Sobre la relevancia del caos para las estrellas del halo en la vecindad solar

Maffione, Gómez, Cincotta, Giordano

60 RAAA

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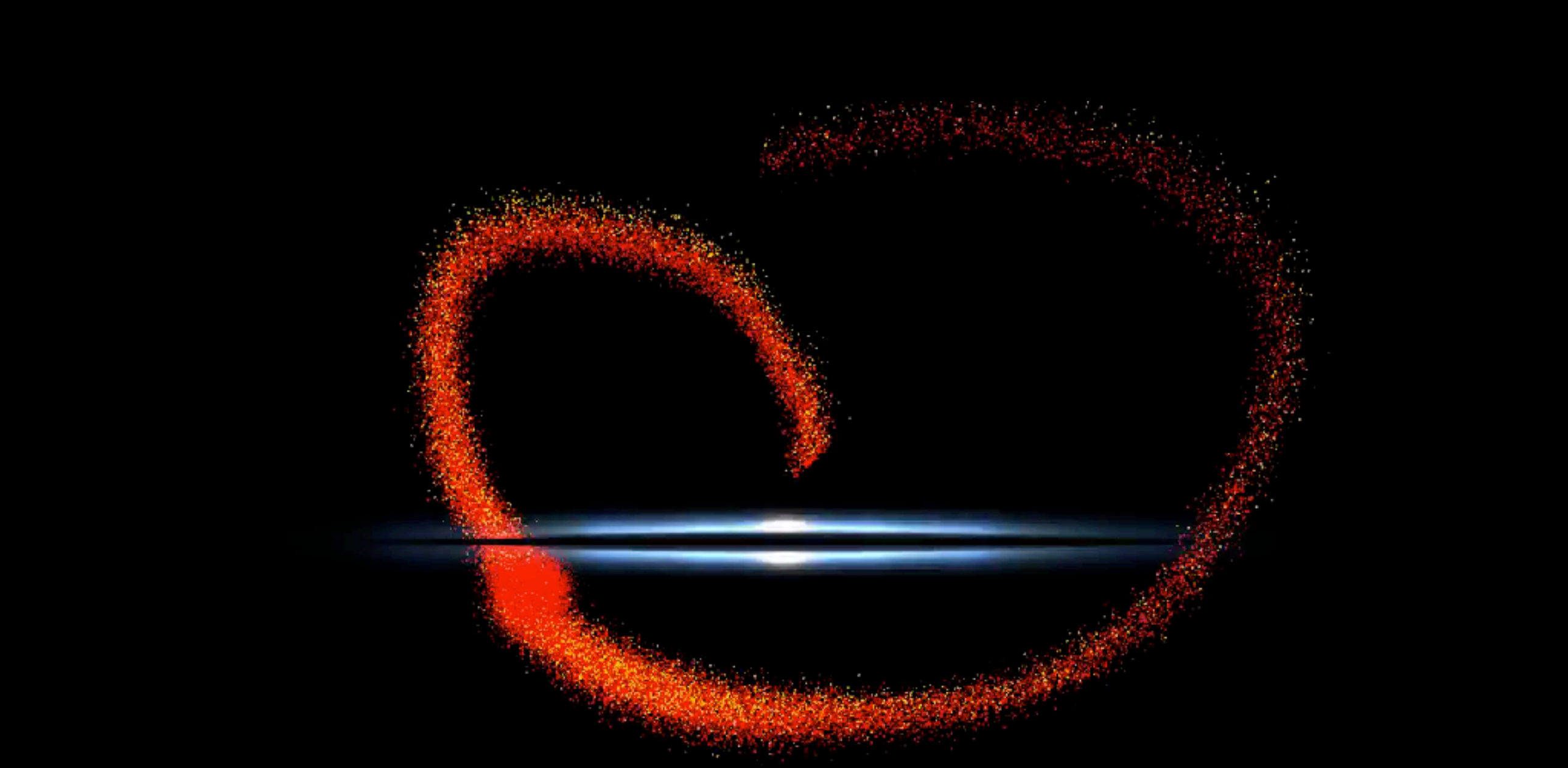
Laboratorio de Procesamiento de Señales Aplicado y Computación de Alto Rendimiento,
Sede Andina, Universidad Nacional de Río Negro
CONICET

Corrientes estelares

¿Qué son?



Sergey Koposov

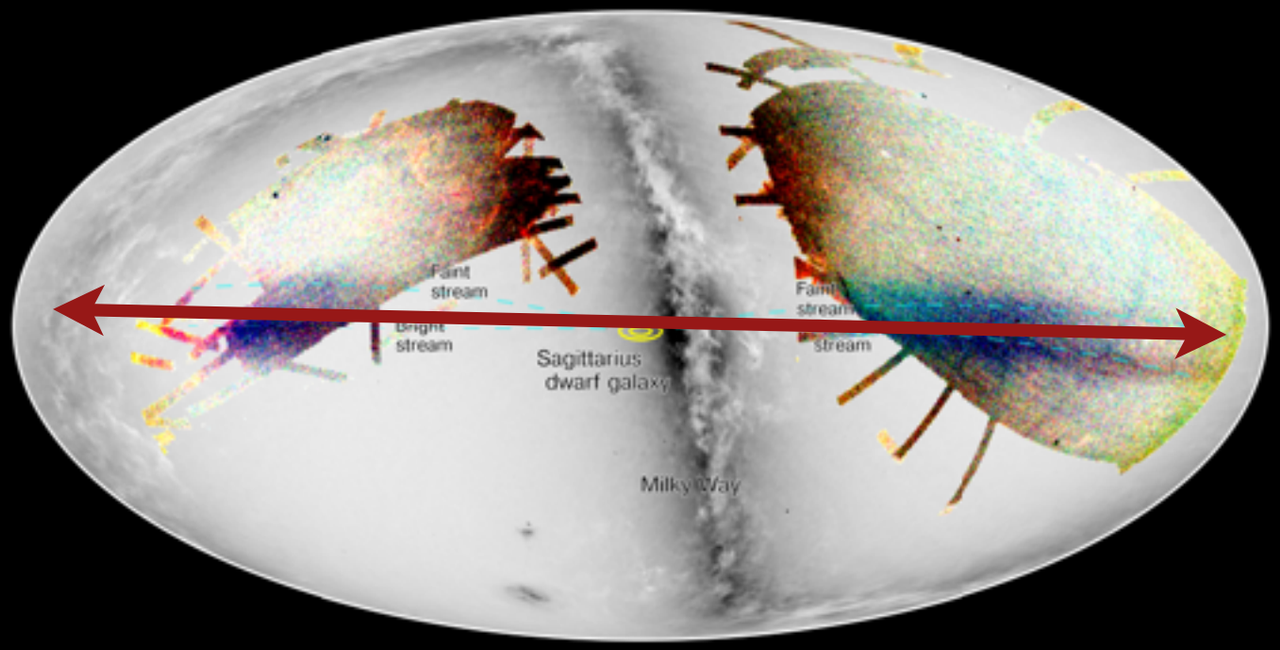
https://www.youtube.com/watch?v=fM3QOPfV17g

