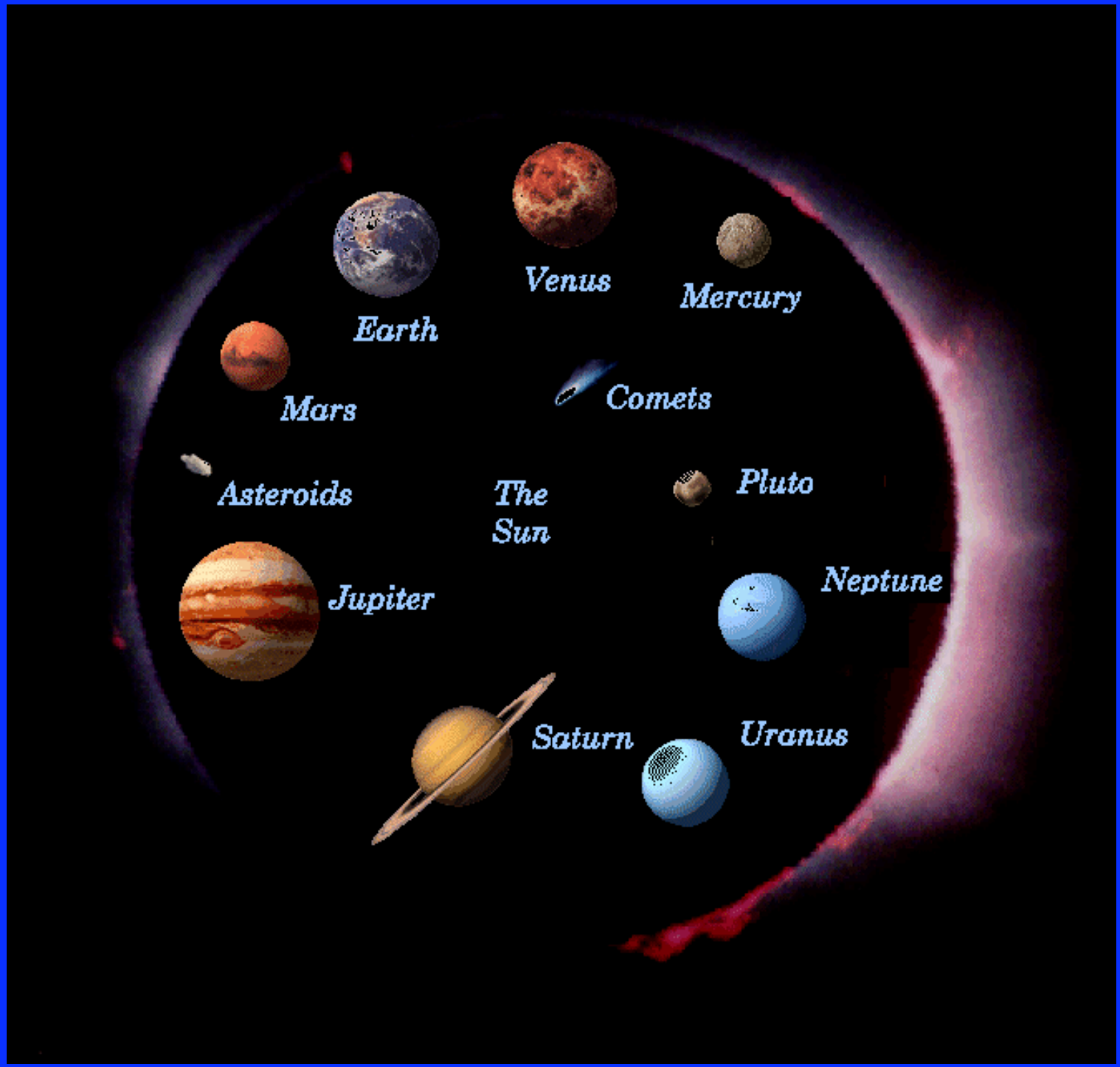
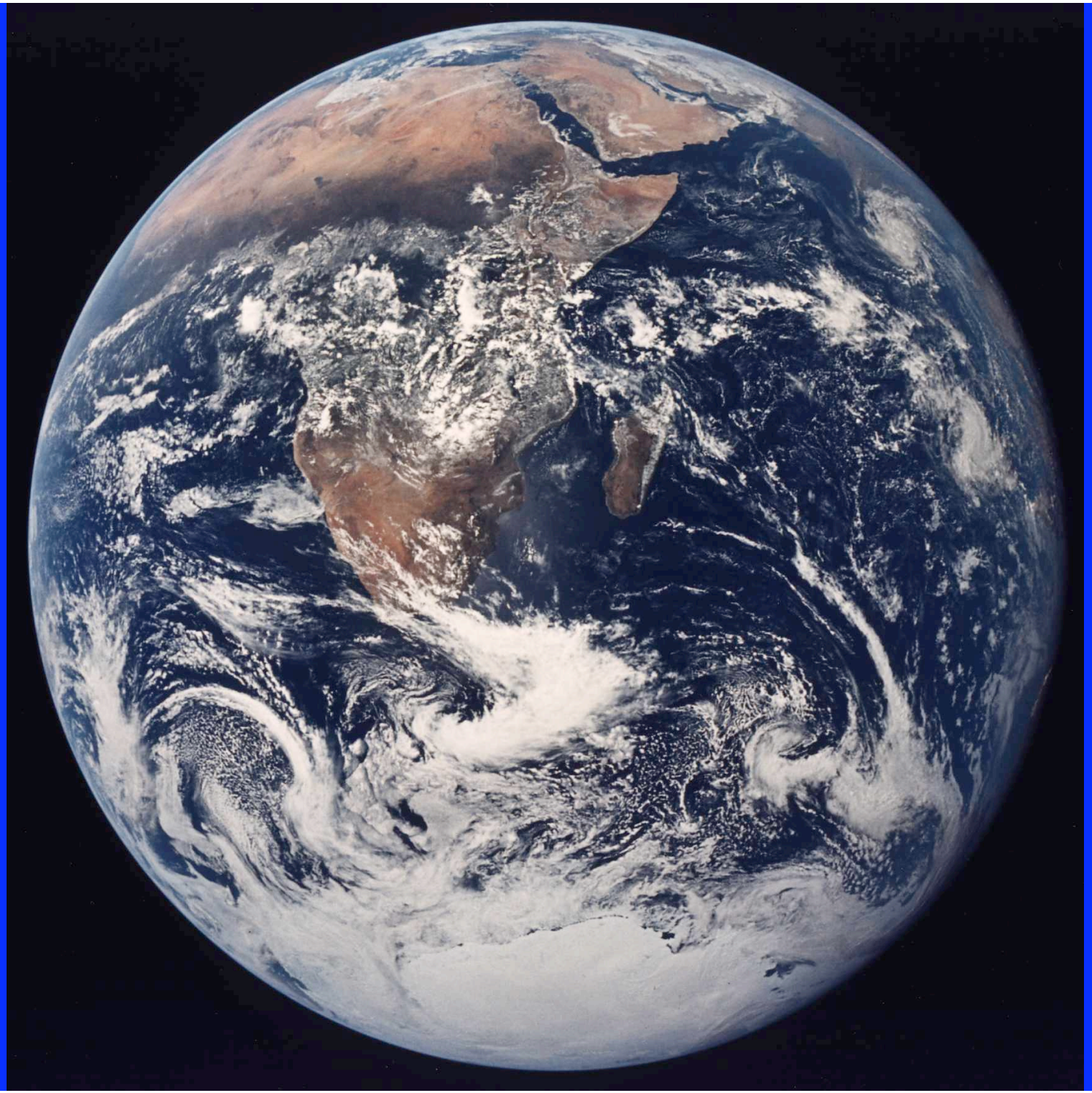
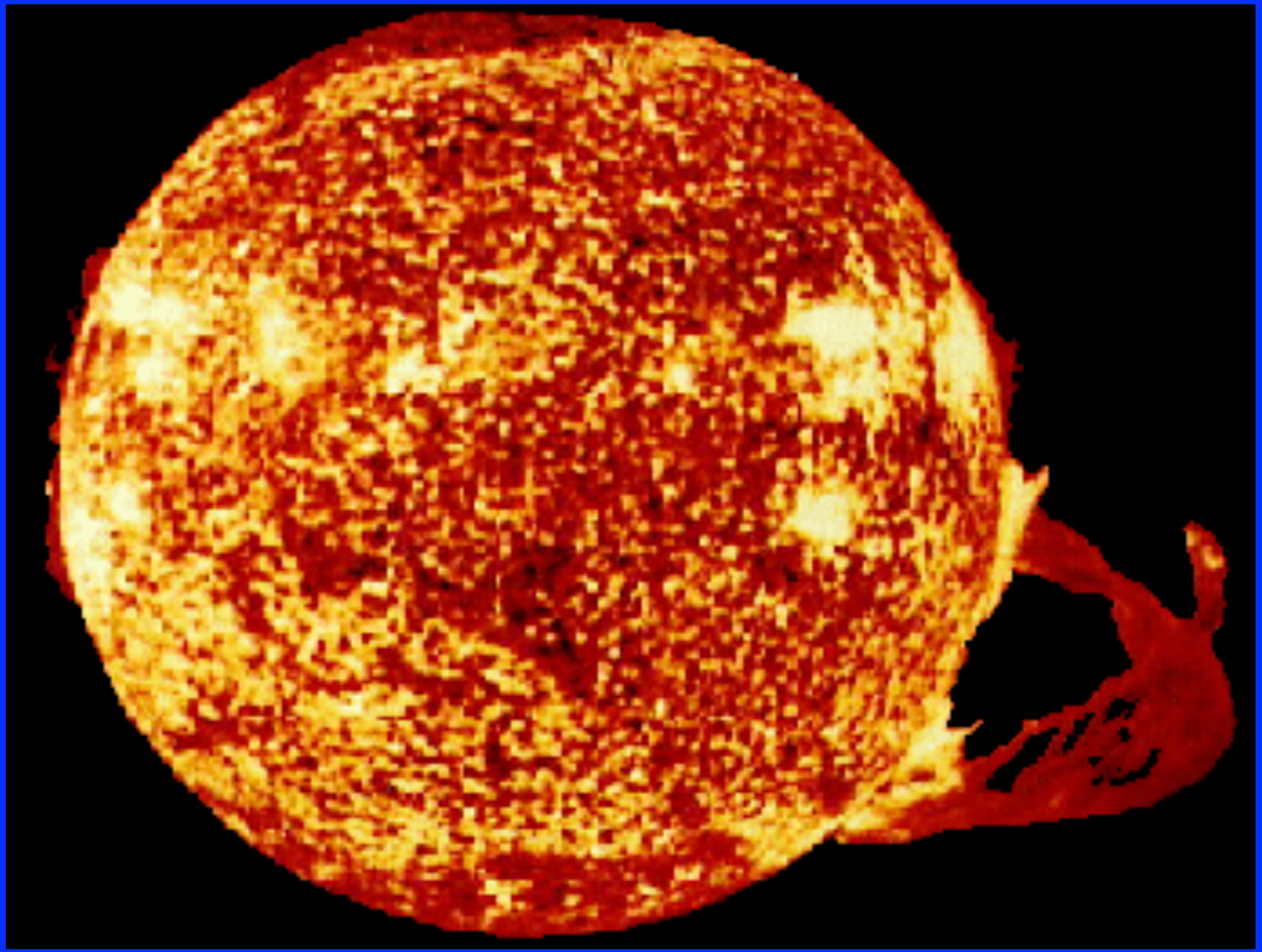
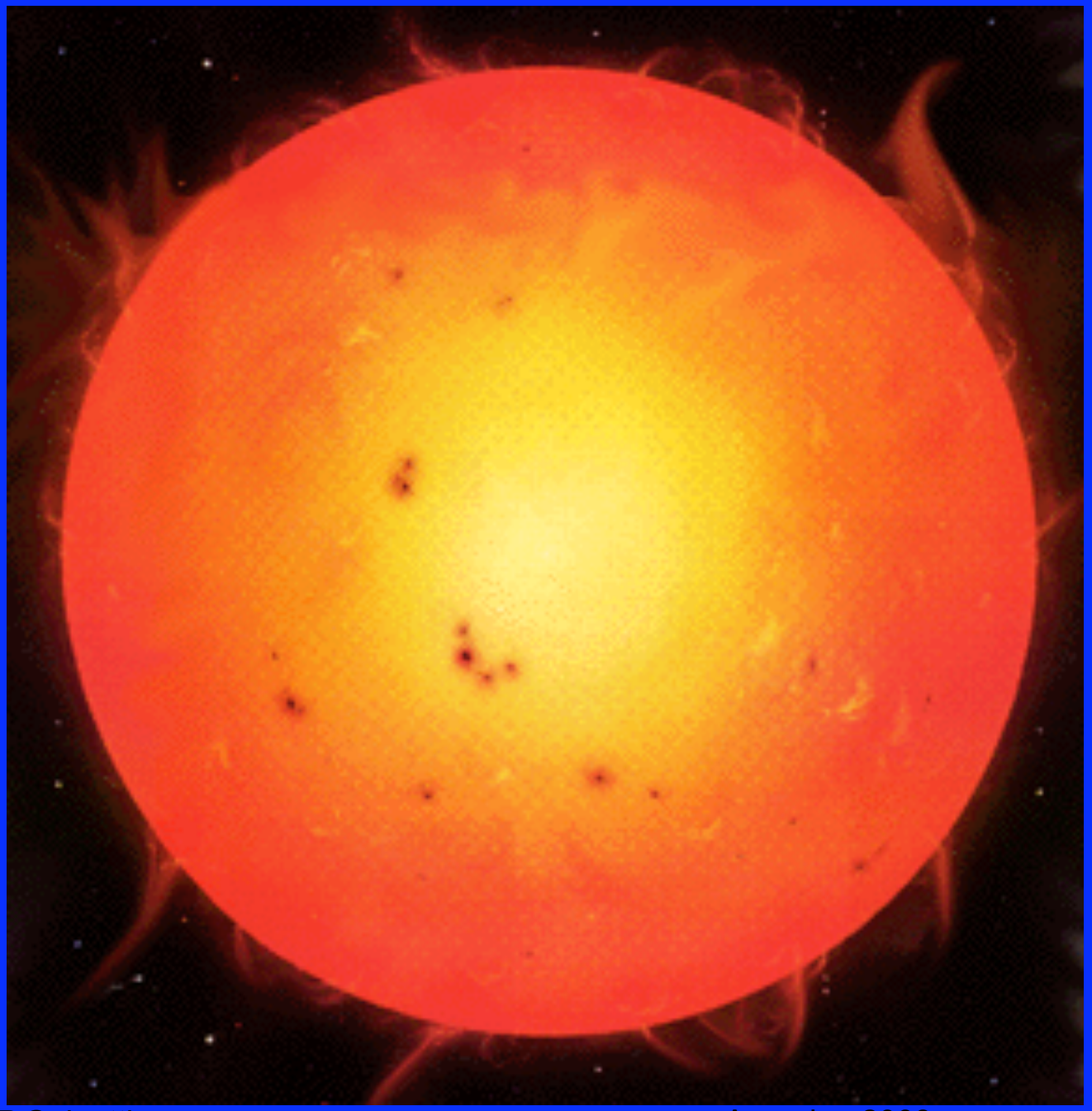

