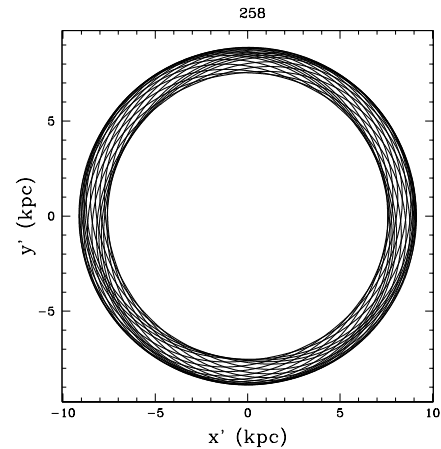


Resonant Families of Orbits in the Milky Way as Mapped by DR13 APOGEE-RC stars: Preliminary results



by
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In collaboration with:

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Semaine de l'Astrophysique Francaise
14 juin - 17 juin 2016, Lyon - France

Milky Way's Gravitational Potential

Triaxial bar + Alternative 3D components (Spiral arms)

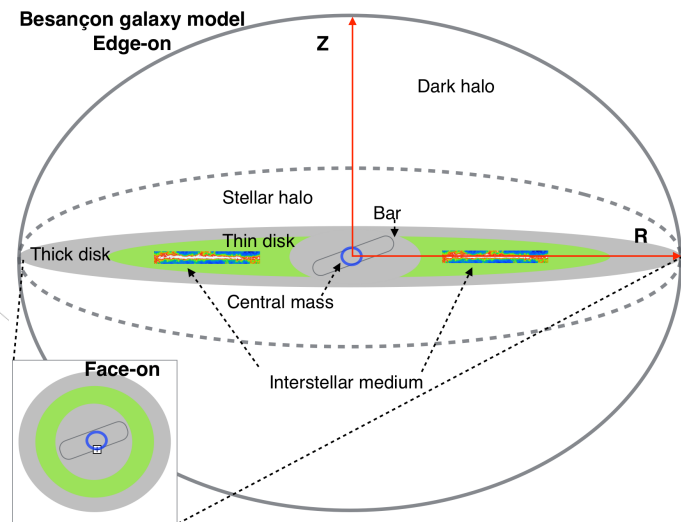
$$\rho(R, z) = \sum_i^7 \rho_{Thin-D}^i + \rho_{YThick-D} + \rho_{OThick-D} + \rho_{SH} + \rho_{DMH} + \rho_{ISM} + \rho_{CM}$$

Solving for $\Phi(R, z)$

$$\nabla^2 \Phi(R, z) = 4\pi G \rho(R, z)$$

$$V_{circ}(R) = (-K_R(R, z=0) \times R)^{(1/2)}$$

Fitting the **DMH** and **CM** parameters until $\Phi(R, z)$ reproduces the observed rotation curve



Solving for $\rho_i(R, Z)$

$$\sigma_{Wi}^2 \ln \left(\frac{\rho_i(R, z)}{\rho_i(R, 0)} \right) = -\Phi(R, z) + \Phi(R, 0)$$

Milky Way's Gravitational Potential

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Fernandez-Trincado / GraPot16 Watch 1 Star 1 Fork 0

Code Issues 0 Pull requests 0 Pulse Graphs

Branch: master GraPot16 / README.md Find file Copy path

Commit	Author	Date
b8d9849	Fernandez-Trincado	Update README.md

1 contributor

131 lines (82 sloc) | 5.42 KB Raw Blame History

GraPot16

A 3D fiducial model of the Gravitational Potential of the Milky Way for orbit calculations based on the Besançon Galaxy Model.

This repository is maintained by **J. G. Fernandez-Trincado**. Feel free to check it out, make comments, provide me with some feedback. I will update the design of it eventually, since at the moment, I have just literally slapped a beta version onto the "default" design of the repository.

