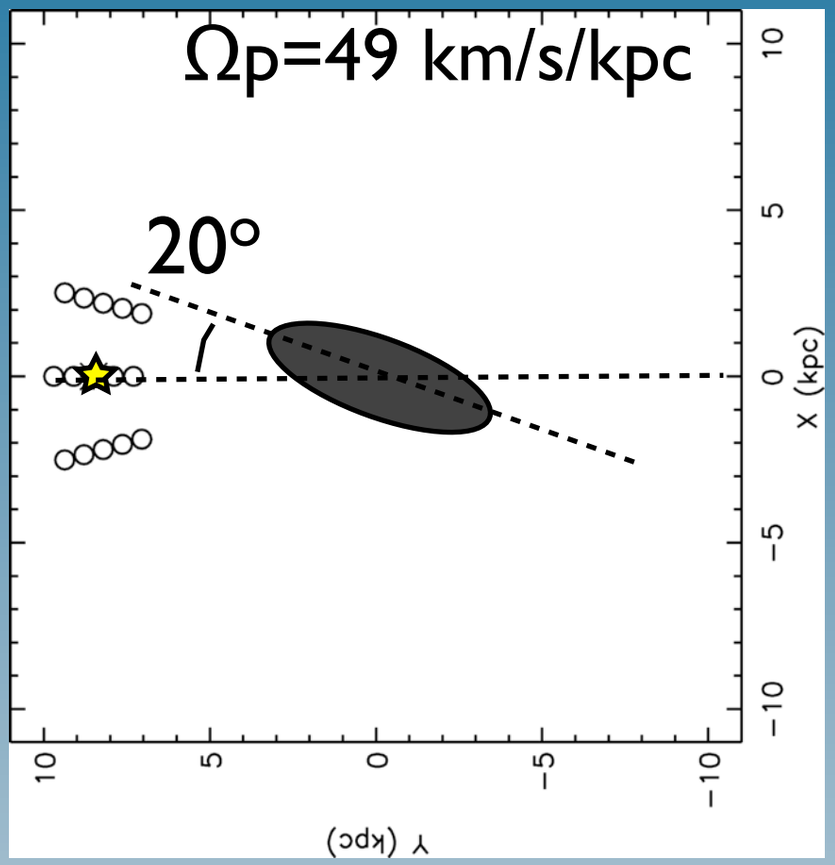

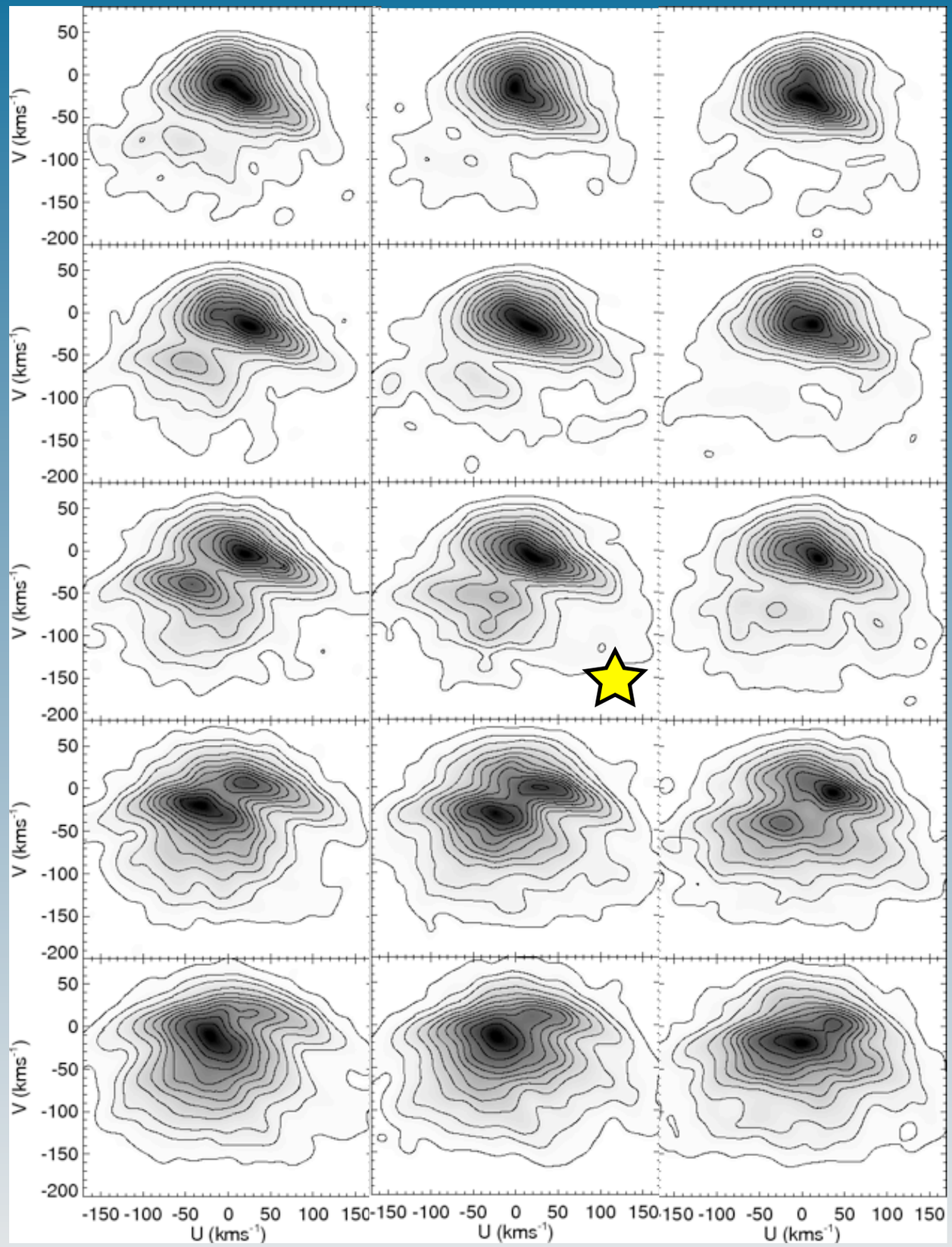