Corrientes estelares

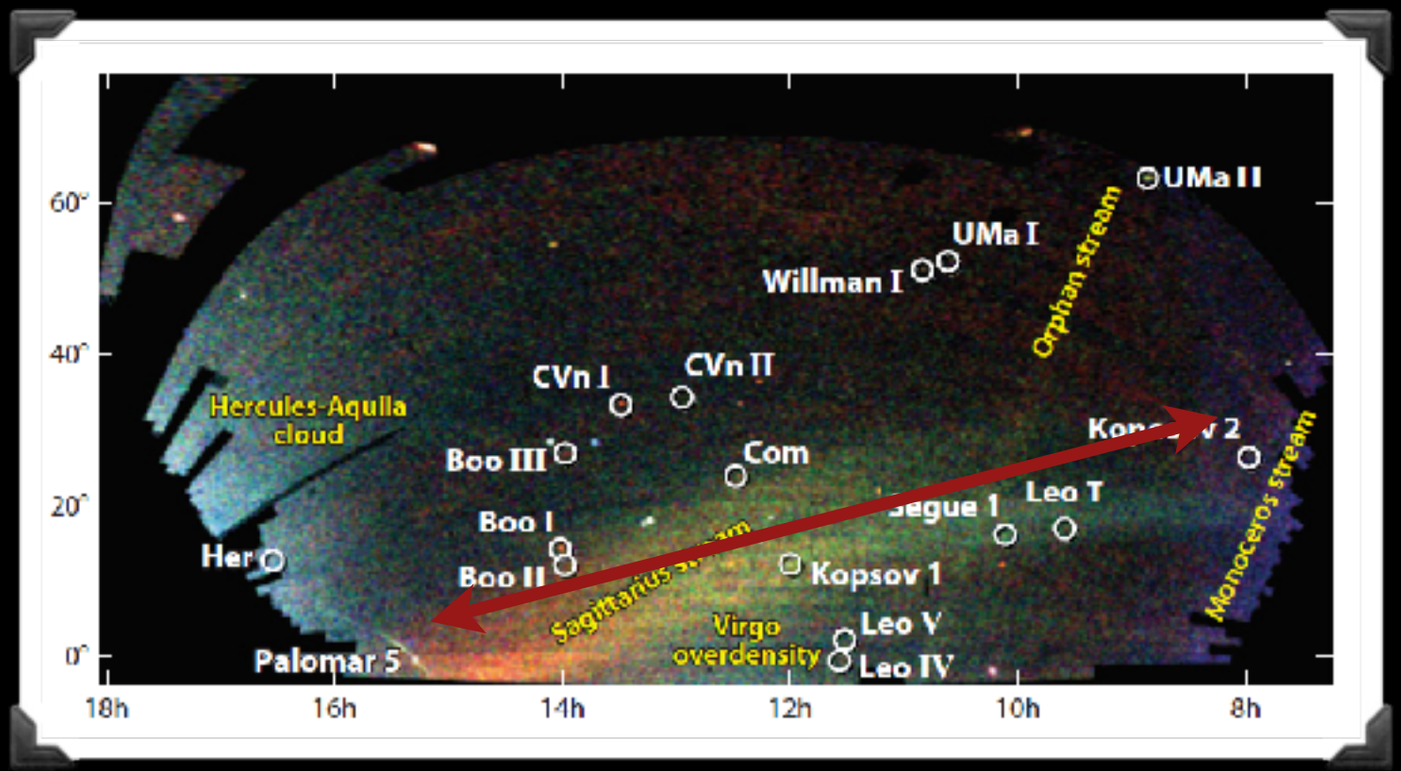
Evidencia observacional en el halo

Observaciones

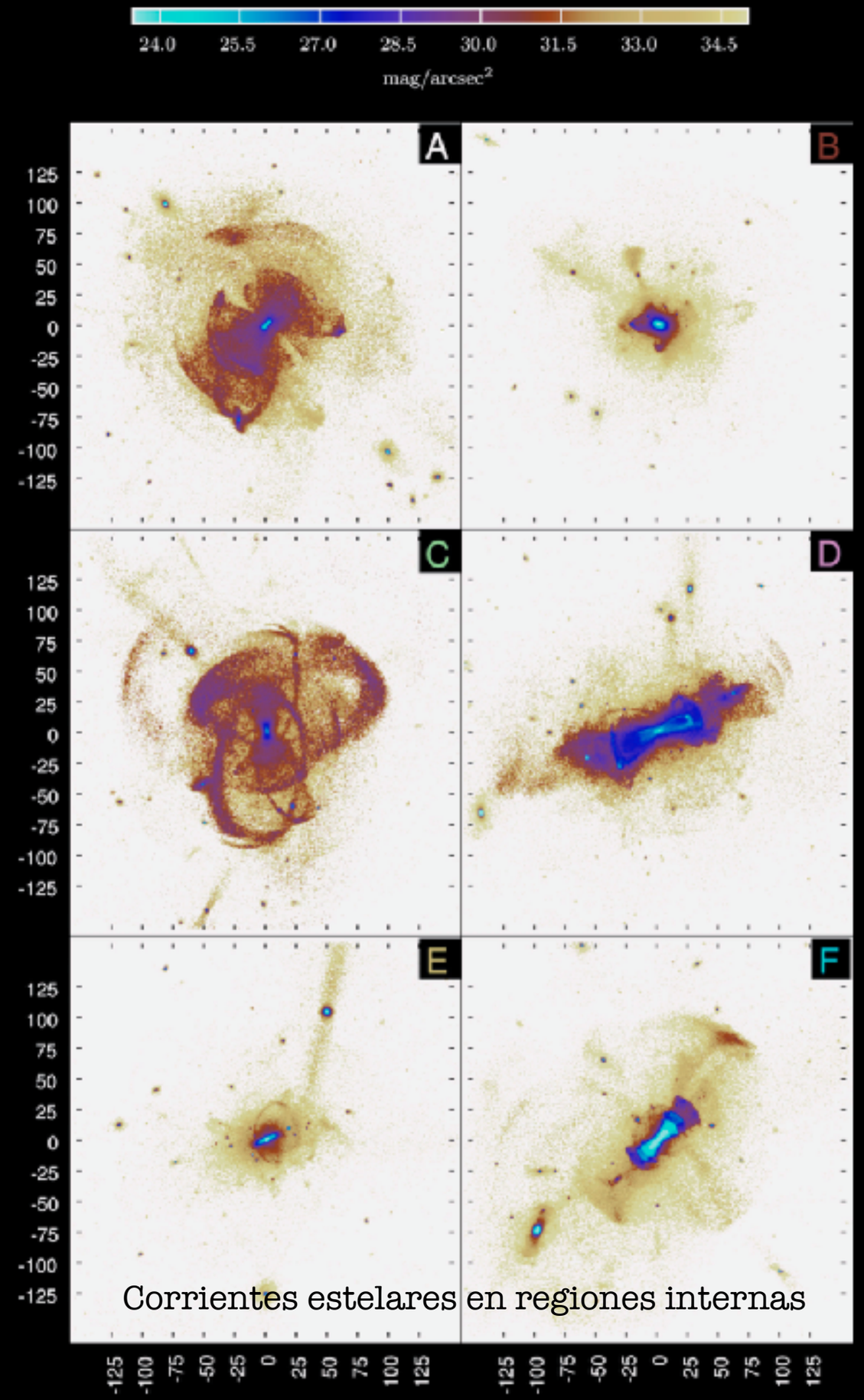
Créditos: S. Koposov y la colaboración SDSS-III