If interested in this project, please contact me: jfernandez@obs-besancon.fr and/or jfernandezt87@gmail.com

Last update: 2016, March 15



Beta Version
GraPot16v1

GraPot16 sources:

- Fortran version can be found at [Fortran-GraPot16](#).
- Python version can be found at [Python-GraPot16](#). Efforts are underway to provide a Python Package of **GraPot16** to the community.
- CUDA version can be found at [CUDA-GraPot16](#). Efforts are underway to provide a CUDA Package of **GraPot16** to the community.

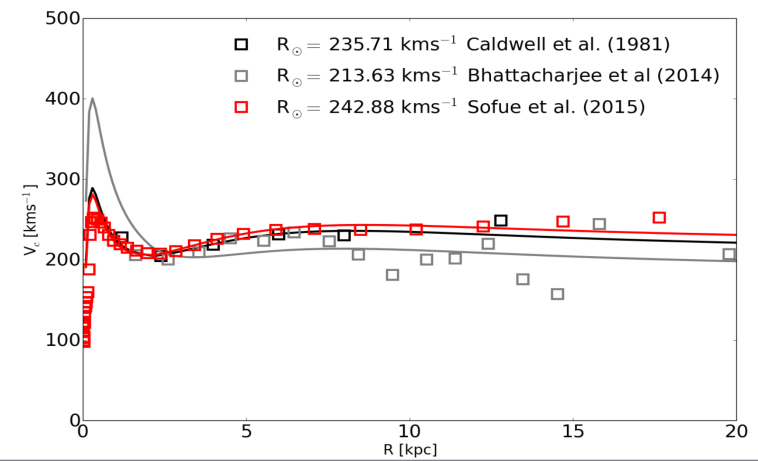
<https://github.com/Fernandez-Trincado/GraPot16/blob/master/README.md>

Galactic Model

We have developed a multicomponent model of the Milky Way potential which we have matched with good accuracy the rotation curve, local disk density, ...

- Axisymmetric Potential
- Non-axisymmetric Potential

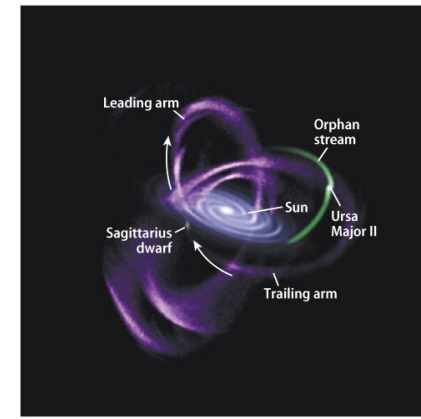
The rotation curve of our model is shown in Figure 1.



Context: **Moving groups**

stellar associations

(Proctor 1869; Eggen & Sandage 1959; Eggen 1977, 1990, 1996a,b; Wilson & Raymond 1938, Roman 1949; Soderblom & Mayor 1993)



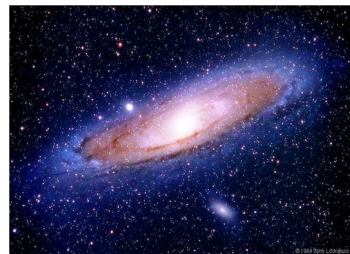
stellar streams

Majewski 1994; Majewski et al. 1996

called 'stellar moving groups'