Venus
Mercury
Earth
Mars
Comets
Asteroids
The
Sun
Pluto
Jupiter
Neptune
Saturn
Uranus

P.Galeotti



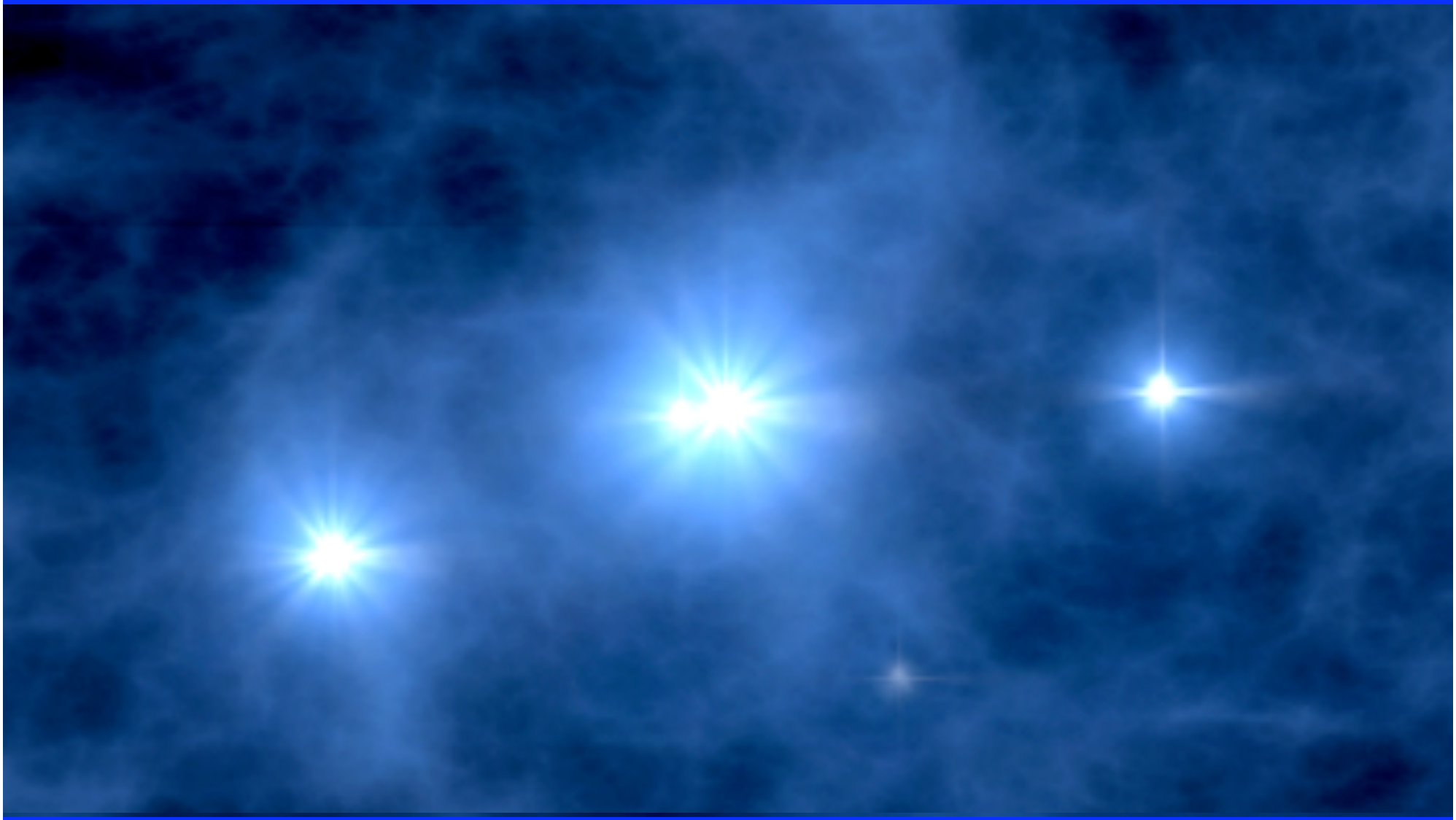


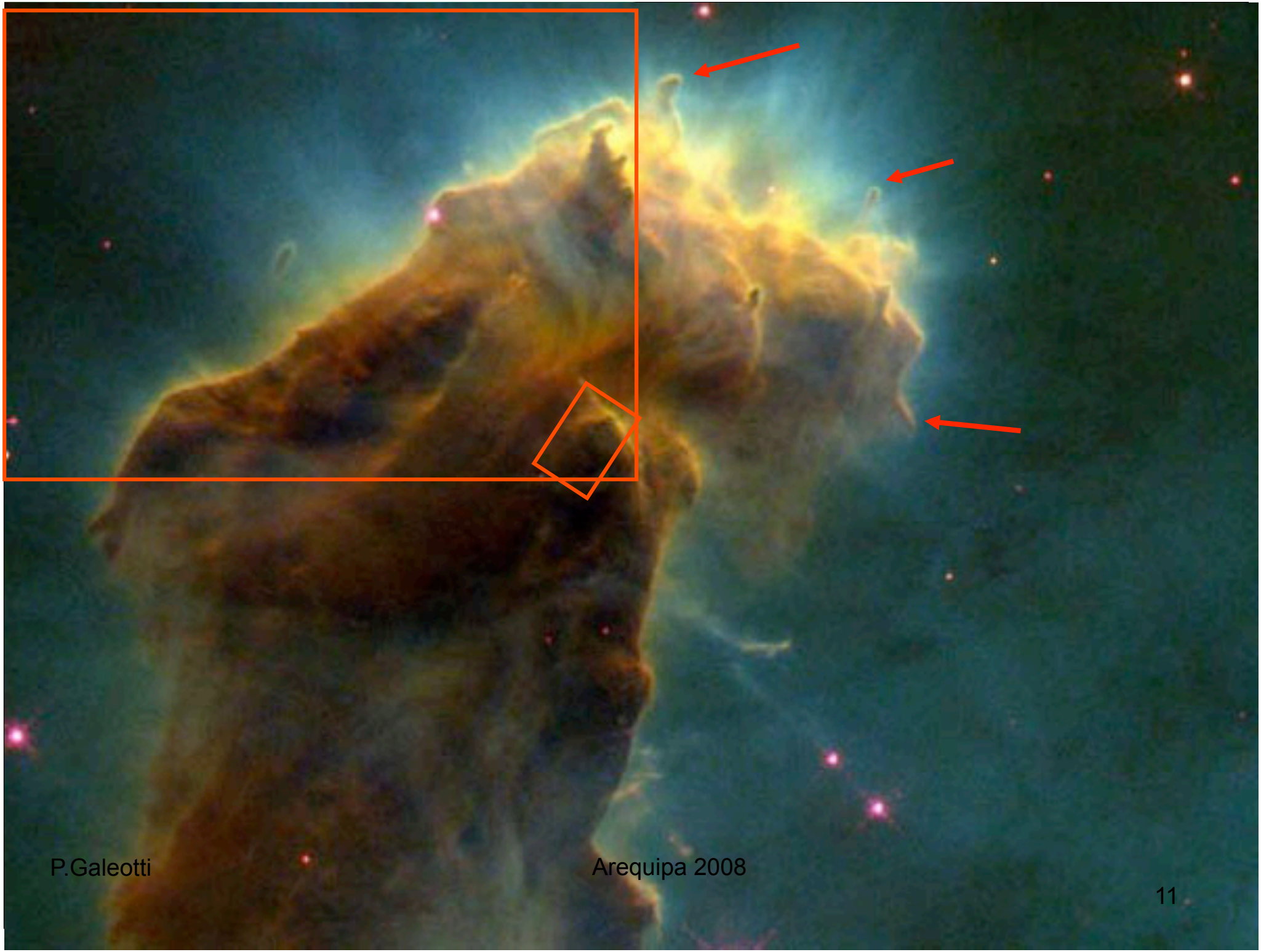


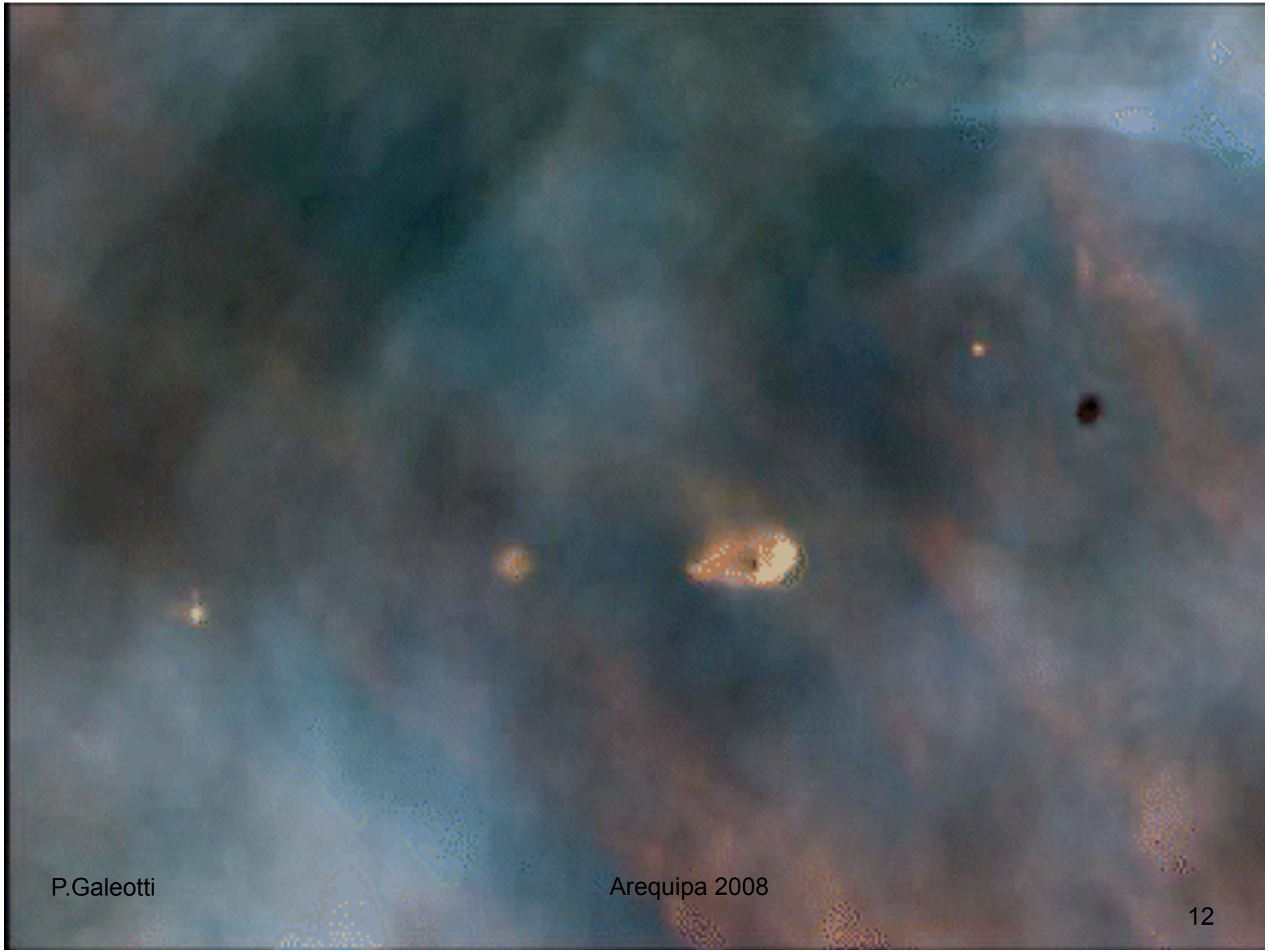
Il Sole

1.000 volte
più grande
di
Giove

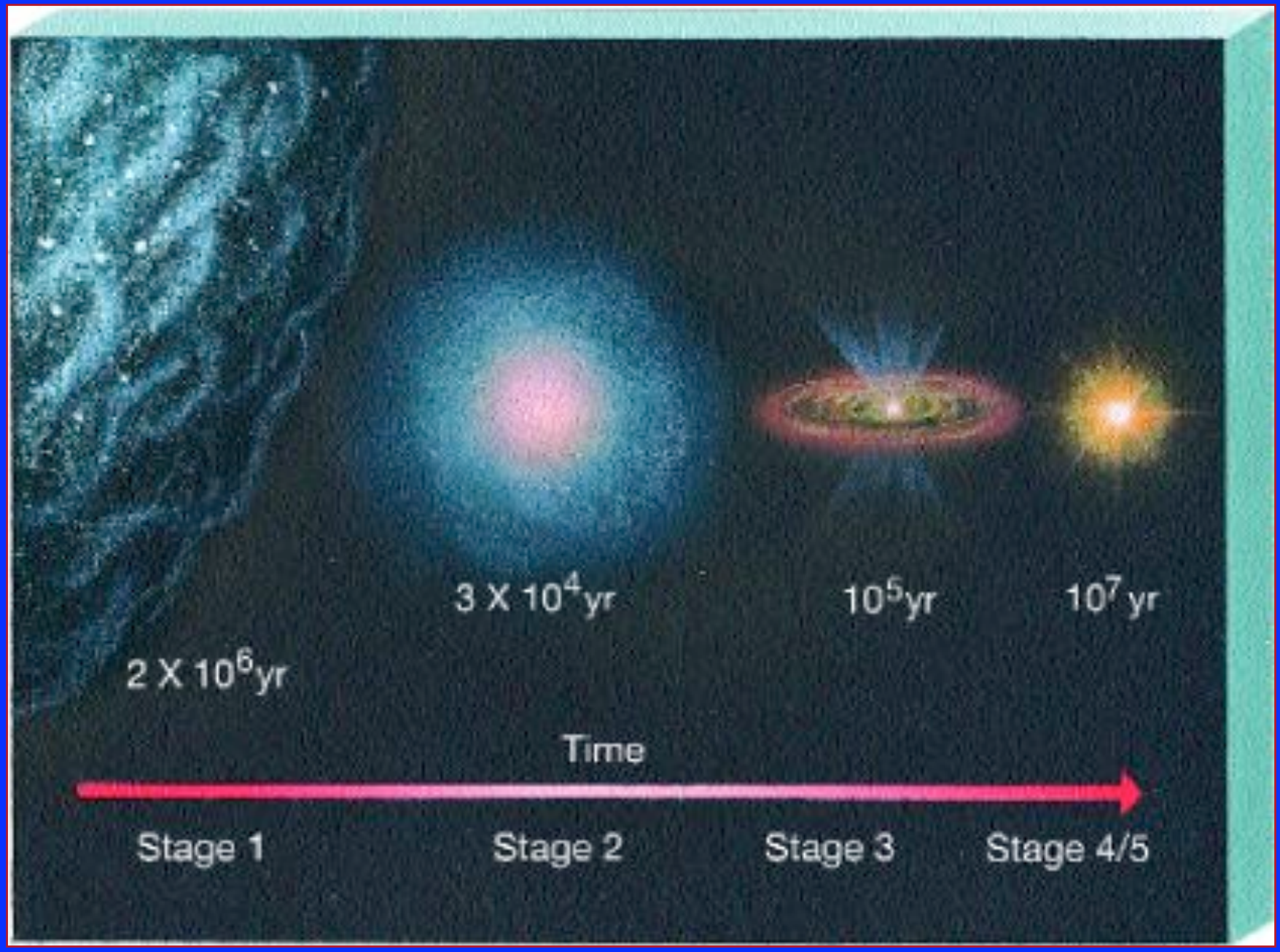
1.000.000
di volte più
grande
della Terra