Belokurov et al. ApJ, 642: L137–L140, 2006



A. P. Cooper et al. Mon. Not. R. Astron. Soc. 406, 744–766 (2010)



Corrientes estelares en regiones internas

Corrientes estelares

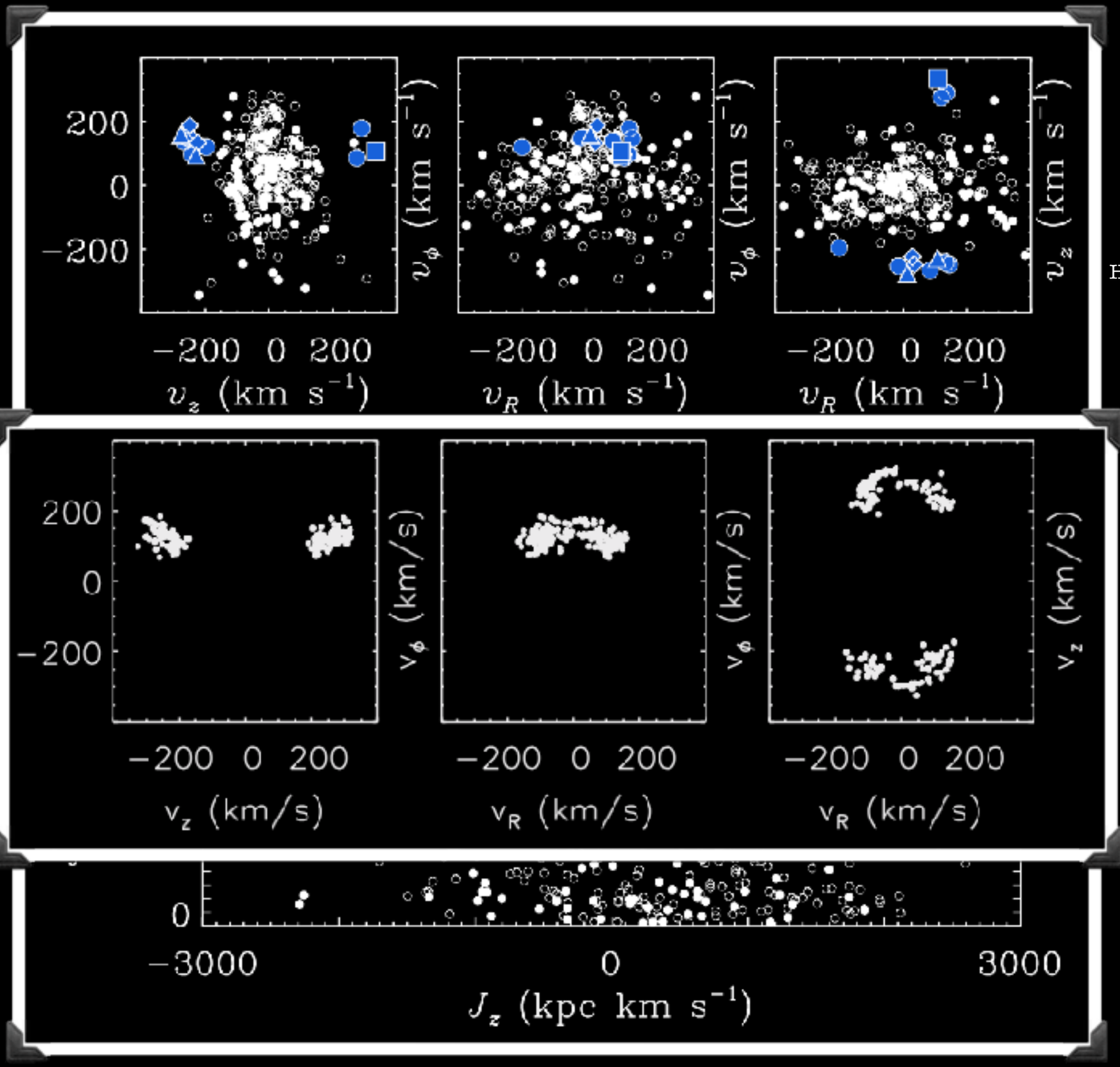
¿Y en la vecindad Solar?

300-500 corrientes estelares esperadas en la vecindad Solar

Helmi A., White S. D. M., 1999, MNRAS, 307, 495

Helmi A., White S. D. M., Springel V., 2003, MNRAS, 339,

Gómez et al. 2013MNRAS.436.3602G



Helmi et al. Nature, Volume 402, Issue 6757, pp. 53-55 (1999).

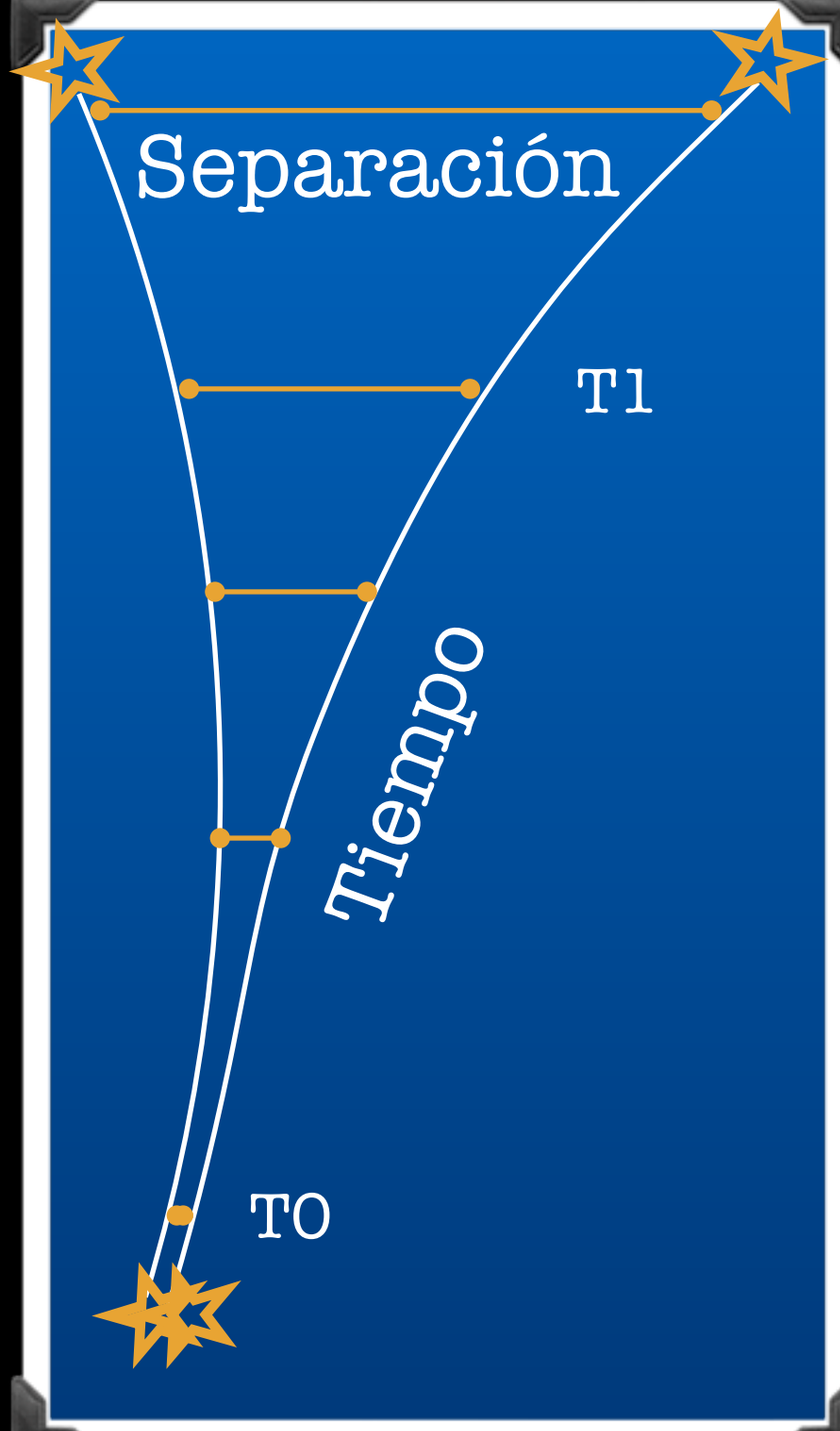
¿Dónde están las corrientes estelares “locales”?