Open clusters



dwarf galaxies

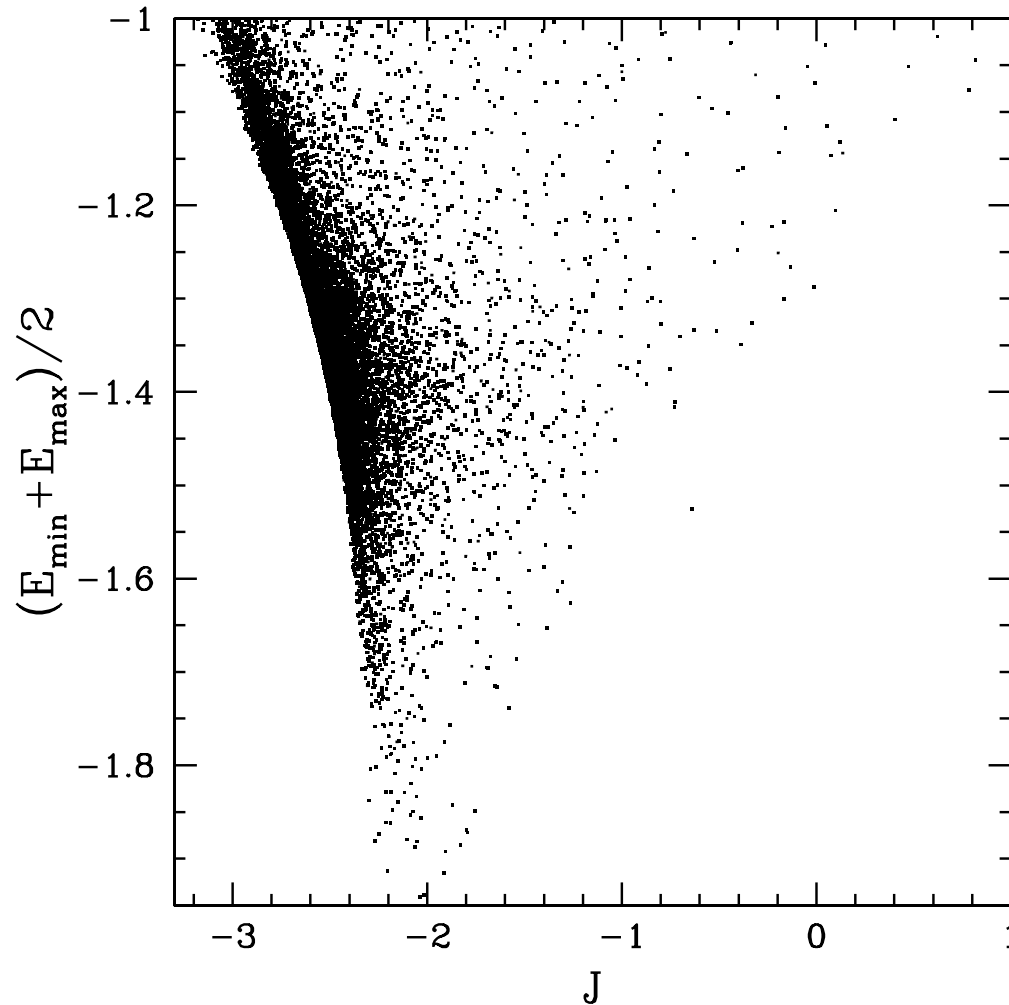


globular clusters

Perturbations by resonances with the Galactic bar and/or spiral arms and also triaxially shaped dark matter haloes