Le pleiadi


2×10^6yr
3×10^4yr
10^5yr
10^7 yr
Time
Stage 1
Stage 2
Stage 3
Stage 4/5

5 pianeti allineati

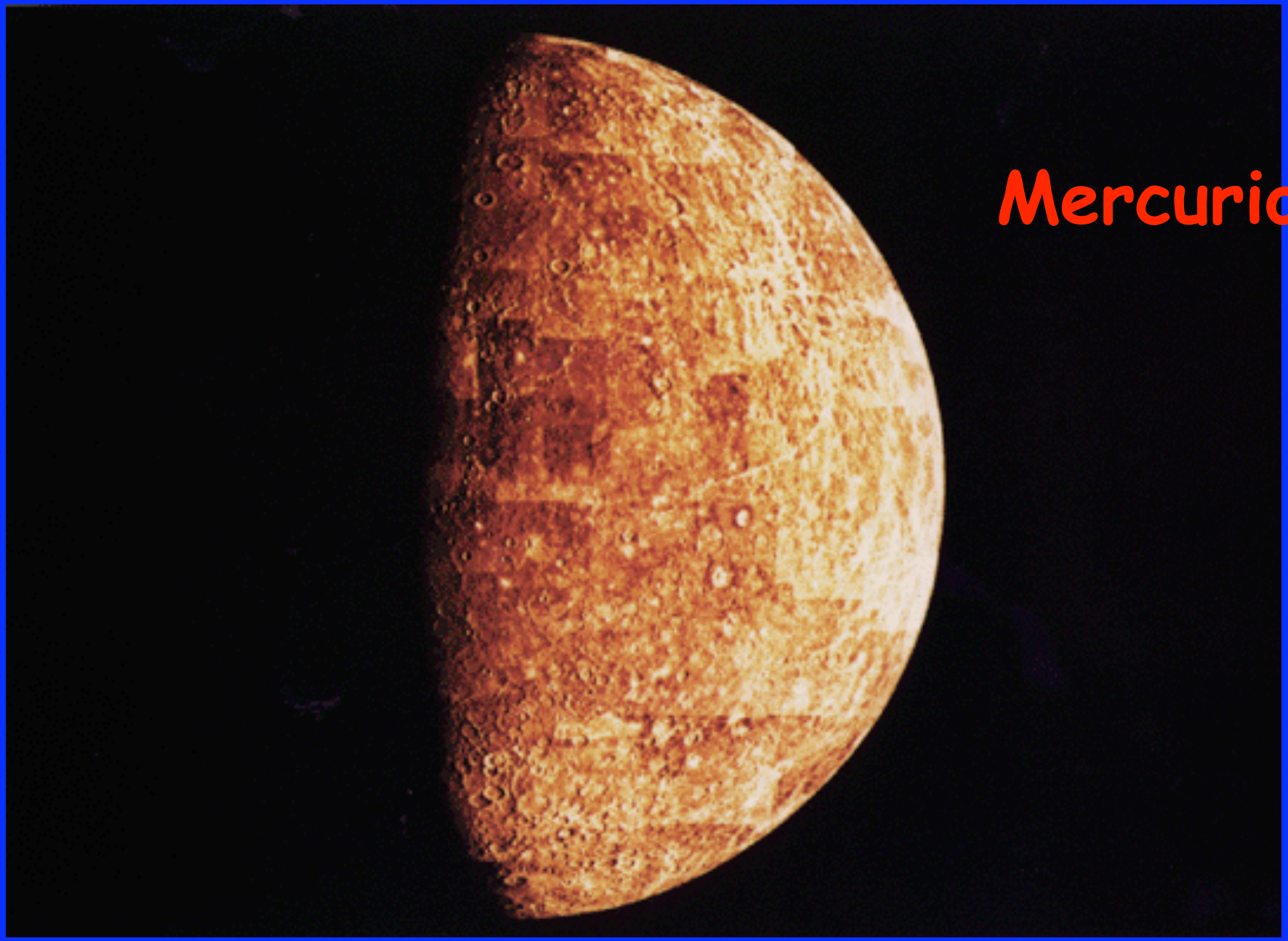
Mercurio

Venere

Marte

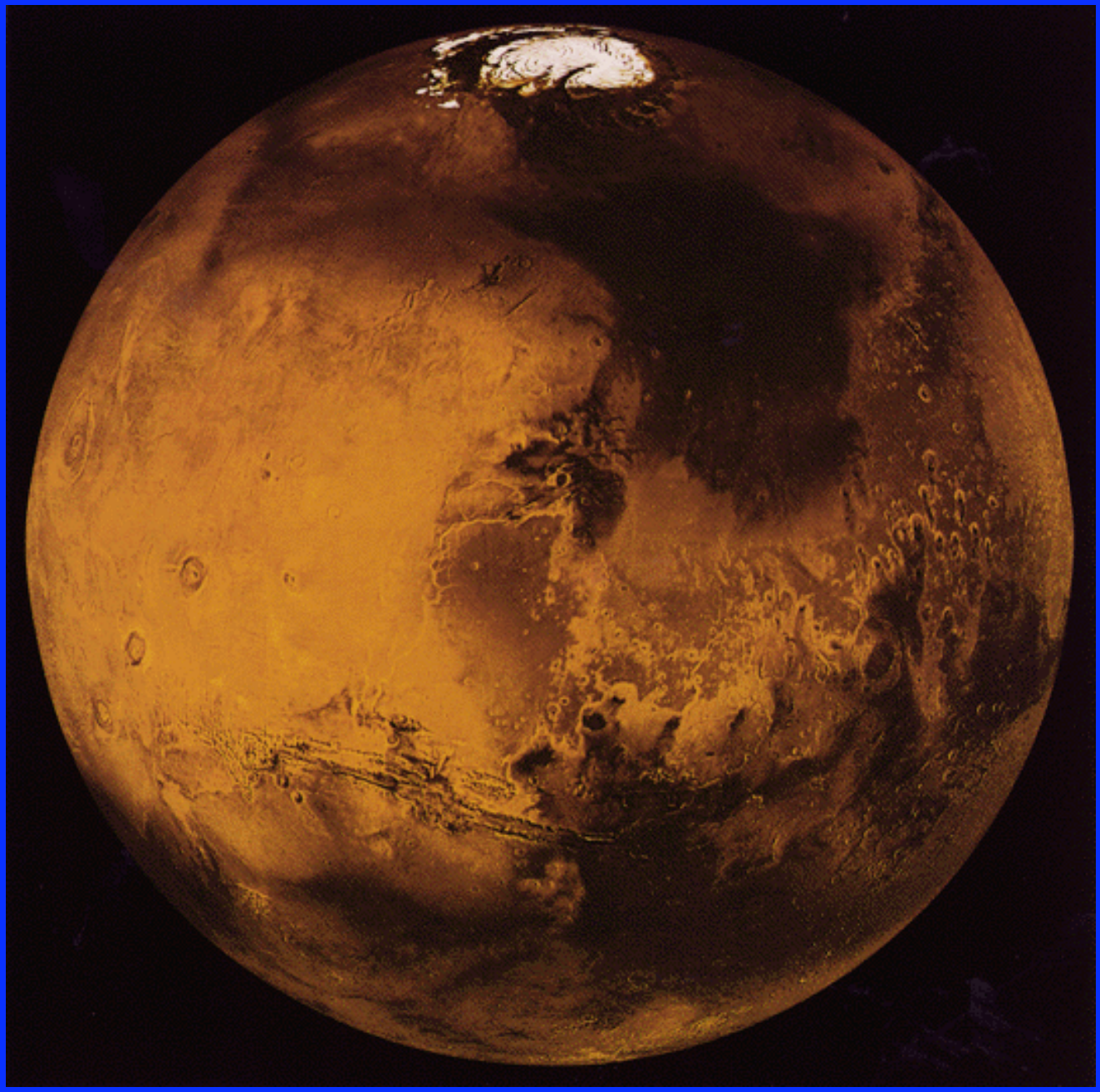
Giove

Saturno



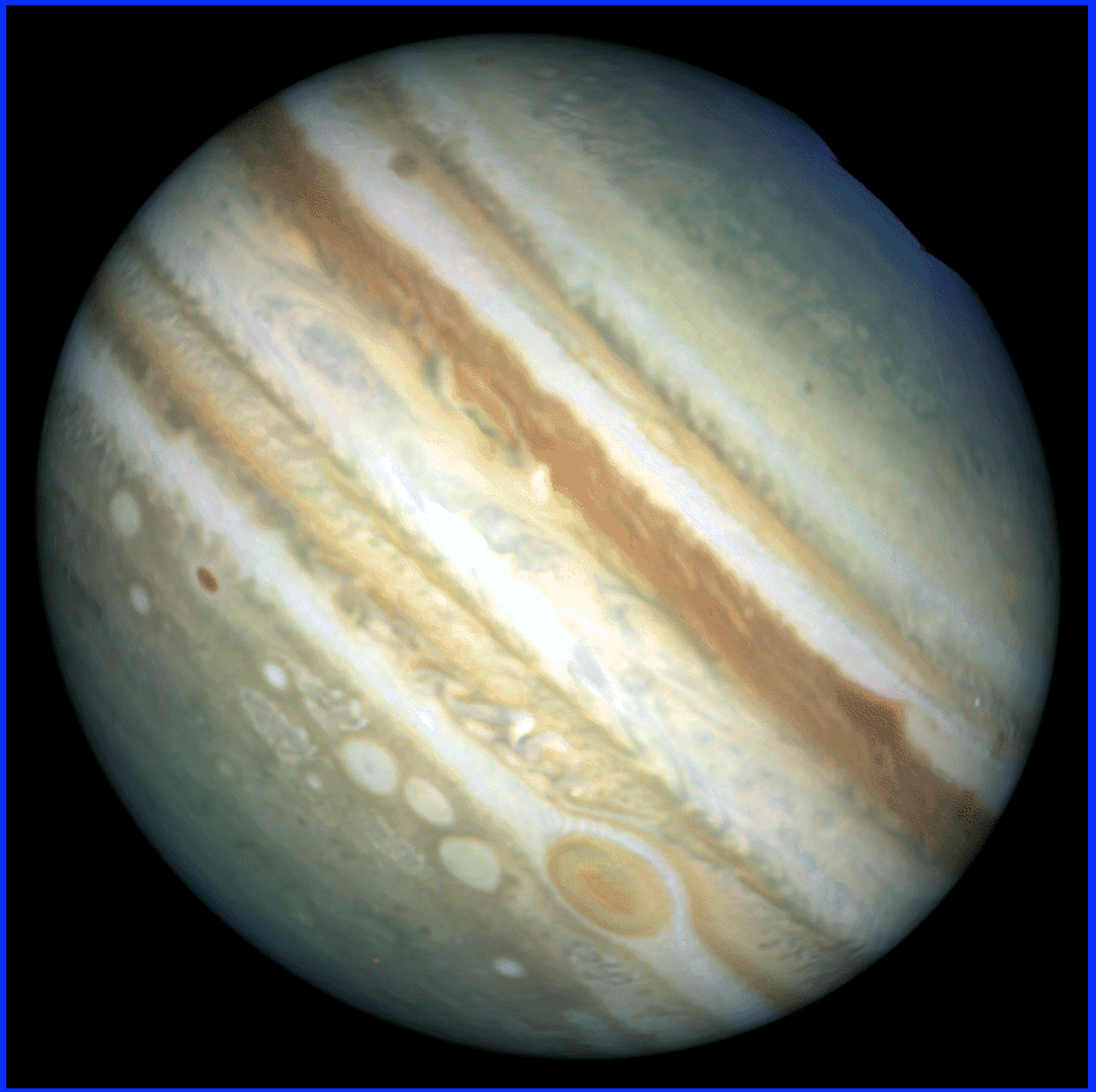
Mercurio

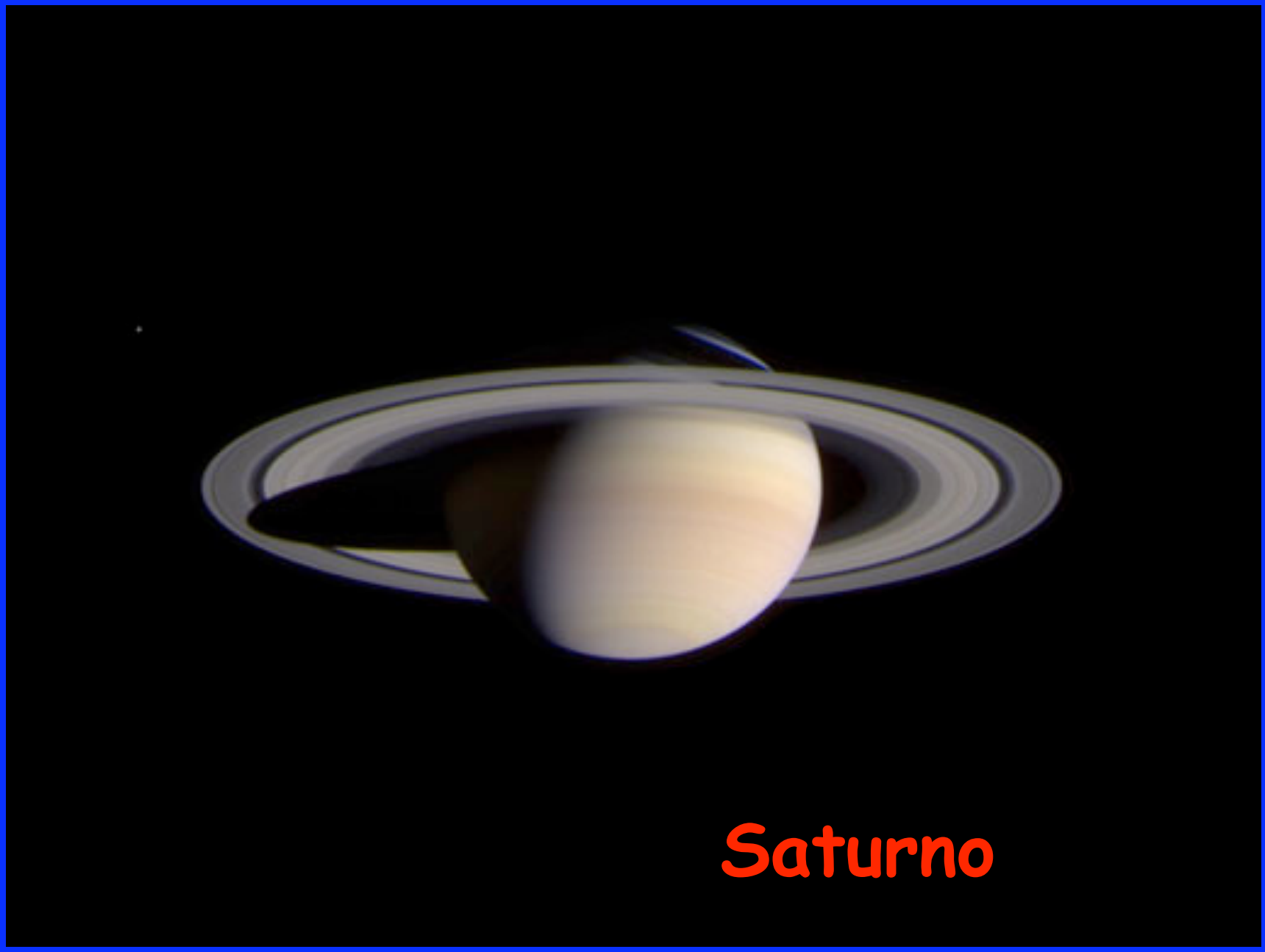
Venere



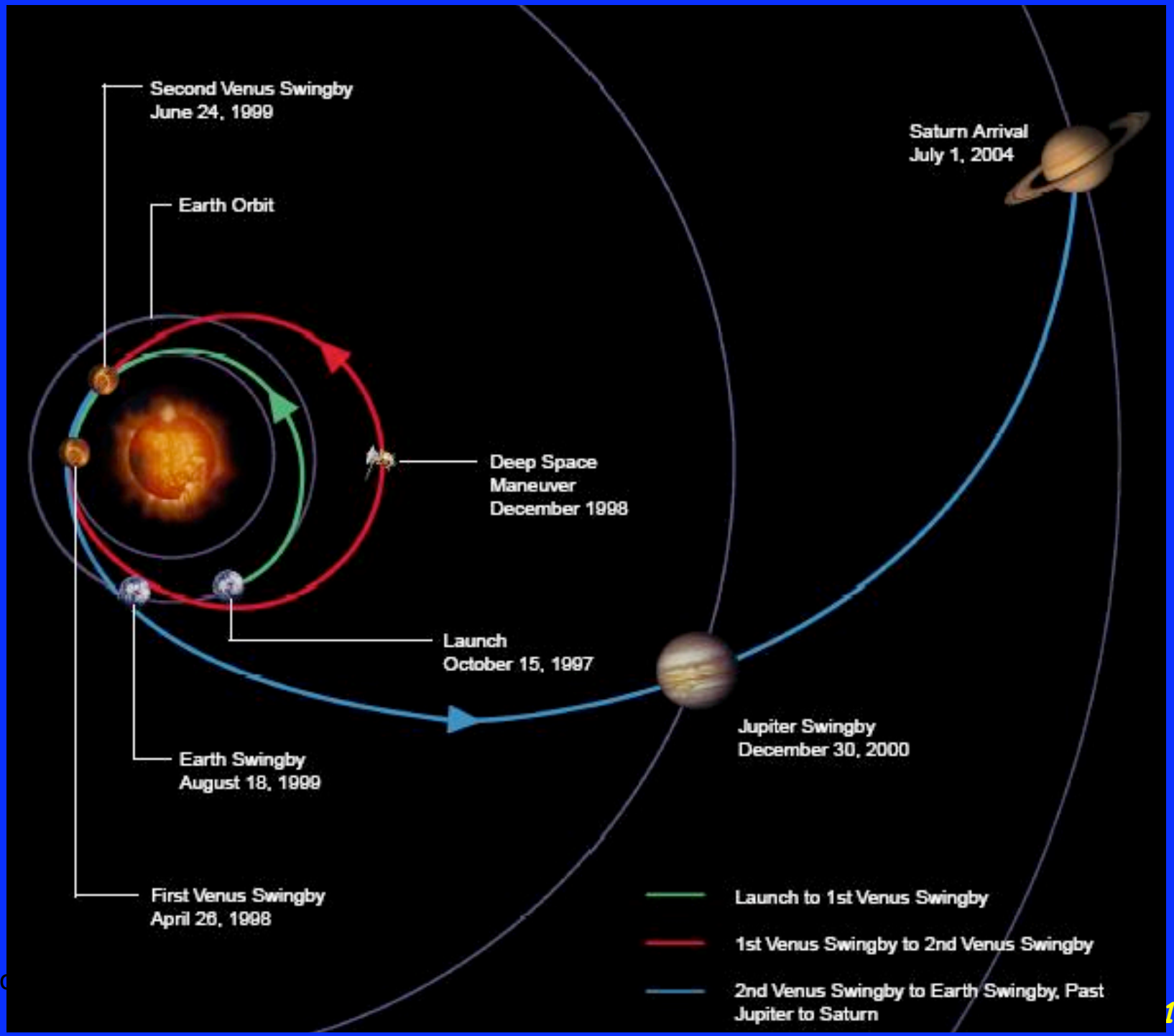
Marte

Giove