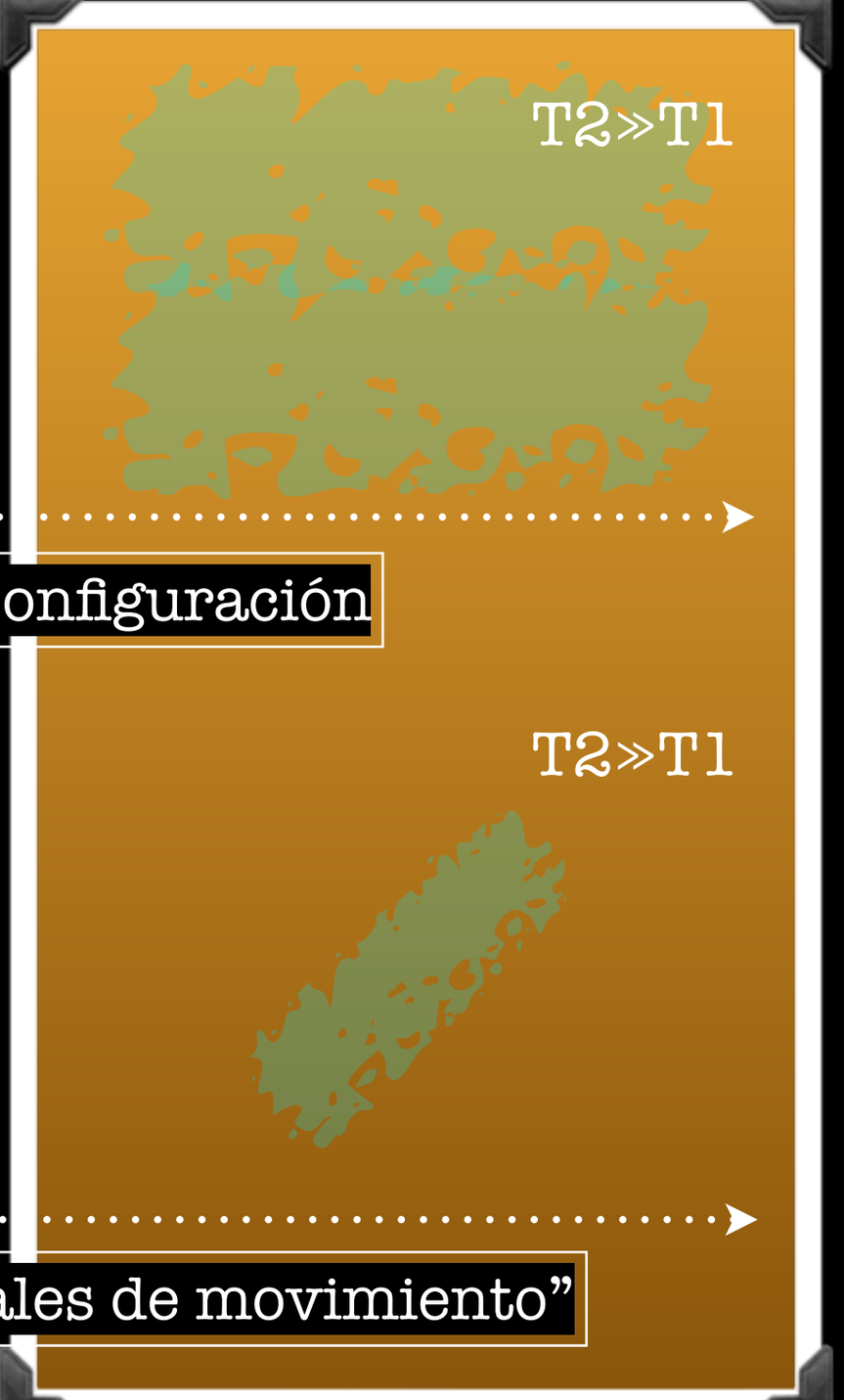
Acaso el caos...