Resonant regions

Preliminary



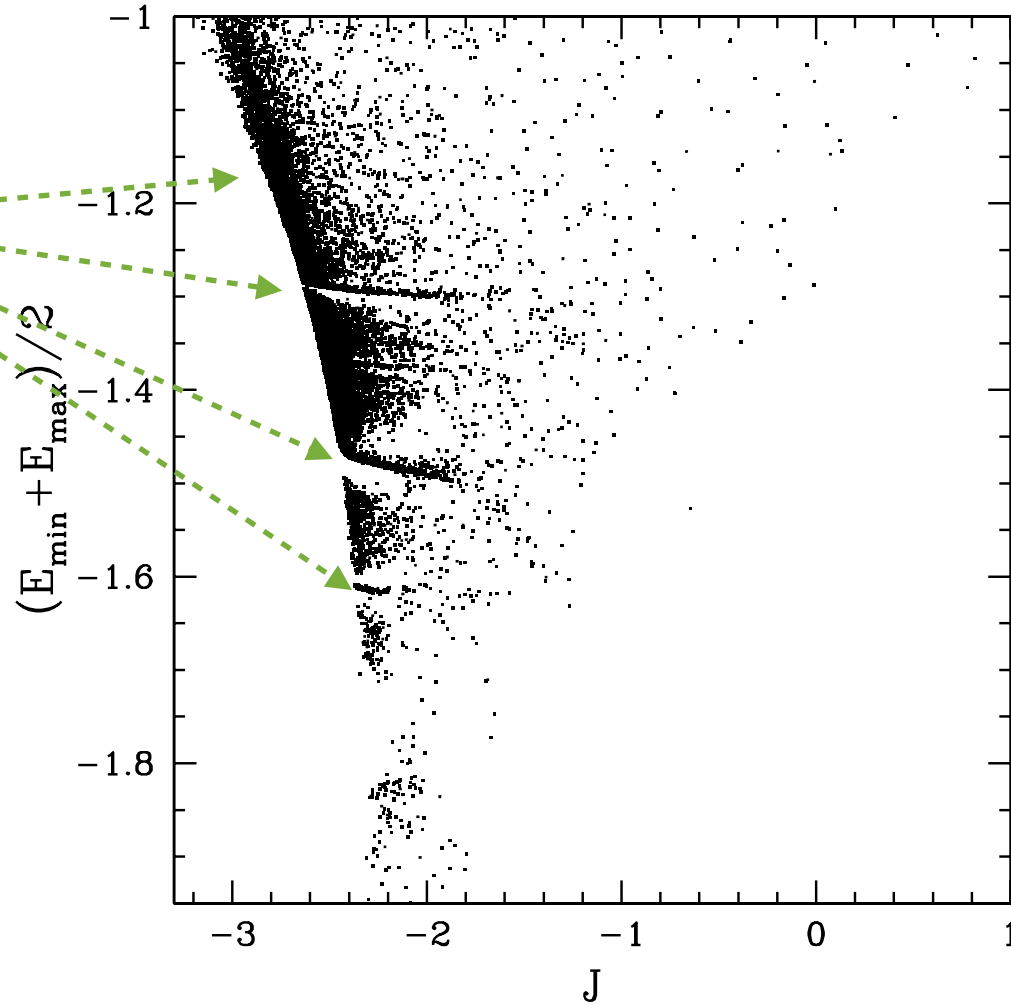
Axisymmetric Galactic model

Moreno et al. (2015) and Fernández-Trincado et al. (2016, in prep.)

