J/A+A/574/A39 Exoplaneraty systems fundamental parameters (Damiani+, 2015)

Evolution of angular-momentum-losing exoplanetary systems.
Revisiting Darwin stability.
Damiani C., Lanza A.F.
<Astron. Astrophys., 574, A39-39 (2015)>
=2015A&A...574A..39D

ADC_Keywords: Stars, double and multiple ; Binaries, orbits

Keywords: planets and satellites: dynamical evolution and stability - planet-star interactions - stars: late-type - methods: analytical

Abstract:
We assess the importance of tidal evolution and its interplay with magnetic braking in the population of hot-Jupiter planetary systems. By minimizing the total mechanical energy of a given system under the constraint of stellar angular momentum loss, we rigorously find the conditions for the existence of dynamical equilibrium states. We estimate their duration, in particular when the wind torque spinning down the star is almost compensated for by the tidal torque spinning it up. We introduce dimensionless variables to characterize the tidal evolution of observed hot Jupiter systems and discuss their spin and orbital states using generalized Darwin diagrams based on our new approach. We show that their orbital properties are related to the effective temperature of their host stars. The long-term evolution of planets orbiting F- and G-type stars is significantly different owing to the combined effect of magnetic braking and tidal dissipation. The existence of a quasi-stationary state, in the case of short-period planets, can significantly delay their tidal evolution that would otherwise bring the planet to fall into its host star. Most of the planets known to orbit F-type stars are presently found to be near this stationary state, probably in a configuration not too far from what they had when their host star settled on the zero-age main sequence. Considering the importance of angular momentum loss in the early stages of stellar evolution, our results indicate that it has to be considered to properly test the migration scenarios of planetary system formation.

File Summary:

FileName	Lrecl	Records	Explanations
ReadMe	80	.	This file
table4.dat	140	109	Main stellar and planetary parameters of the systems considered in Sect. 4

Byte-by-byte Description of file: table4.dat

Bytes	Format	Units	Label	Explanations
1- 11	A11	---	Name	Star name
13- 18	F6.4	d	Porb	[0.7/9.5] Orbital period of the planet (error typically smaller than 10^{-5}d)
20- 24	F5.3	AU	a	[0.01/0.09] Semi-major axis of the orbit (error typically smaller than 10^{-3}AU)
26- 30	F5.3	---	e	[0/0.1] Eccentricity of the orbit
32- 36	F5.3	---	E_e	[0/0.1]? Error on Eccentricity (upper value)
38- 41	F4.2	---	e_e	[0/0.1]? Error on Eccentricity (lower value)
43- 47	F5.2	Mjup	Mp	[0.02/11] Planet mass (in Jupiter mass)
49- 52	F4.2	Mjup	E_Mp	[0/1.6] Error on Mp (upper value)
54- 57	F4.2	Mjup	e_Mp	[0/1.6] Error on M (lower value)
59- 62	F4.2	Rjup	Rp	[0.2/1.8] Planet radius (in Jupiter radius)
64- 67	F4.2	Rjup	E_Rp	[0/1] Error on Rp (upper value)
69- 72	F4.2	Rjup	e_Rp	[0/1] Error on Rp (lower value)
74- 77	F4.2	Msun	M*	[0.6/1.6] Star mass
79- 82	F4.2	Msun	E_M*	[0.01/0.2] Error on M* (upper value)
84- 87	F4.2	Msun	e_M*	[0.01/0.2] Error on M* (lower value)
89- 92	F4.2	Rsun	R*	[0.6/2.3] Star radius
94- 97	F4.2	Rsun	E_R*	[0.01/0.2] Error on R* (upper value)
99-102	F4.2	Rsun	e_R*	[0.01/0.2] Error on R* (lower value)
104-107	I4	K	Teff	Effective temperature
109-111	I3	K	e_Teff	rms uncertainty on Teff
113-116	F4.1	km/s	vsini	[0.2/40] Rotational velocity
118-120	F3.1	km/s	E_vsini	[0/5] Error on vsini (upper value)
122-124	F3.1	km/s	e_vsini	[0/5] Error on vsini (lower value)
126-130	F5.1	deg	lambda	?=- Projected obliquity λ (angle between the stellar spin axis and the orbital pole)
132-135	F4.1	deg	E_lambda	? Error on lambda (upper value)
137-140	F4.1	deg	e_lambda	? Error on lambda (lower value)

History:
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(End) Patricia Vannier [CDS] 09-Mar-2015

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