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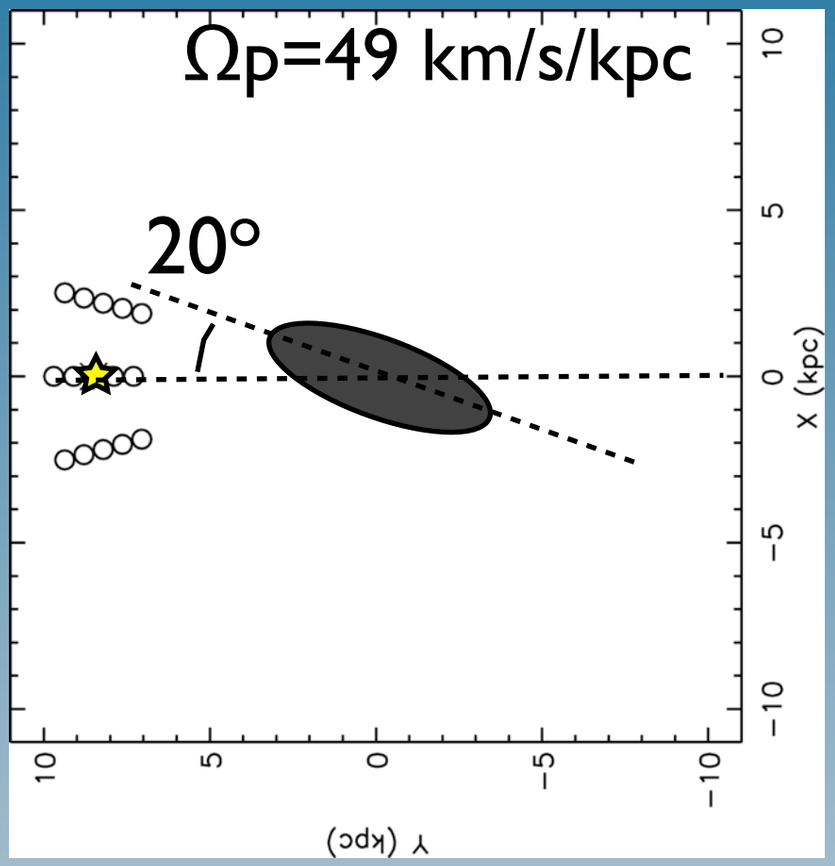
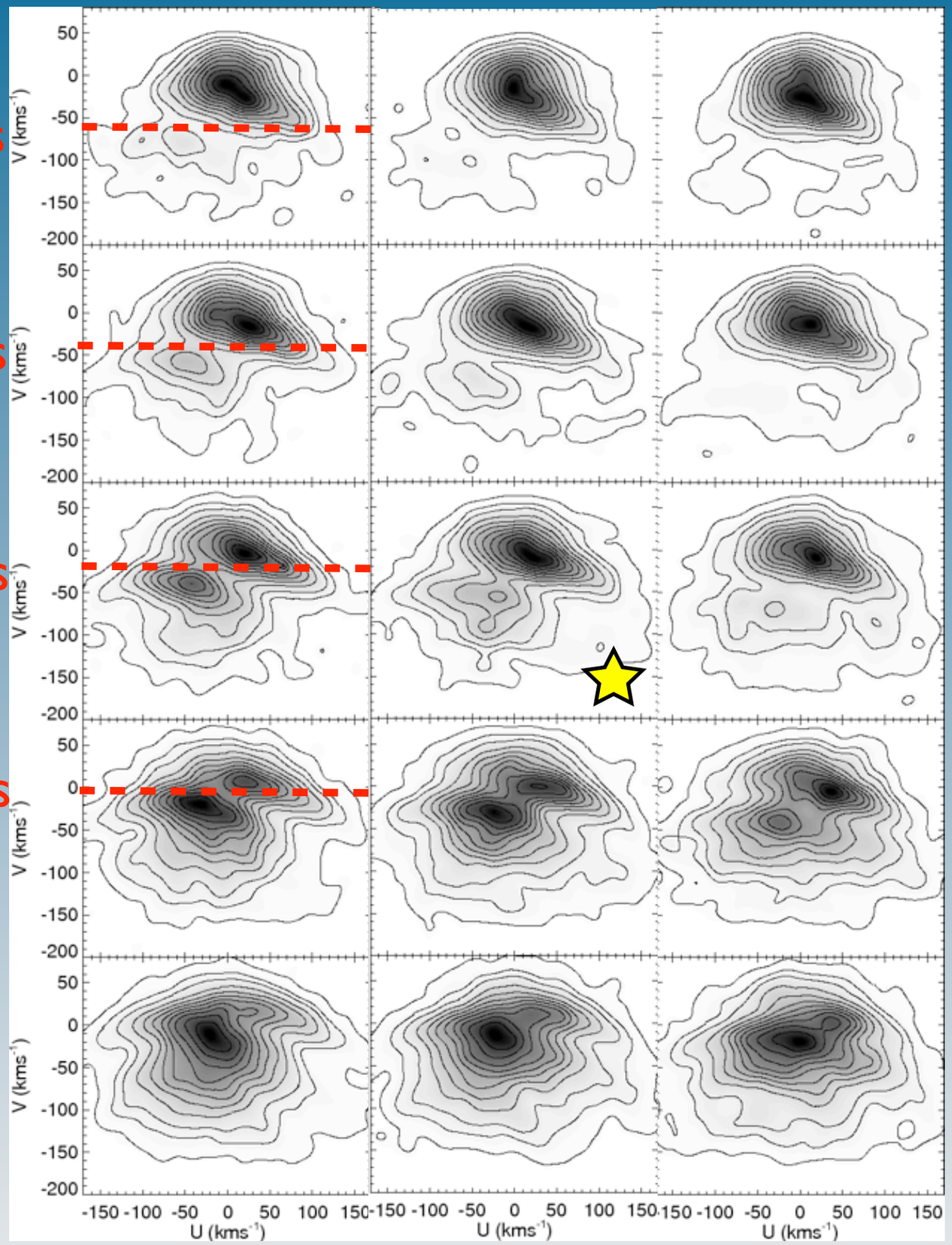