Resonant regions

Preliminary

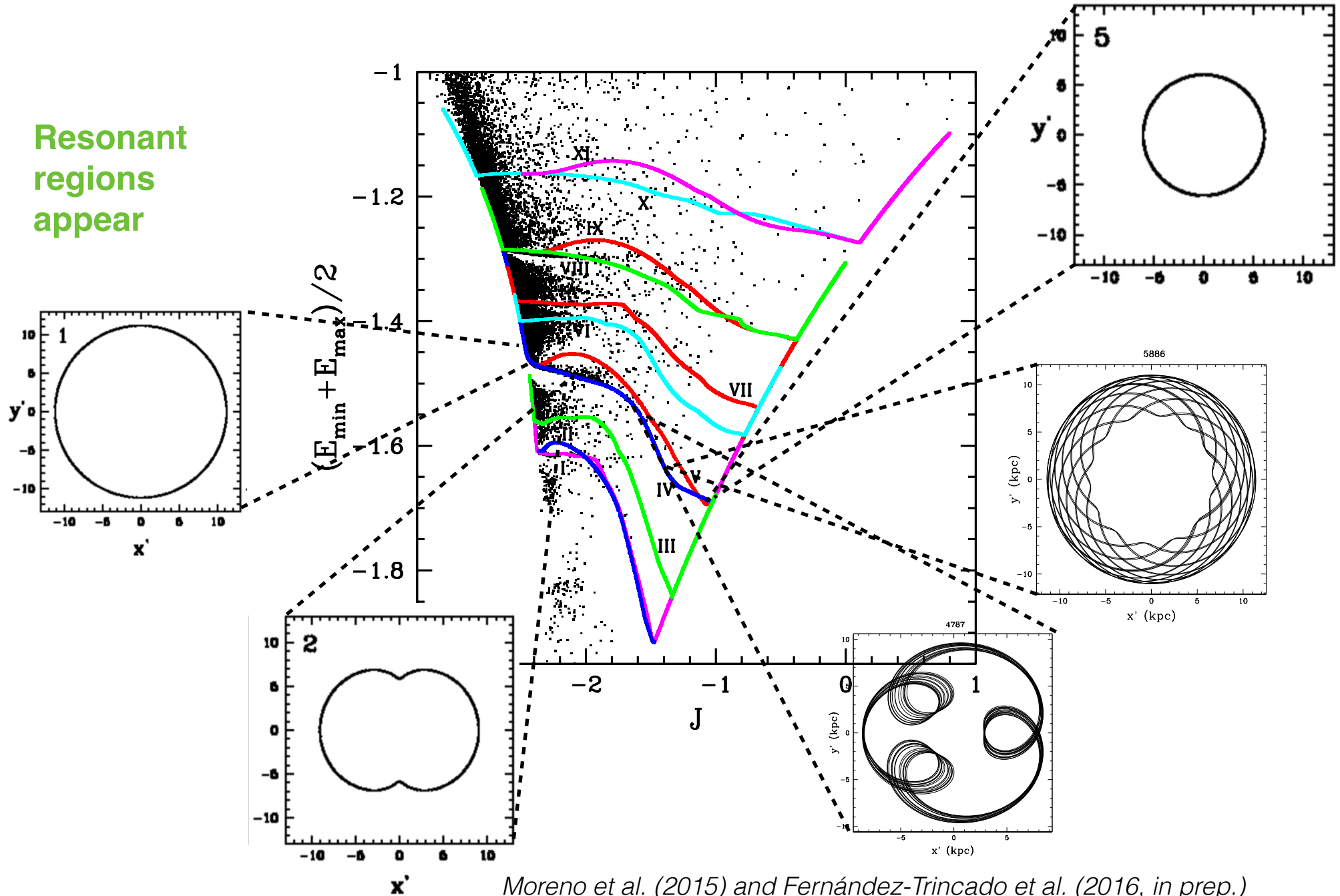
Resonant
regions
appear



Non-Axisymmetric Galactic model: Bar + Spiral arms

Resonant regions

Preliminary

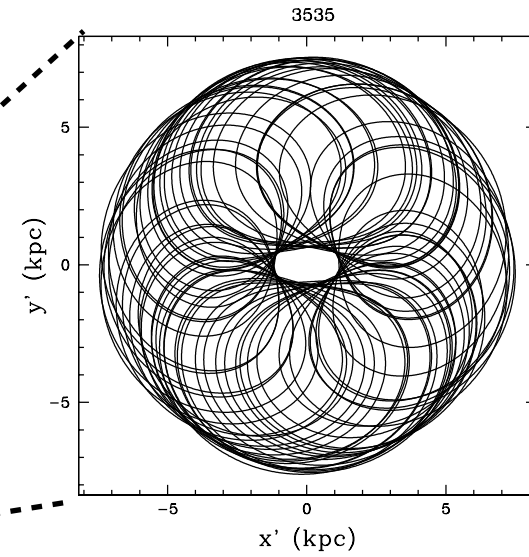
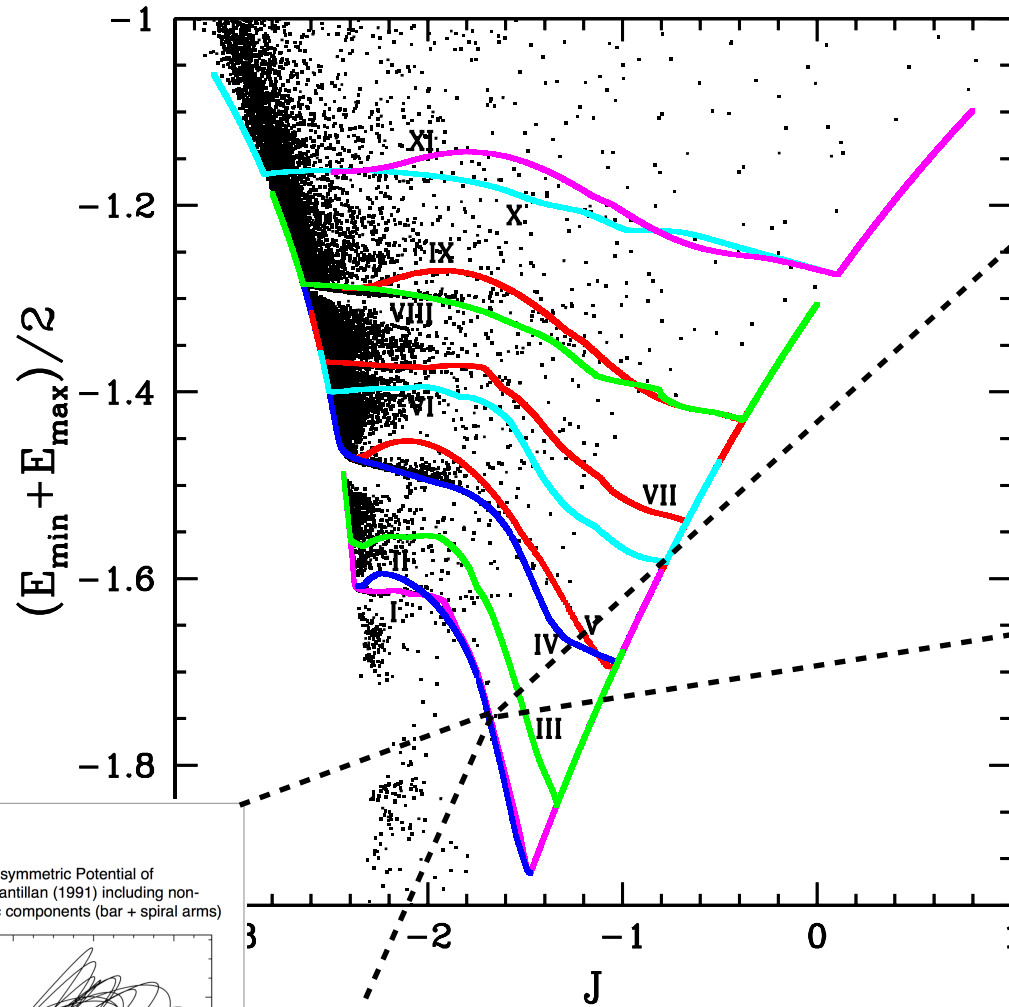


Resonant regions

Preliminary

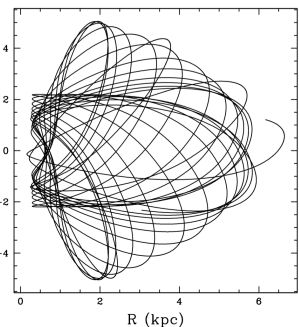
Discovery of a Peculiar star in the Galactic Plane of the Milky Way with extreme GC-like abundance patterns

Fernandez-Trincado et al. (2016b)

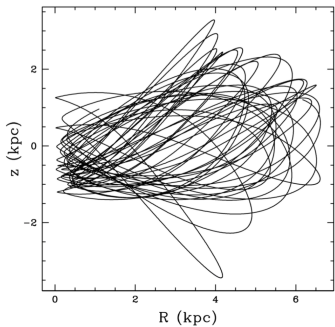


Orbit Projection

Axisymmetric Potential
Allen & Santillan (1991)



Axisymmetric Potential of
Allen & Santillan (1991) including non-
axisymmetric components (bar + spiral arms)