Señal del caos

Impacto del caos

Impacto de la difusión caótica



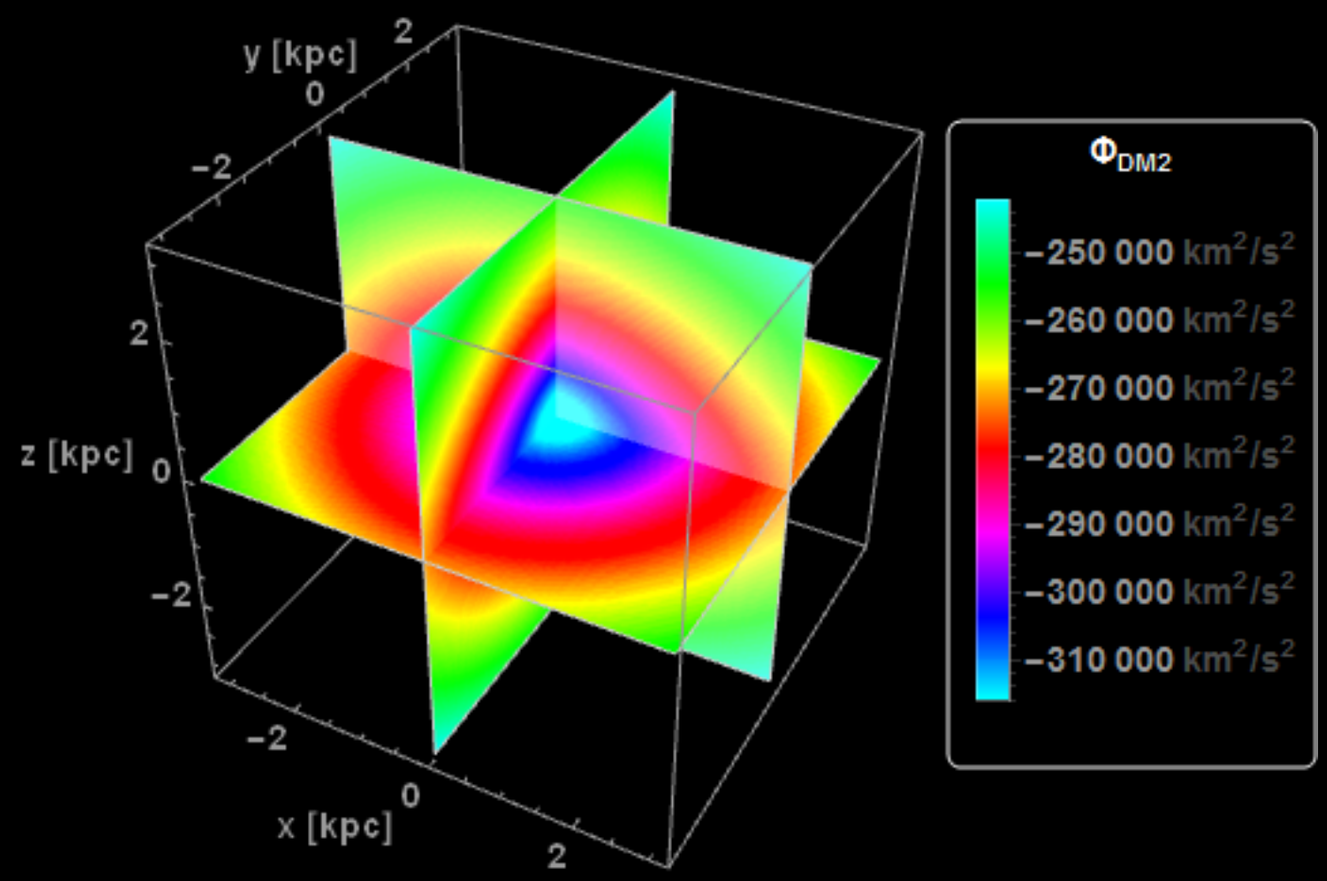


¿Cómo estudiamos el efecto del caos?
Aproximación numérico—analítica

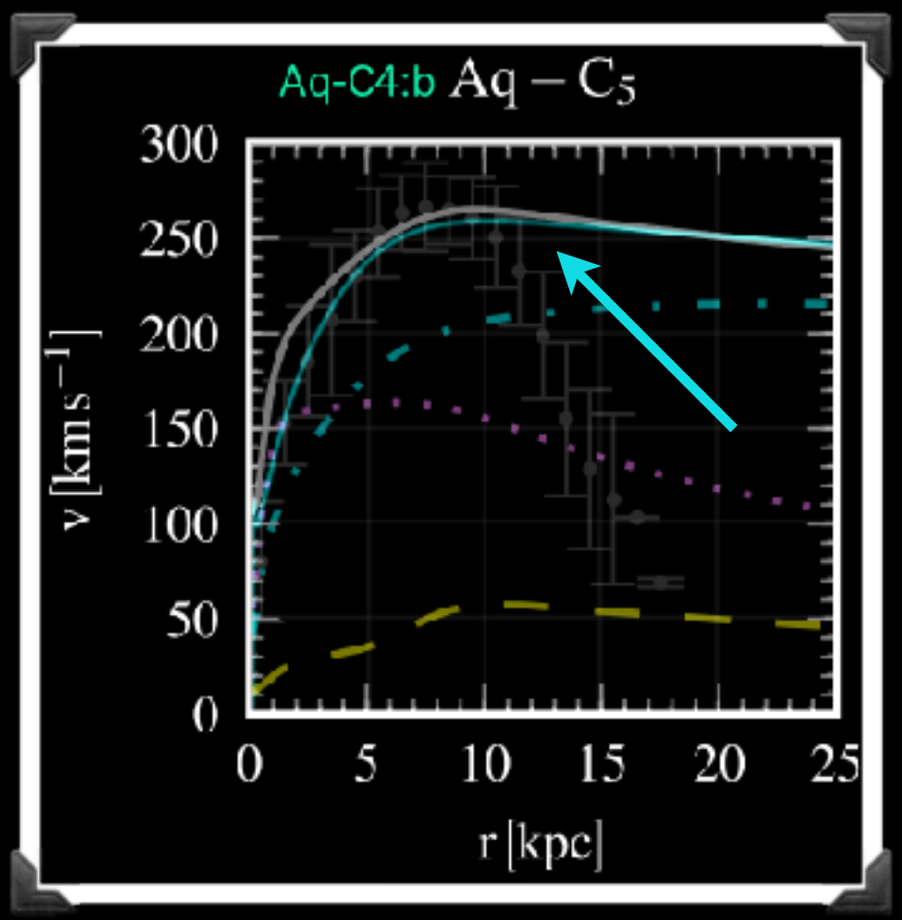
Simulaciones cosmológicas

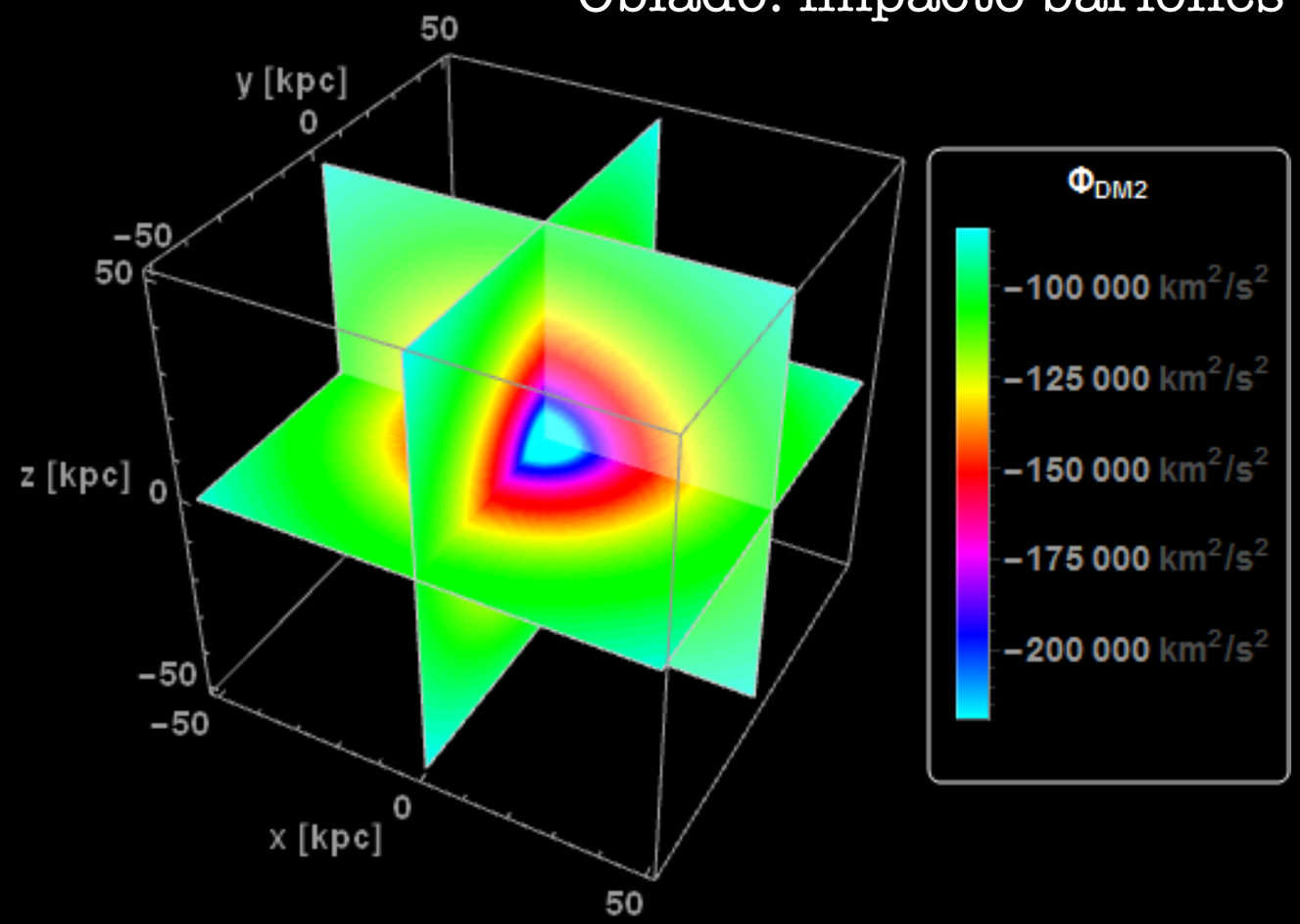
Modelos analíticos

Indicadores de caos



Oblado: impacto bariones





www.fcaglp.unlp.edu.ar/LP-Vlcode/

CONICET FCAGLP Publis-FCAGLP SeCyT CVar MinCyT IAU

The La Plata Variational Indicators Code (LP-Vlcode)

Current version: 1.0.3 (Kaos)

LP-Vlcode

Motivation

The correct analysis of a given dynamical system rests on the reliable identification of the chaotic or regular behaviour of its orbits. The most commonly used tools for such analyses are based either on the study of the fundamental frequencies of the trajectories, or on the study of the evolution of the deviation vectors, the so-called variational chaos indicators (CIs hereinafter). **Therefore, it seems very useful to have a tool with which one can compute several CIs in an easy and fast way. This is the main motivation of the LP-Vlcode.**

Latest News

About the code

Possible improvements:

1. Introduction of the LDI (see "Publications-Talks", 6th publication in the link below). Antonopoulos & Bountis (2006)
2. Implementation of Taylor package. See Jorba & Zou (2005)

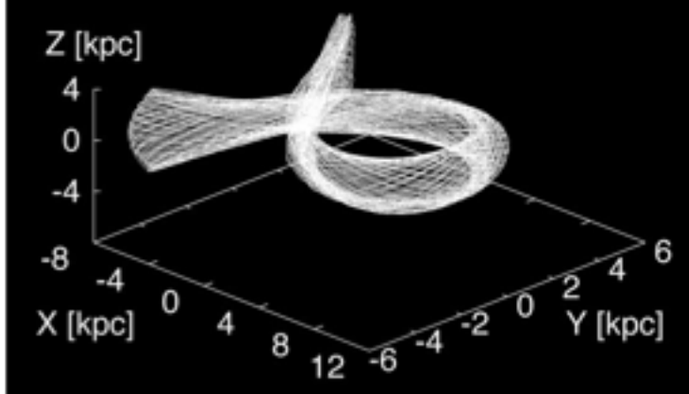
Variational Chaos Indicators Code

www.fcaglp.unlp.edu.ar/LP-VIcode/

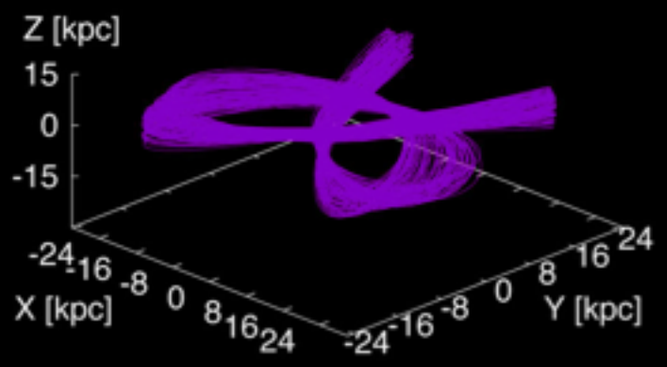
Resultados

¿El responsable es el caos?