160 km/s

180 km/s

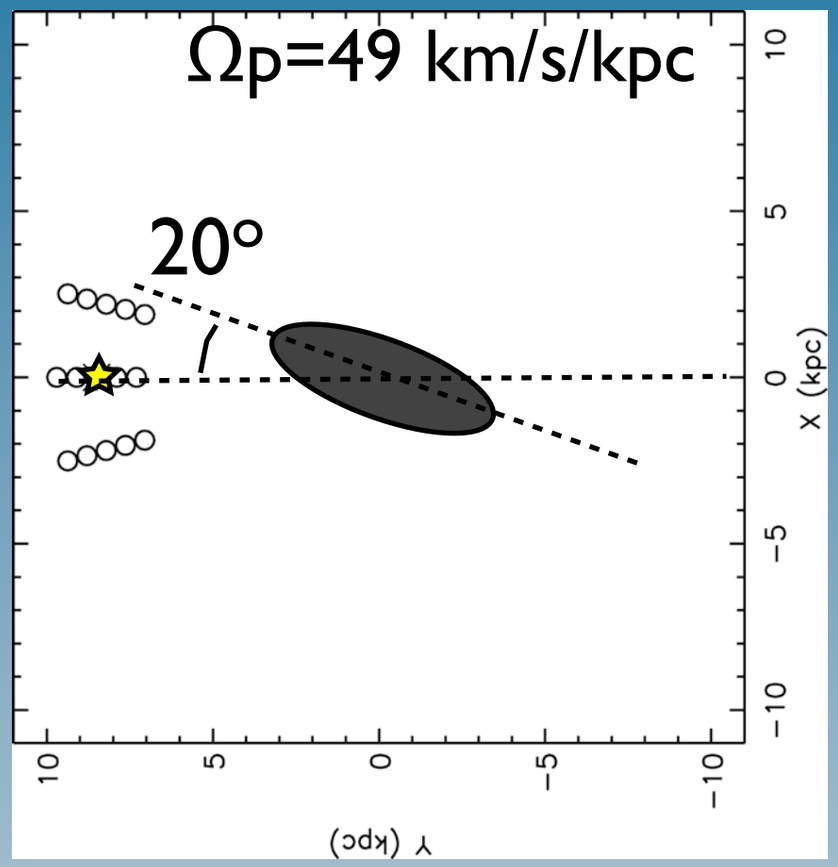
200 km/s

220 km/s



- The Hercules gap moves to lower azimuthal velocities for larger Galactocentric radius

Bar effects: Hercules across the disc



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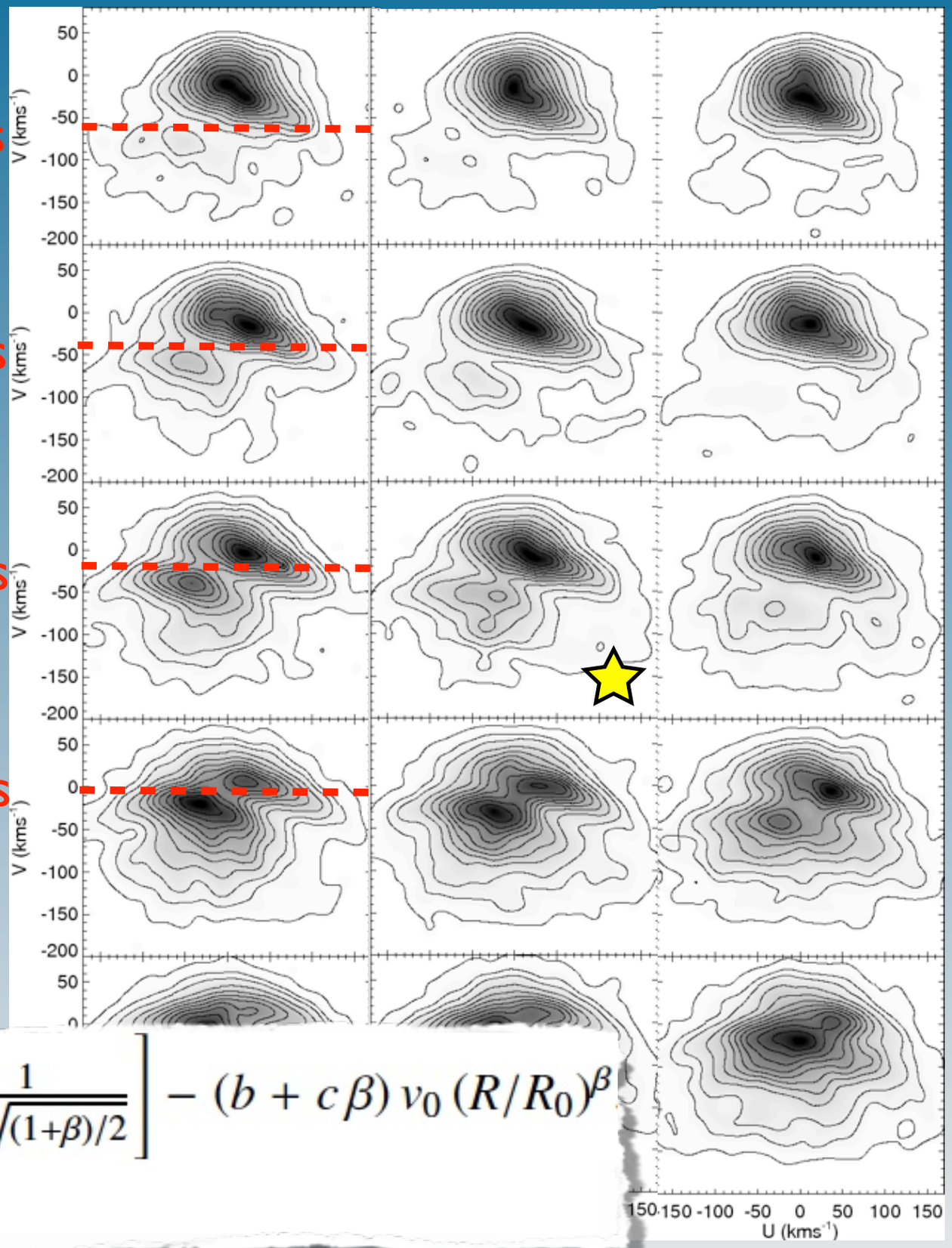