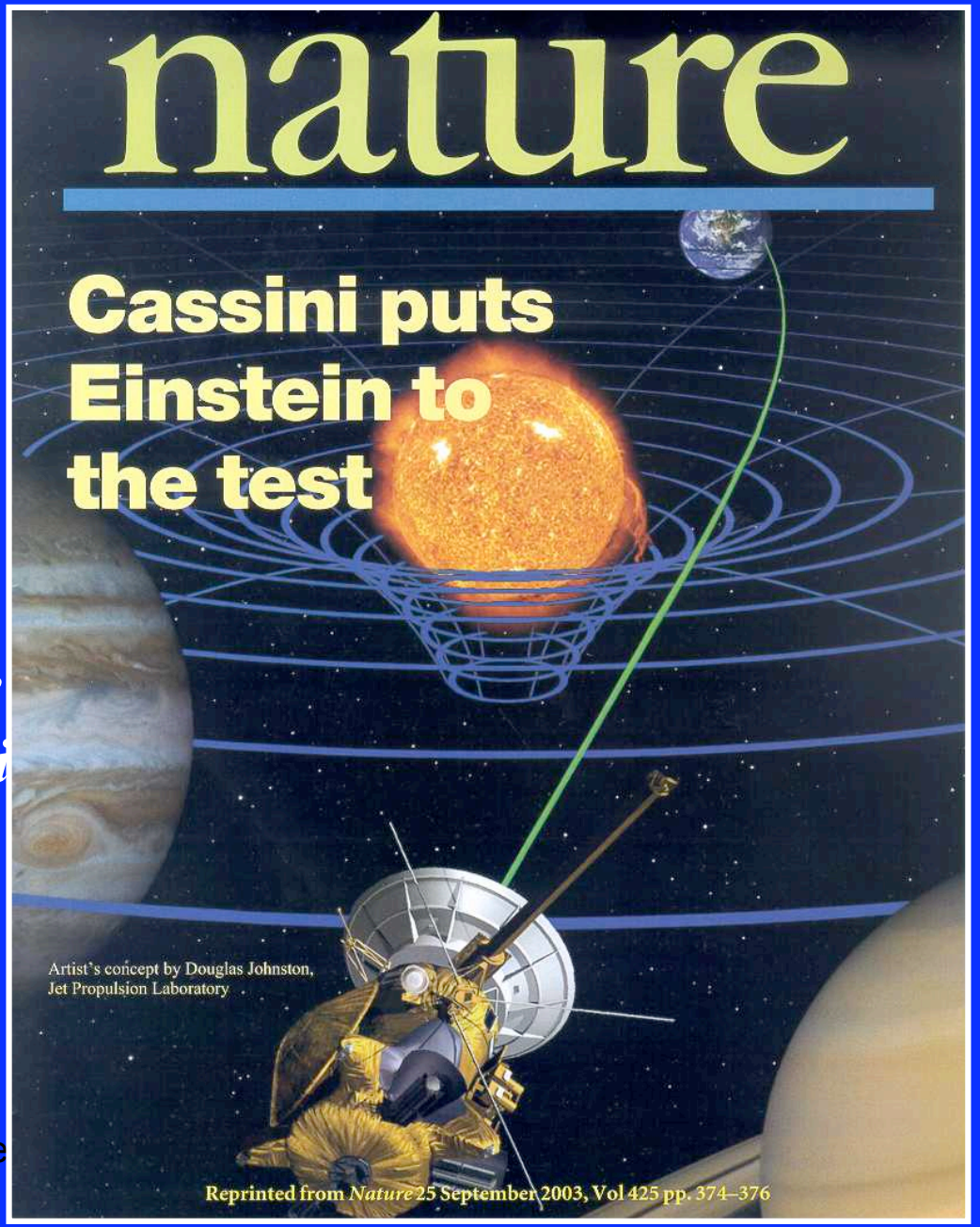
Saturno


Second Venus Swingby
June 24, 1999
Earth Orbit
Saturn Arrival
July 1, 2004
Deep Space
Maneuver
December 1998
Launch
October 15, 1997
Jupiter Swingby
December 30, 2000
Earth Swingby
August 18, 1999
First Venus Swingby
April 26, 1998
Launch to 1st Venus Swingby
1st Venus Swingby to 2nd Venus Swingby
2nd Venus Swingby to Earth Swingby, Past