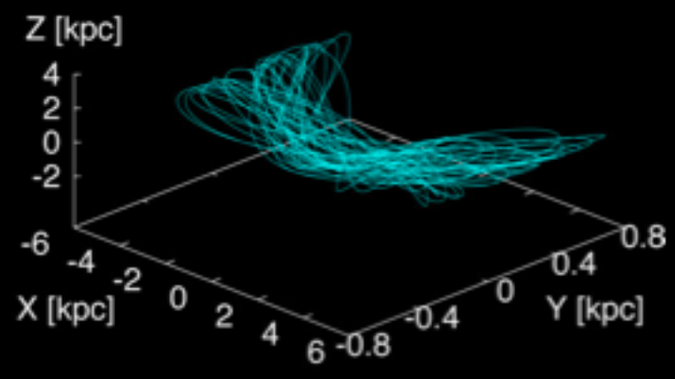
Regular orbit: 0-50 [Gyr]



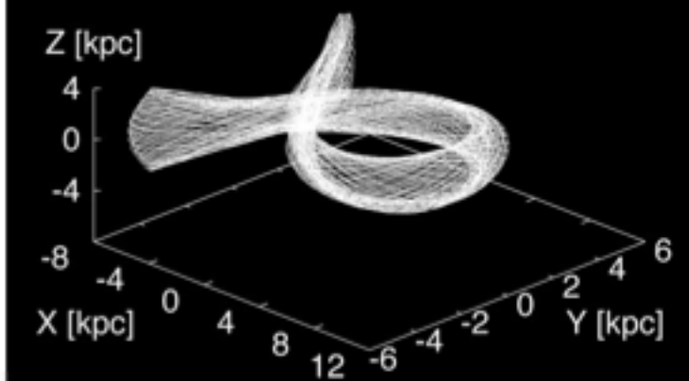
Sticky orbit: 0-110 [Gyr]



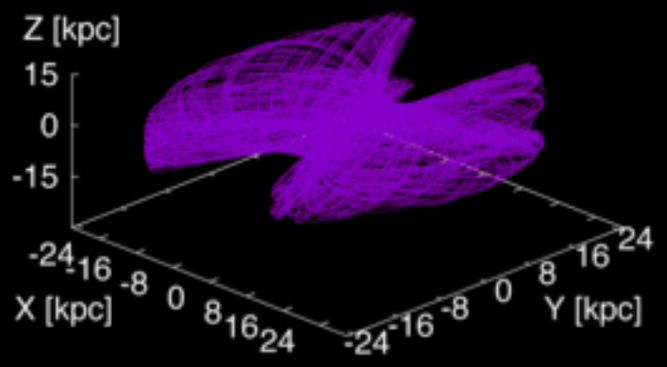
Chaotic orbit: 0-5 [Gyr]



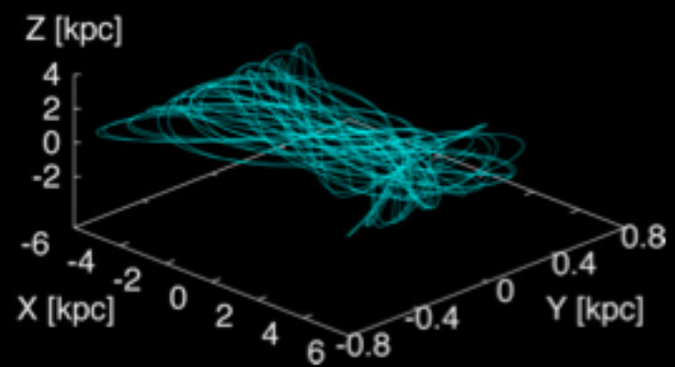
Regular orbit: 950-1000 [Gyr]