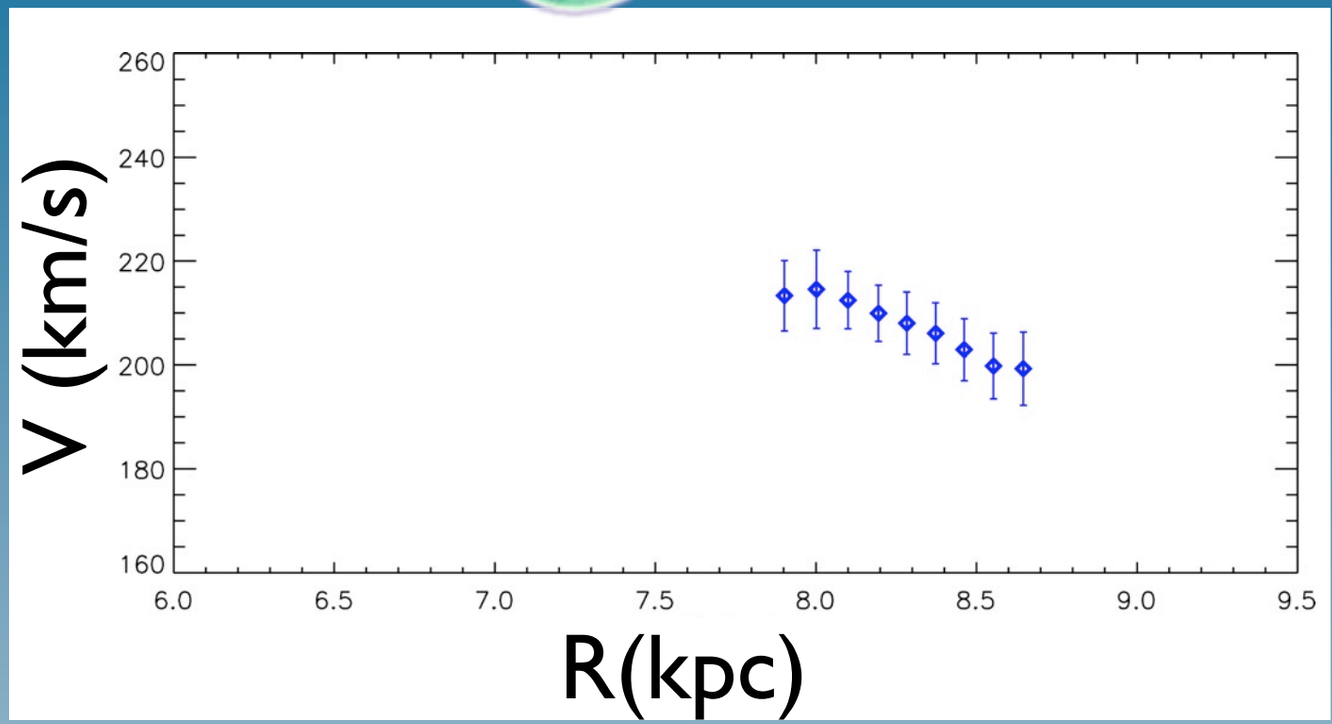
- The Hercules gap moves to lower azimuthal velocities for larger Galactocentric radius