Jupiter to Saturn

Un esperimento di relatività generale

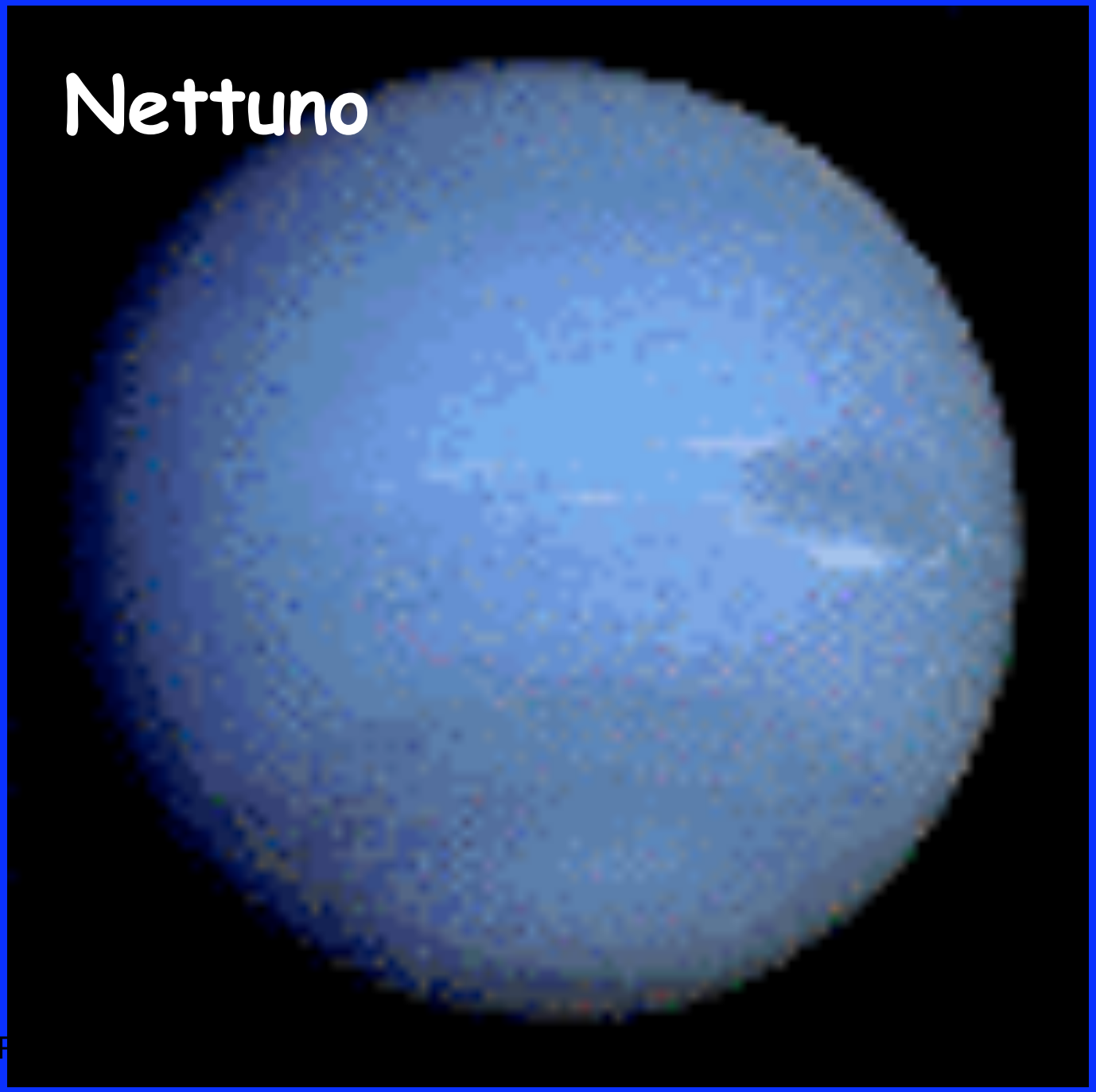
B.Bertotti, L.Iess, P.Tortora hanno effettuato un originale esperimento per la misura della deviazione del segnale causata dal campo gravitazionale del Sole.

Si è avuta conferma della teoria della relatività generale con un'accuratezza di 20 parti per milione, 50 volte meglio del precedente limite.



