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Bar-Driven Dynamic Structures in Local Velocity Space

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June 4, 2010

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Outline

Introduction

Hercules stream as a testing ground

Motivation

Background

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Models'n'things A quick word on methodology

Pretty Pictures and Animations Simulation results

Summary

This is...

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The one we're interested in



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- We know that a bar can cause dynamical structure
- The dynamical signature might be seen locally,
- The problem with the Milky Way seems to be that:
- There are two different observed large-scale (kpc) bars. (see e.g.: Benjamin et al. 2005, Bissantz & Gerhard 2002)

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- So let's study the effects of two bars separately.
- And then go for two.



- Standard axisymmetric stuff:
- Bulge, Halo, Dark Halo (see Flynn et al. 1996)
- Disk, scale length of 3 kpc (new, in comparison to Flynn et al. 1996)
- Non-standard triaxial stuff:
- Ferrers' n = 2 potential (Pfenniger 1984, Ferrers 1877)

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- $\rho = \rho_0 (1 m^2)^n$ • $m = \frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2}$
- ho= 0 , when $m\geq$ 1



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Backwards restricted method

- Dehnen (2000)
- Create a library of orbits
- Assign a weight for each point of phase-space for a certain orbit
- Compile the orbits into a table of some kind
- Interpret



Quick words on simulations

- Uniform 100 x 100 grid of velocity points, starting at our local position.
- Velocities U:[-50,50], V: [-150:50], 2 kms⁻¹ steps
- Full orbital history for each velocity point over 1 Gyr
- Weighted values for each point in velocity-space;
- Corrected for the local circular velocity, and asymmetric drift. See Lewis and Freeman (1989).

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What does it do? - Mass

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OLR variations - Long Bar

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Angle variations - Long Bar

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Two bars! Phase locked at 1.87.



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Two bars! Phase locked at 1.95.



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Two bars! Phase unlocked, long at 1.87, Galactic at 1.50



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Two bars! Phase unlocked, long at 1.50, Galactic at 1.87



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Two bars! Phase locked at 1.87, half-mass.



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Two bars! long at 1.87, Galactic at 1.50, half-mass.



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Summary

Potentially something very interesting





- A bar will create structure(s) in velocity space.
- The angle, mass, and speed of the bar will affect it's position and shape in velocity space.
- Two large, massive bars will wreck havok on velocity structure.
- Direct interaction with bars can cause also cause structure in velocity space.
- More details in Gardner & Flynn 2010 (MNRAS 405, p. 545 or arXiv:1002.0551)

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