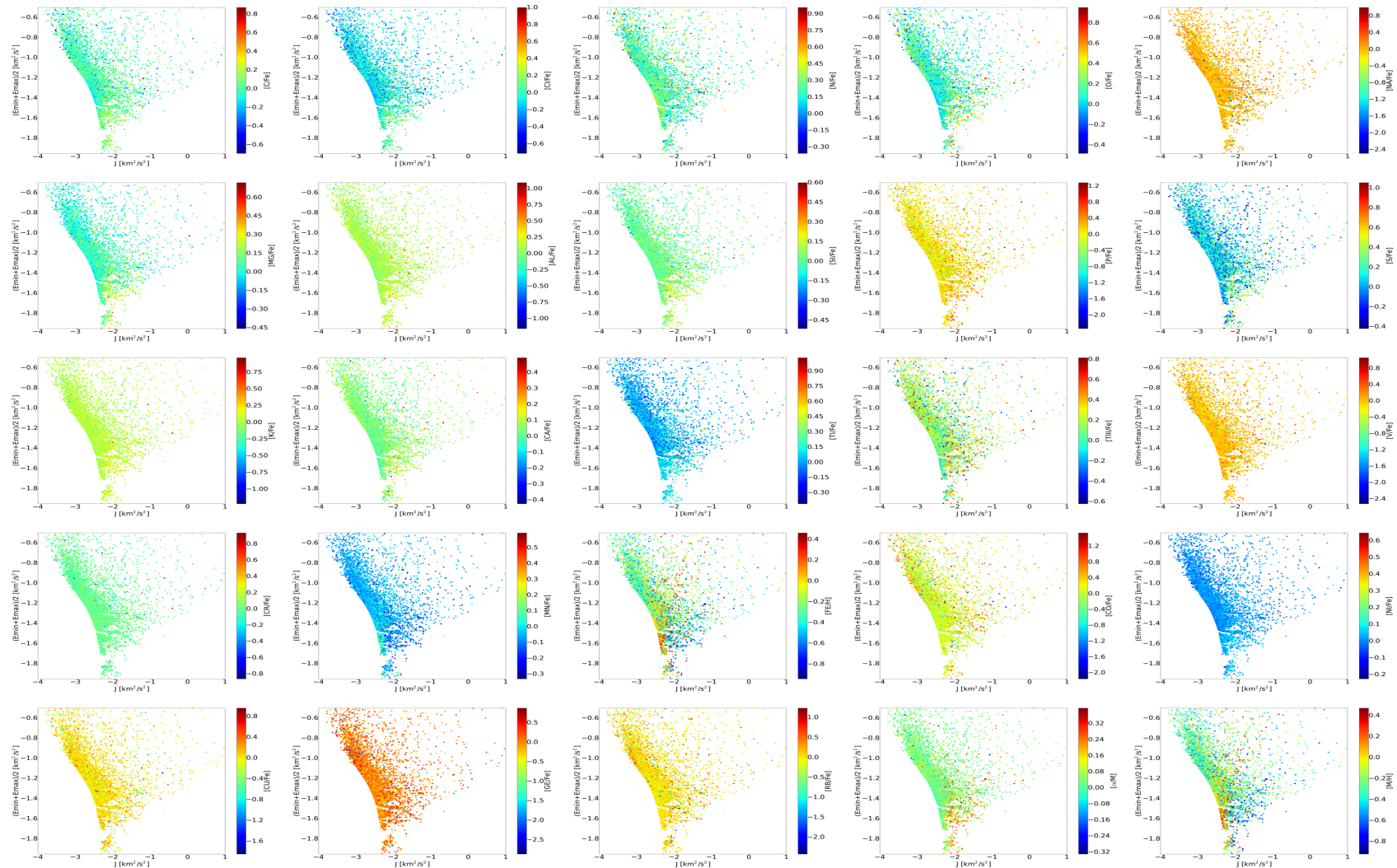
A possible origin mechanism is bar-induced resonant trapping

Moreno et al. (2015) and Fernández-Trincado et al. (2016, in prep.)

Resonant regions

Next

Searching for GC-like abundance patterns in resonant trapping regions from SDSS-IV data



Merci