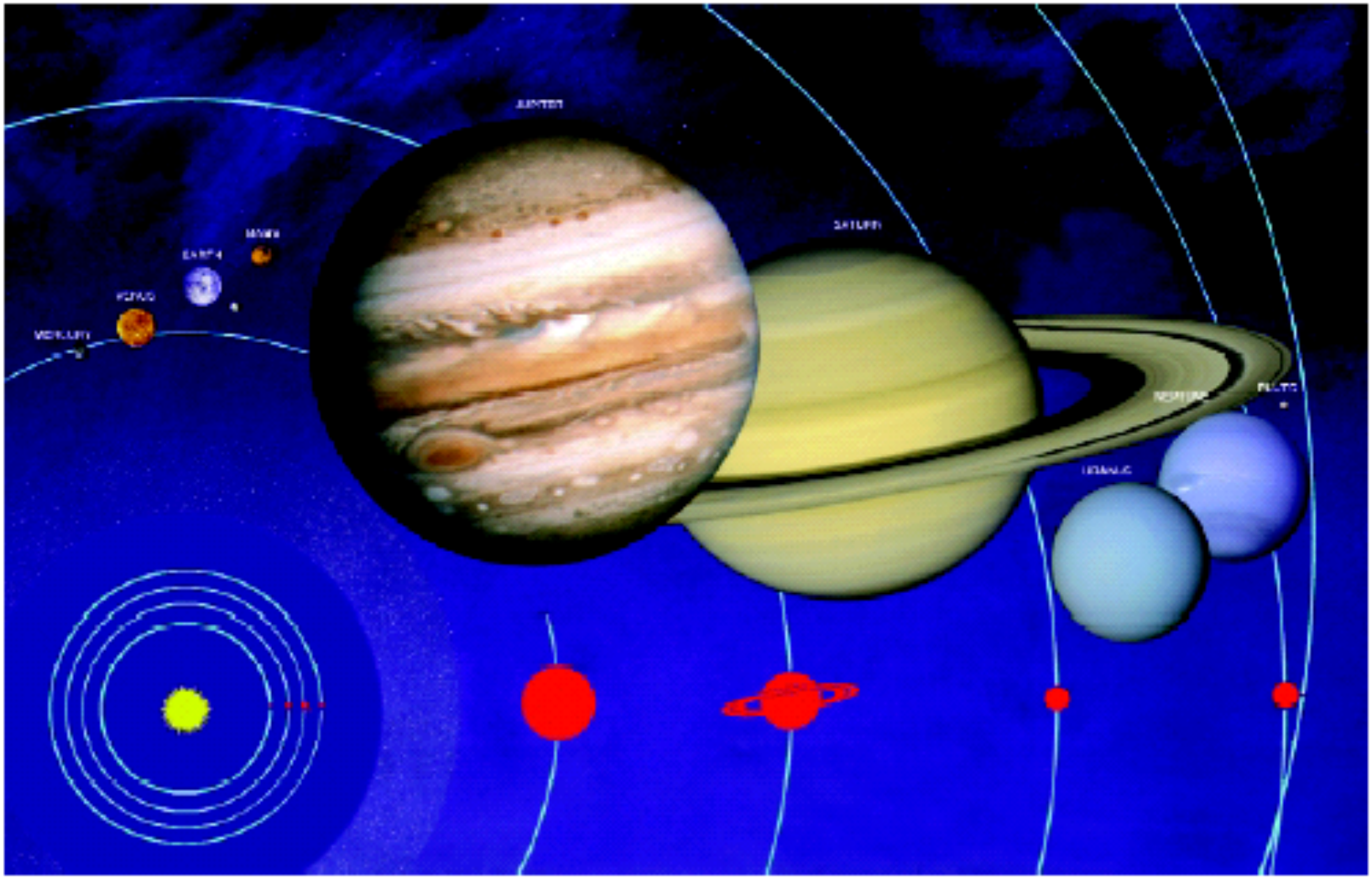
Urano

Nettuno



National Aeronautics and Space Administration

Our Solar System

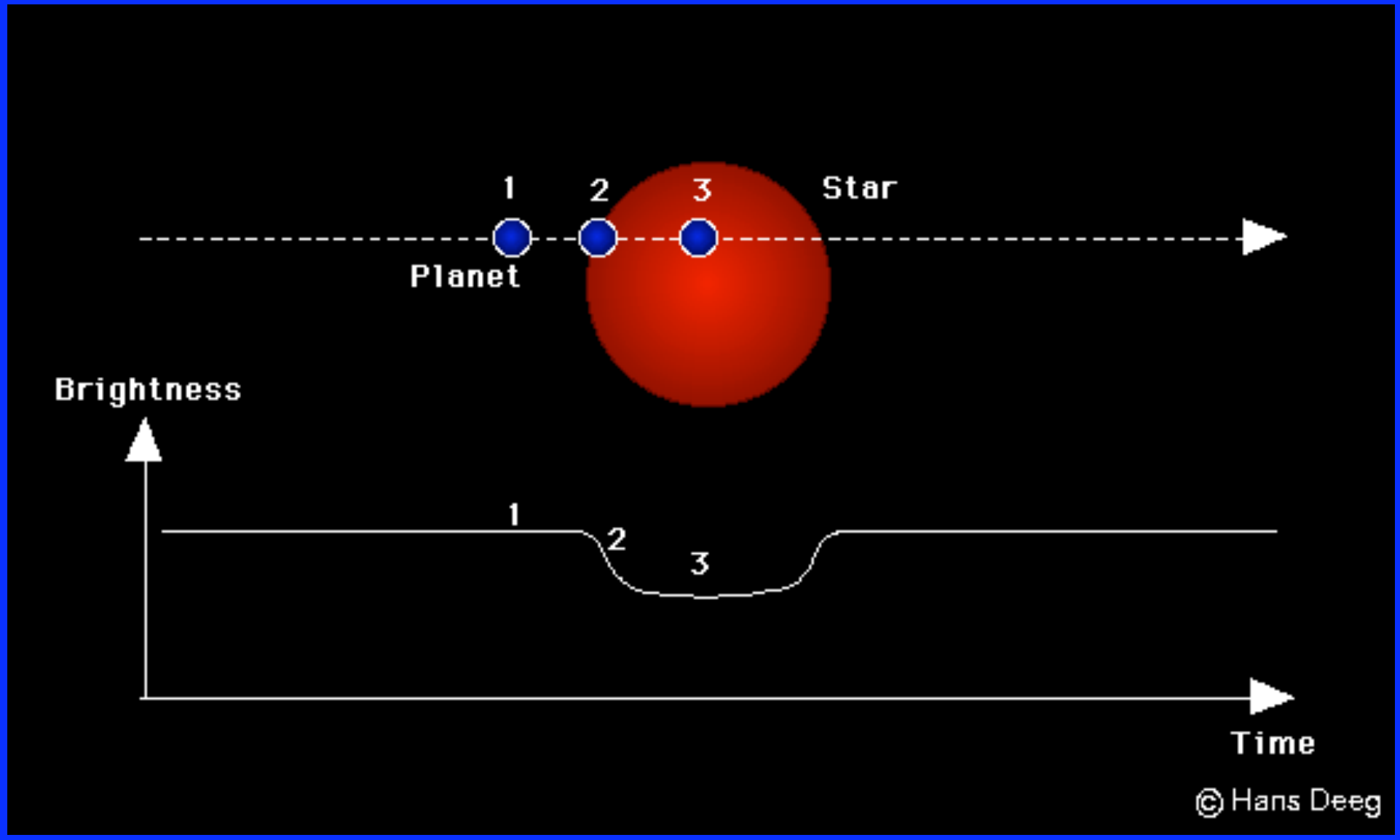


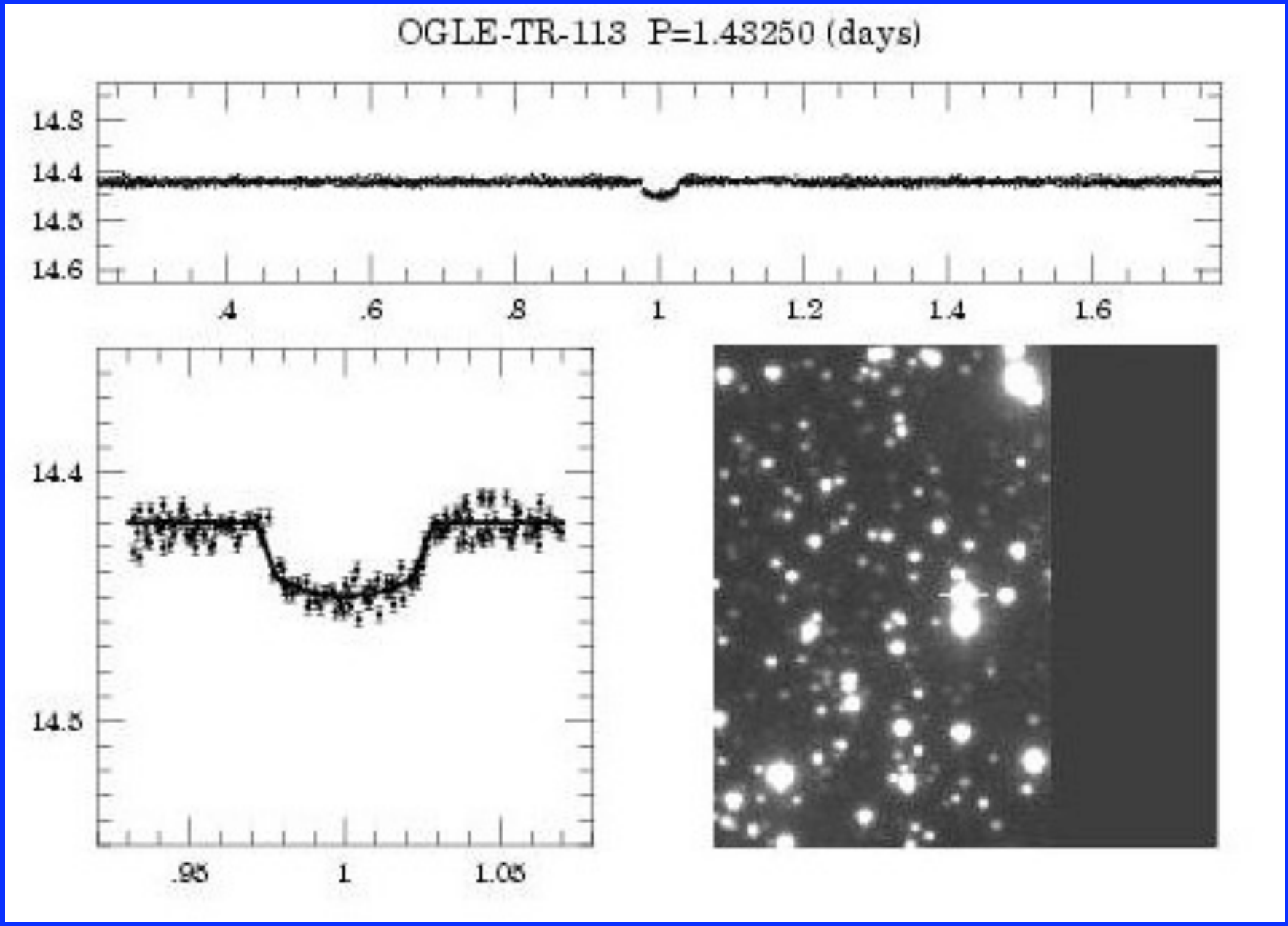
	Distance (AU)	Radius (Earth's)	Mass (Earth's)	Rotation (Earth's)	# Moons	Orbital Inclination	Orbital Eccentricity	Density (g/cm^3)
Sun	0	109	332,800	25-36*	9	---	---	1.410
Mercury	0.39	0.38	0.05	58.8	0	7	0.2056	5.43
Venus	0.72	0.95	0.89	244	0	3.394	0.0068	5.25
Earth	1.0	1.00	1.00	1.00	1	0.000	0.0167	5.52
Mars	1.5	0.53	0.11	1.029	2	1.850	0.0934	3.95
Jupiter	5.2	11	318	0.411	16	1.308	0.0483	1.33
Saturn	9.5	9	95	0.428	18	2.488	0.0560	0.69
Uranus	19.2	4	15	0.748	15	0.774	0.0461	1.29
Neptune	30.1	4	17	0.802	8	1.774	0.0097	1.64
Pluto	39.5	0.18	0.002	0.267	1	17.15	0.2482	2.03