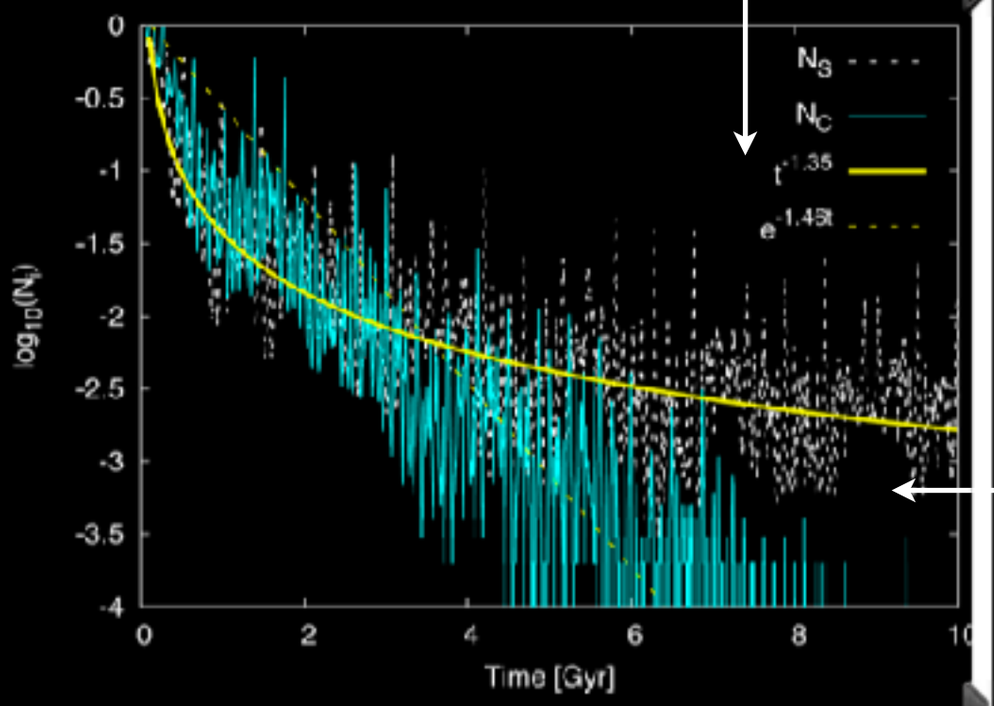


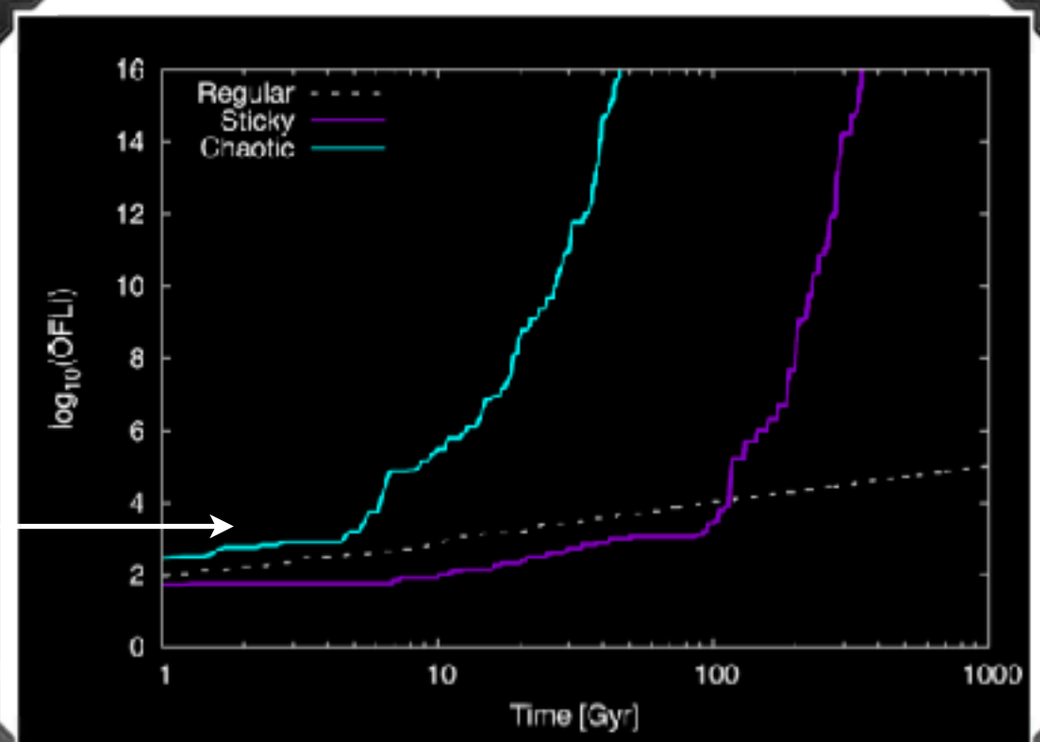
Sticky orbit: 890-1000 [Gyr]



Chaotic orbit: 5-10 [Gyr]







Uniendo

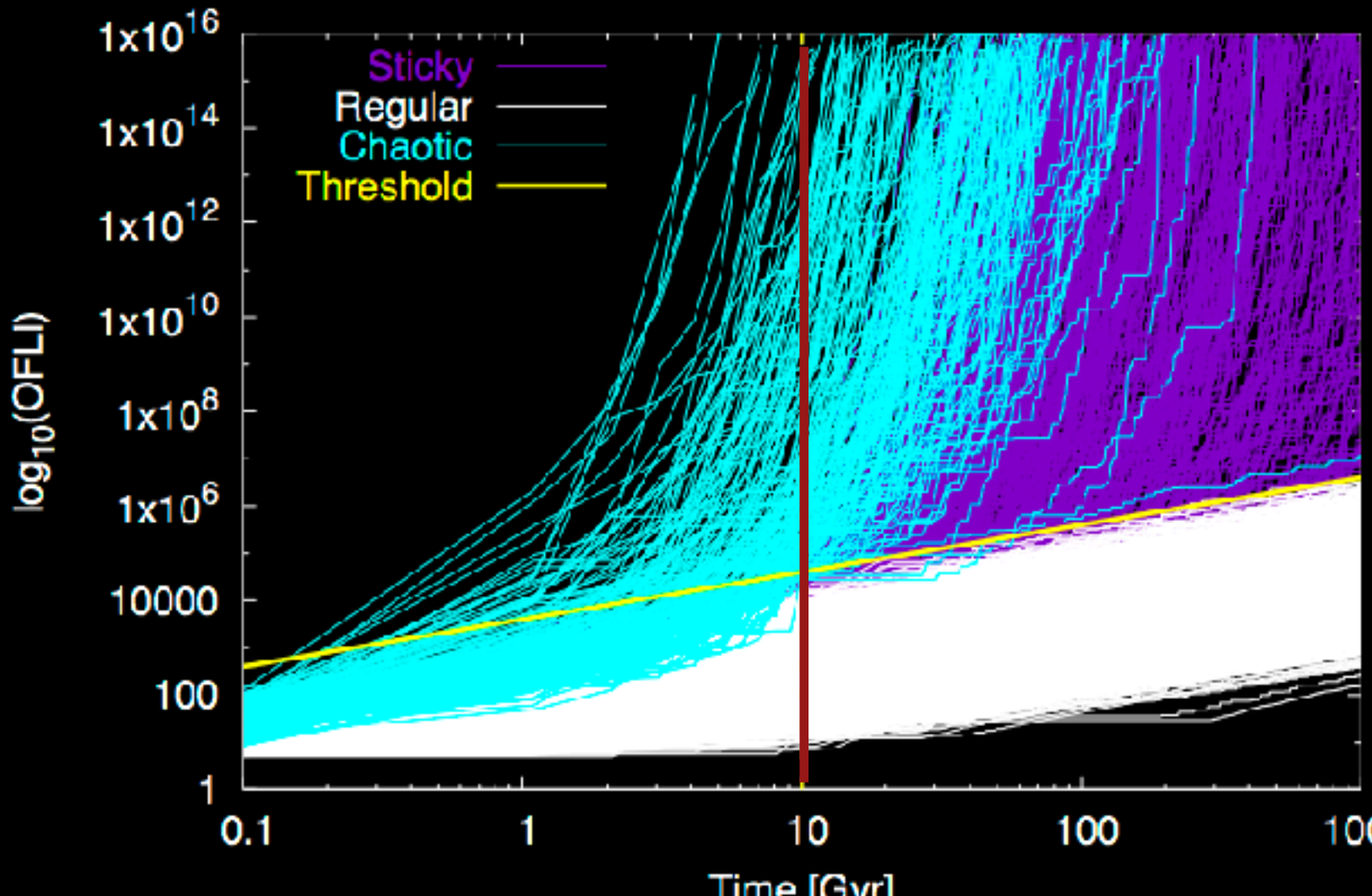
Órbitas

↓

Densidad

↕

OFLI



Name	R_{sph}	$N^\star$	$N^\star_R$	$N^\star_S$	$N^\star_C$
Au–3	19.875	557	395 (70.92%)	96 (17.23%)	66 (11.85%)
Au–6	12.005	2261	1467 (64.88%)	563 (24.9%)	231 (10.22%)
Au–15	10.06	4065	2541 (62.51%)	1039 (25.56%)	485 (11.93%)
Au–16	20.776	839	785 (93.56%)	33 (3.94%)	21 (2.5%)
Au–19	11.422	4445	2365 (53.21%)	1340 (30.15%)	740 (16.64%)
Au–21	13.065	3353	2455 (73.22%)	589 (17.57%)	309 (9.21%)