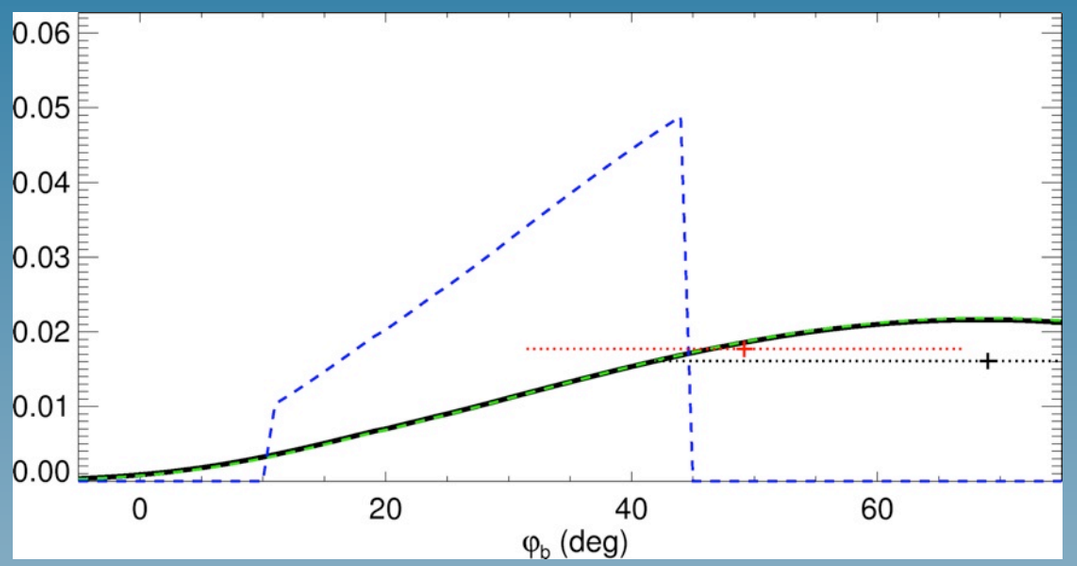
$$v_{OLR} \approx a\ v_0 (R/R_0)^{\beta} \frac{1+\beta}{1-\beta} \left[1 - \frac{\Omega_b R}{v_0 (R/R_0)^{\beta}} \frac{1}{1+\sqrt{(1+\beta)/2}} \right] - (b + c\beta)\, v_0 (R/R_0)^{\beta}$$