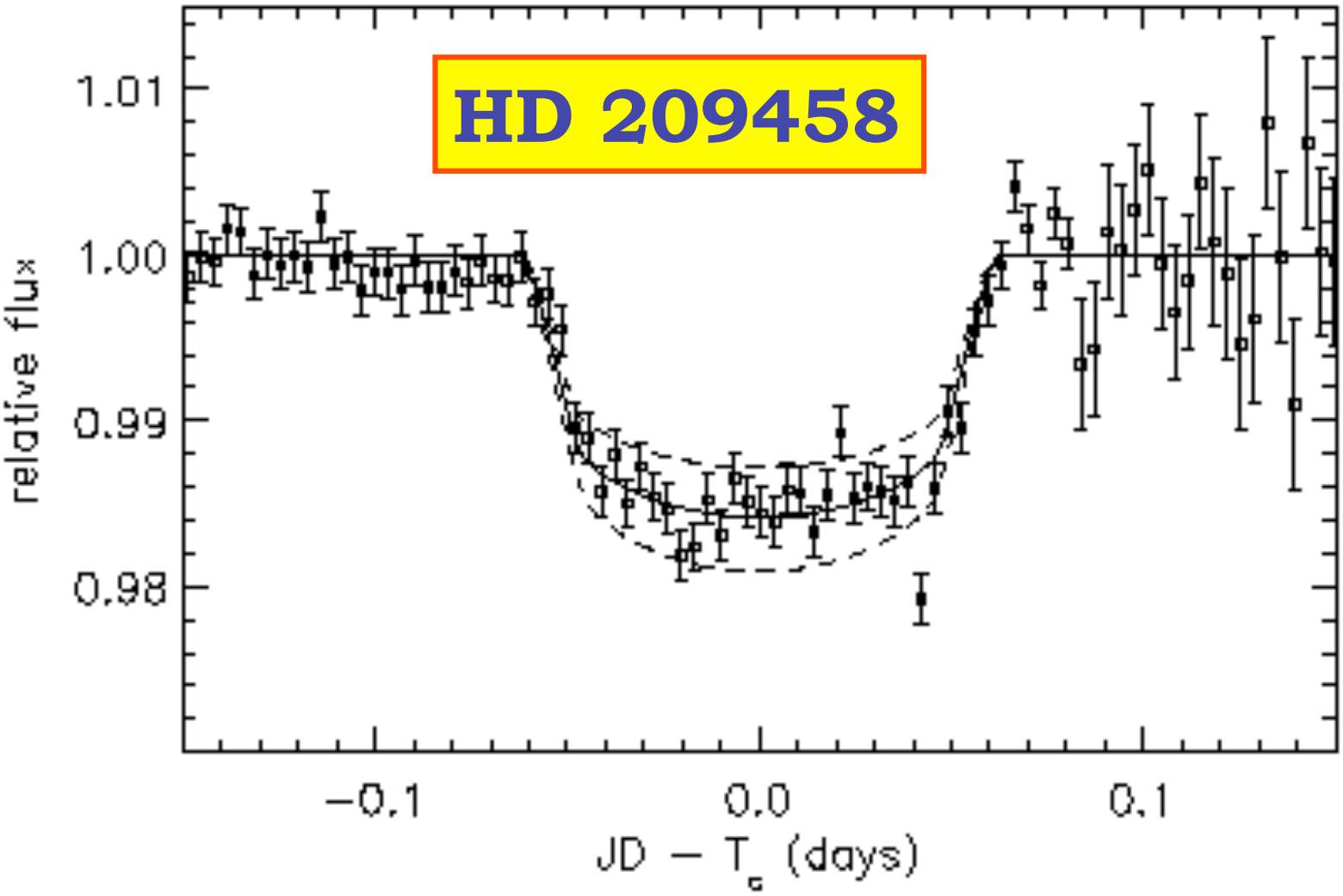
transito di un pianeta sul disco della sua stella

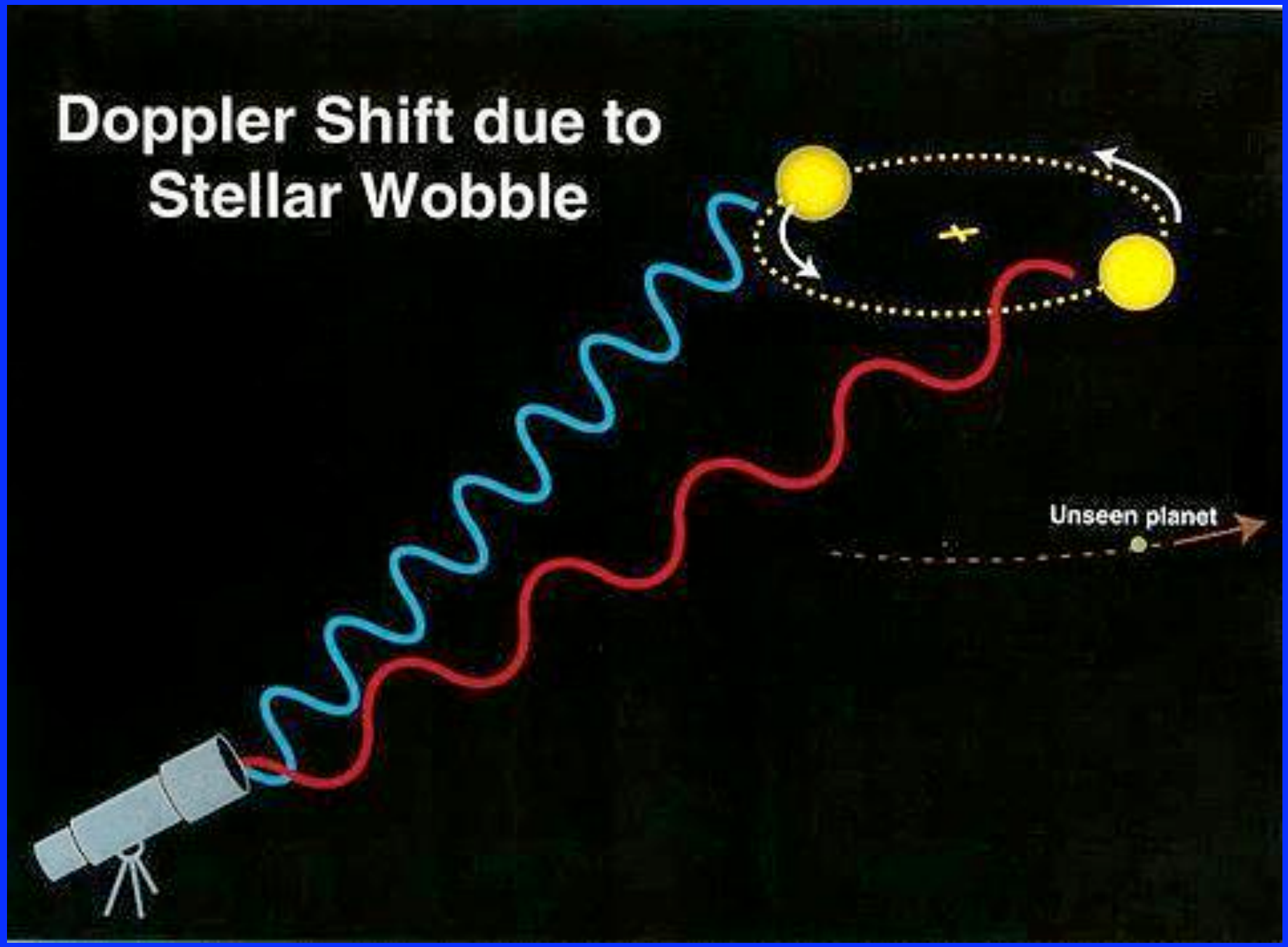

eclisse
totale
di Sole

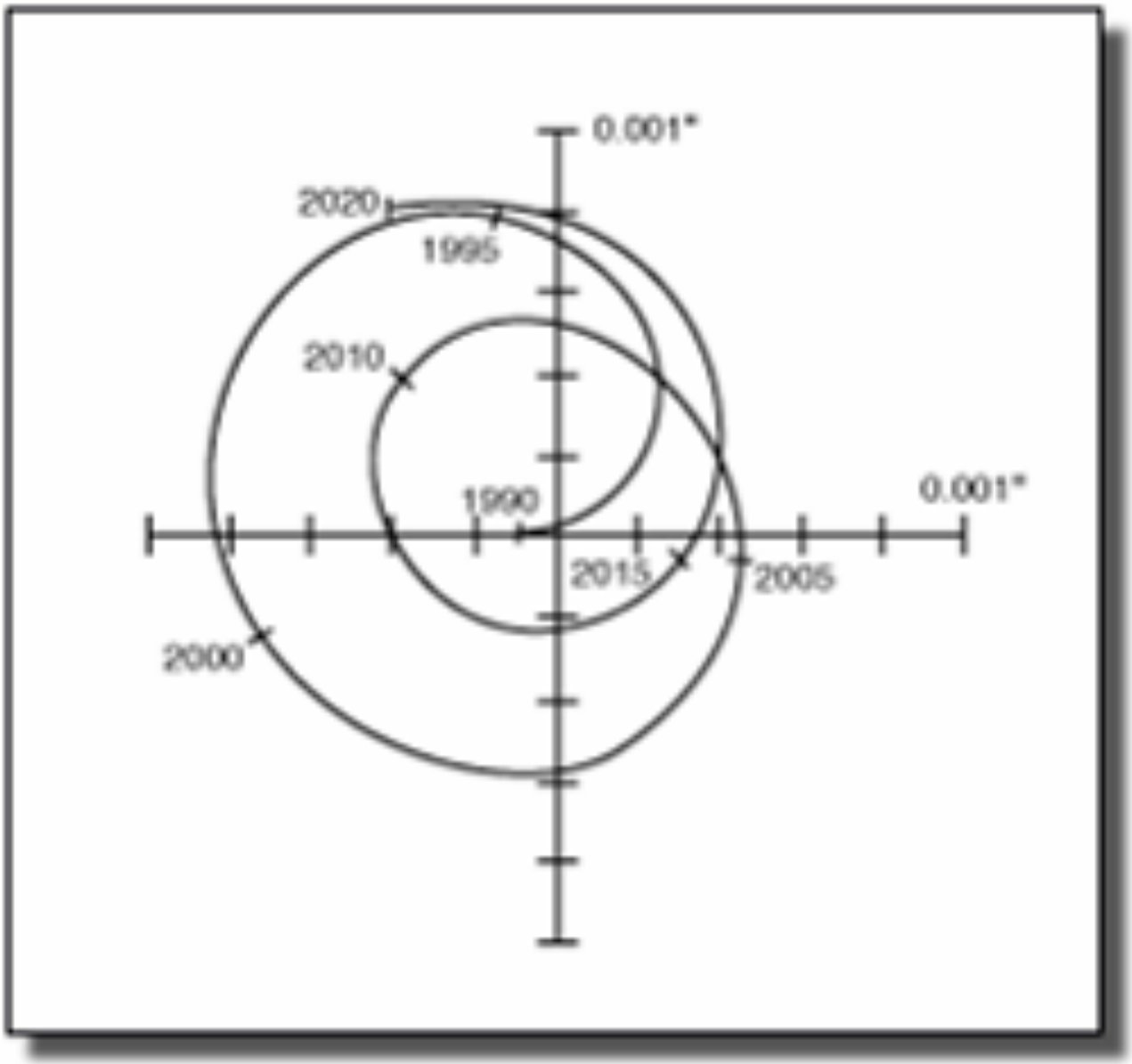
Transito di Venere sul Sole


1
2
3
Star
Planet
Brightness
1
2
3
Time
© Hans Deeg


OGLE-TR-113 P=1.43250 (days)
14.3
14.4
14.5
14.6
.4
.6
.8
1
1.2
1.4
1.6
14.4
14.5
.95
1
1.05