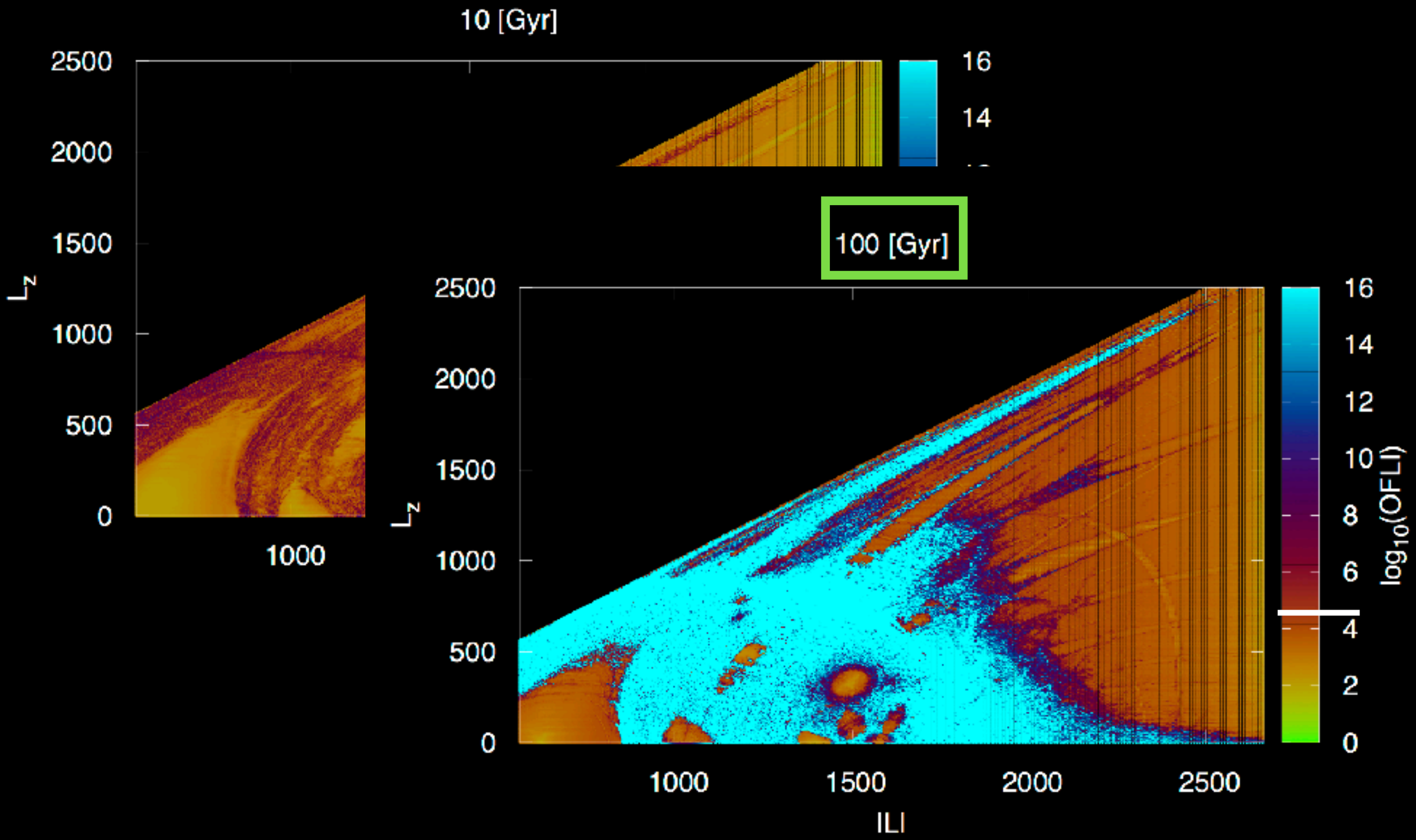
D/T	$N^\star$	$N^\star_R$	$N^\star_S$	$N^\star_C$
		3 (84.91%)	512 (11.62%)	153 (3.47%)
		4 (71.34%)	832 (18.88%)	431 (9.78%)
		8 (65.23%)	1042 (23.62%)	492 (11.15%)
		0 (63.02%)	999 (22.65%)	632 (14.33%)
		5 (59.04%)	1148 (26.02%)	659 (14.94%)
		515 (57%)	1230 (27.88%)	667 (15.12%)
		426 (55%)	1321 (29.95%)	664 (15.05%)
		4 (54.03%)	1323 (29.99%)	705 (15.98%)
		3 (51.97%)	1471 (33.34%)	648 (14.69%)
		7 (51.17%)	1555 (35.25%)	599 (13.58%)
1	4411	2225 (50.44%)	1552 (35.19%)	634 (14.37%)

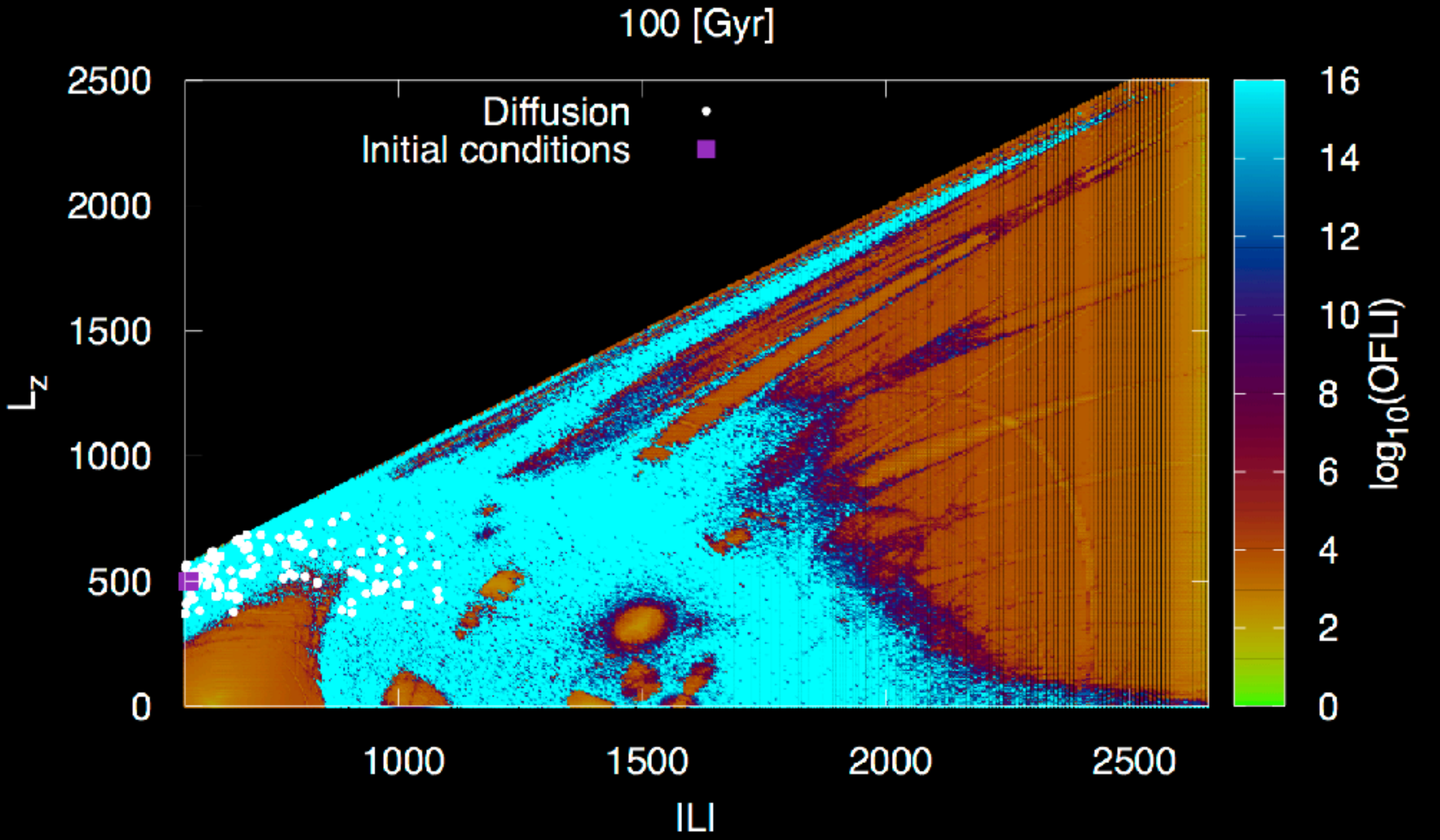
Resultados

¿Y la difusión?

Difusión

Variación de las “integrales de movimiento”




100 [Gyr]
Diffusion
Initial conditions
2500
2000
1500
1000
500
0
L_Z
1000
1500
2000
2500
ILI
16
14
12
10
8
6
4
2
0
$\log_{10}$(OFLI)

100 [Gyr]

Diffusion
Initial conditions

2500
2000
1500
1000
500
0
L_z

1000
1500
|L|

16
14
12
10

1
0.8
0.6
0.4
0.2
0
E_{norm}

A

−2000
0
2000
Lz [kpc km s^{-1}]

Gómez et al. 2013MNRAS.436.3602G

Conclusiones, aspectos a mejorar, trabajo en proceso y a futuro

Problema

¿Acaso el caos es responsable de destruir información crucial para reconstruir la historia evolutiva de la Galaxia?

Resultados

Encontramos evidencia numérica de que no sería así para estrellas del halo en la vecindad solar.

Aspectos a mejorar

Modelos analíticos.

Trabajo en proceso

Modelos analíticos dependientes del tiempo.

Trabajo a futuro

Cuantificar el caos directamente sobre simulaciones cosmológicas.