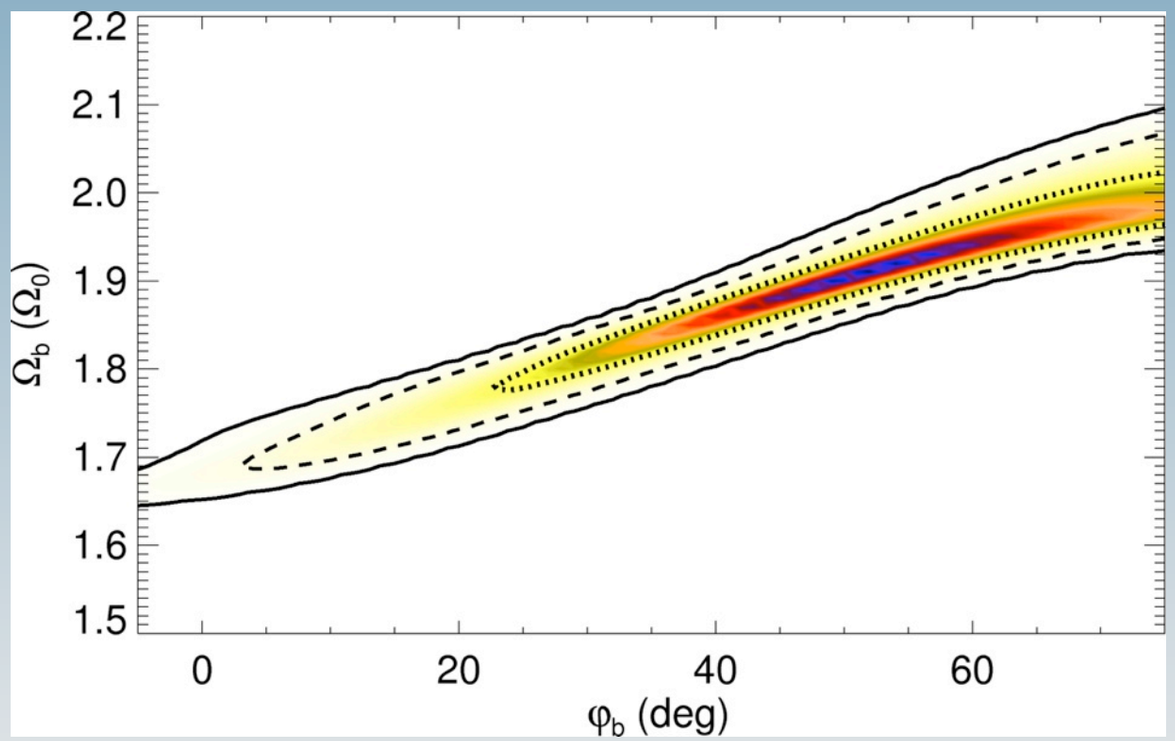
$$\approx f(\Omega_b, v_0, \beta, \phi, R)$$

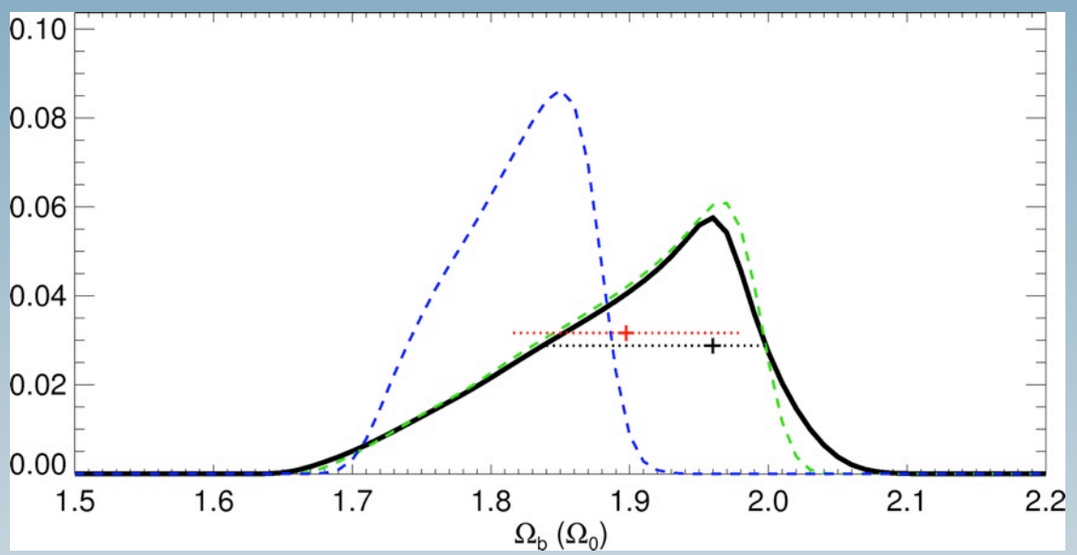
Hercules changes with R in RAVE

Antoja et al., in preparation









$$\Omega b = 57.9^{+1.2}_{-3.6}\ \text{km/s/kpc}$$