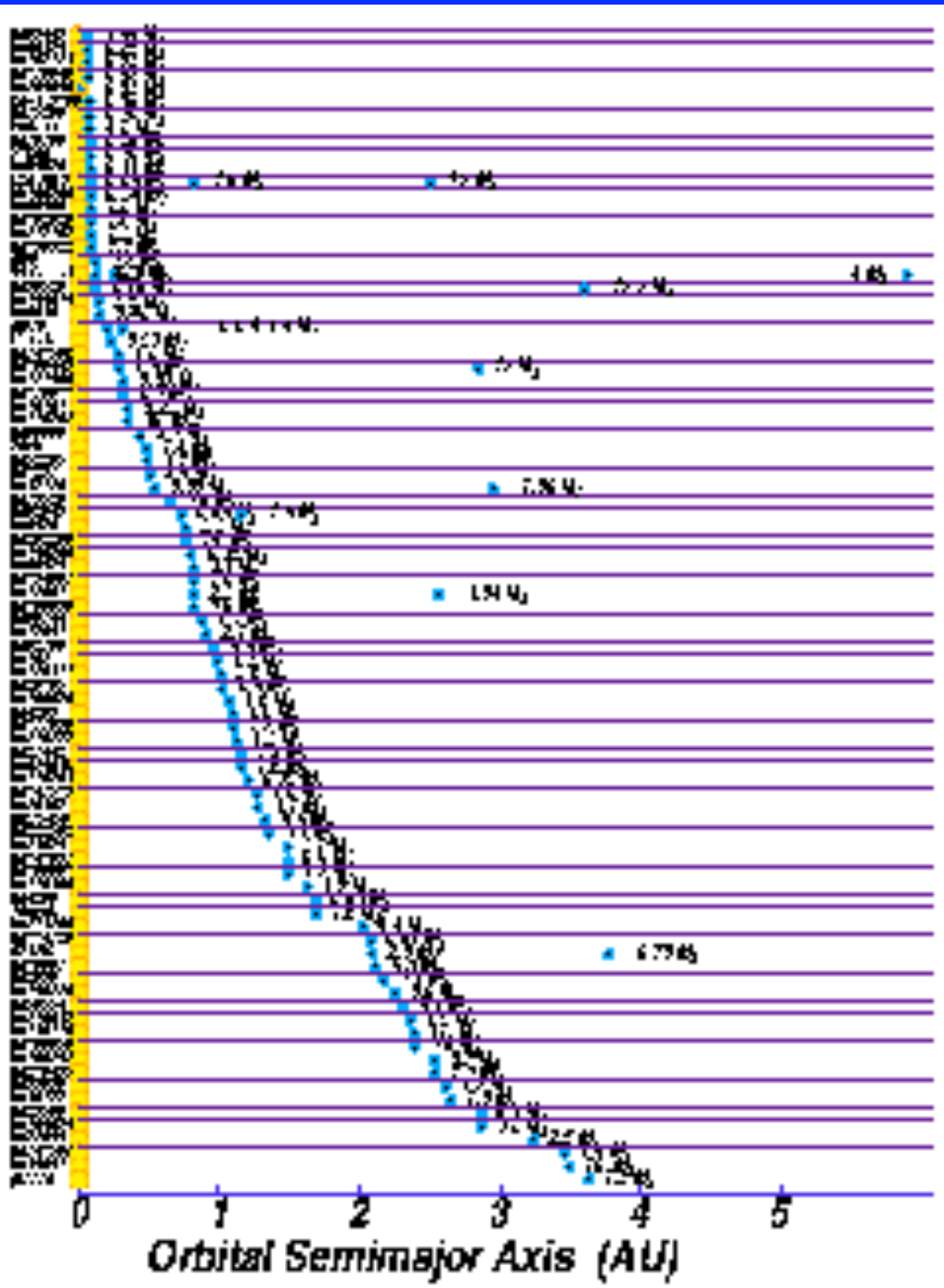

HD 209458
1.01
1.00
0.99
0.98
relative flux
−0.1
0.0
0.1
JD − T_c (days)

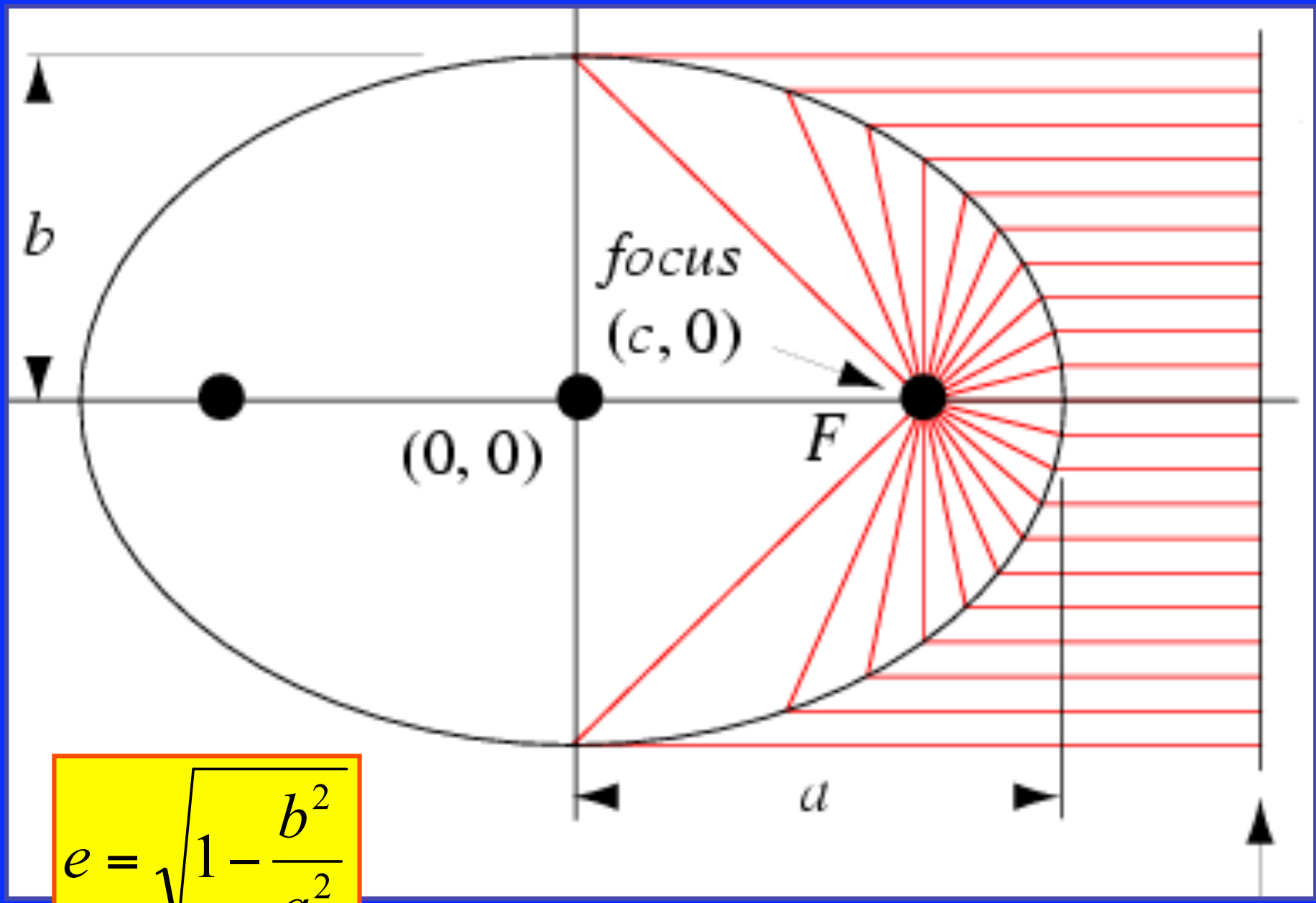

Doppler Shift due to
Stellar Wobble
Unseen planet



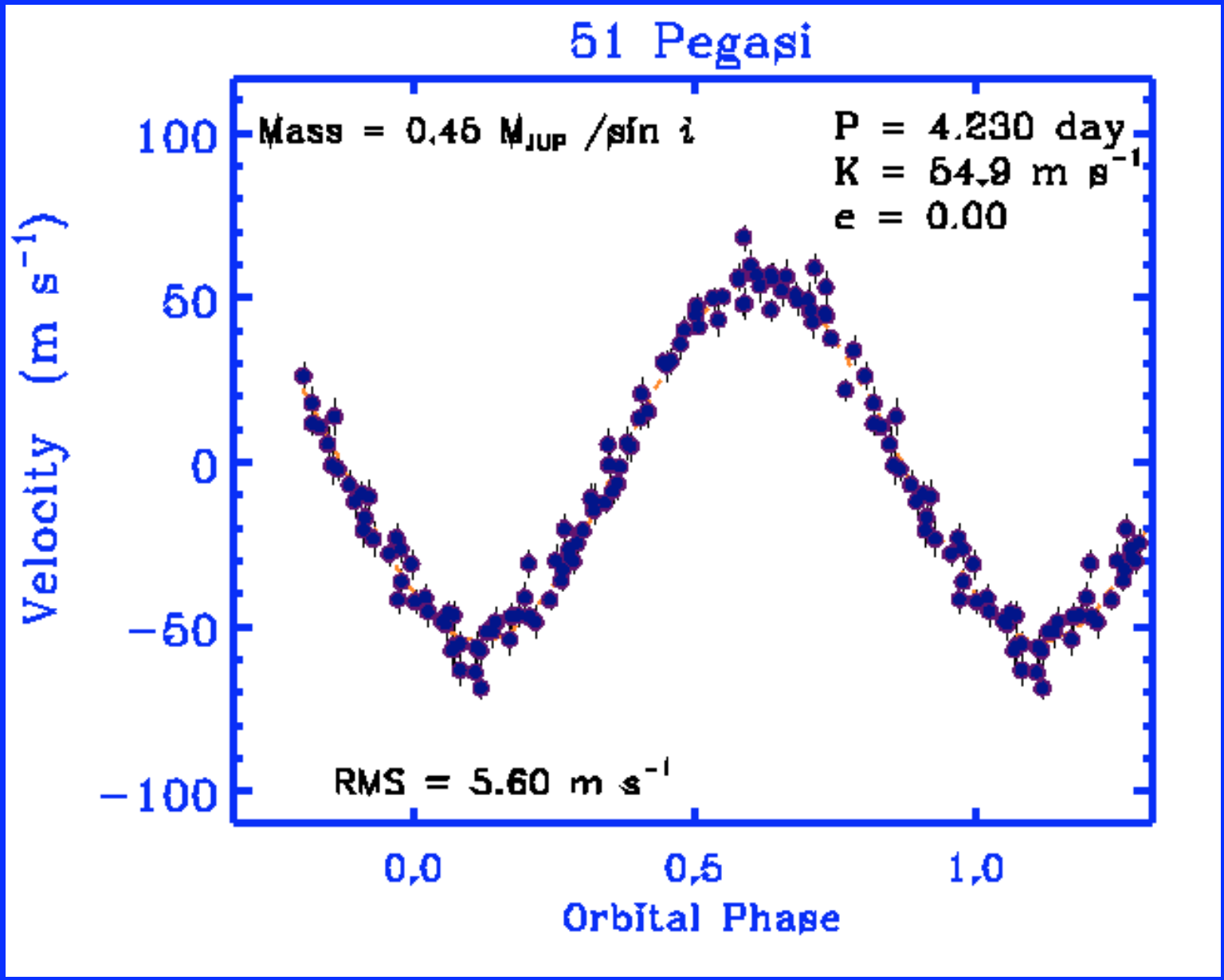
Astrometric displacement of the Sun due to Jupiter as seen from 10 parsecs.

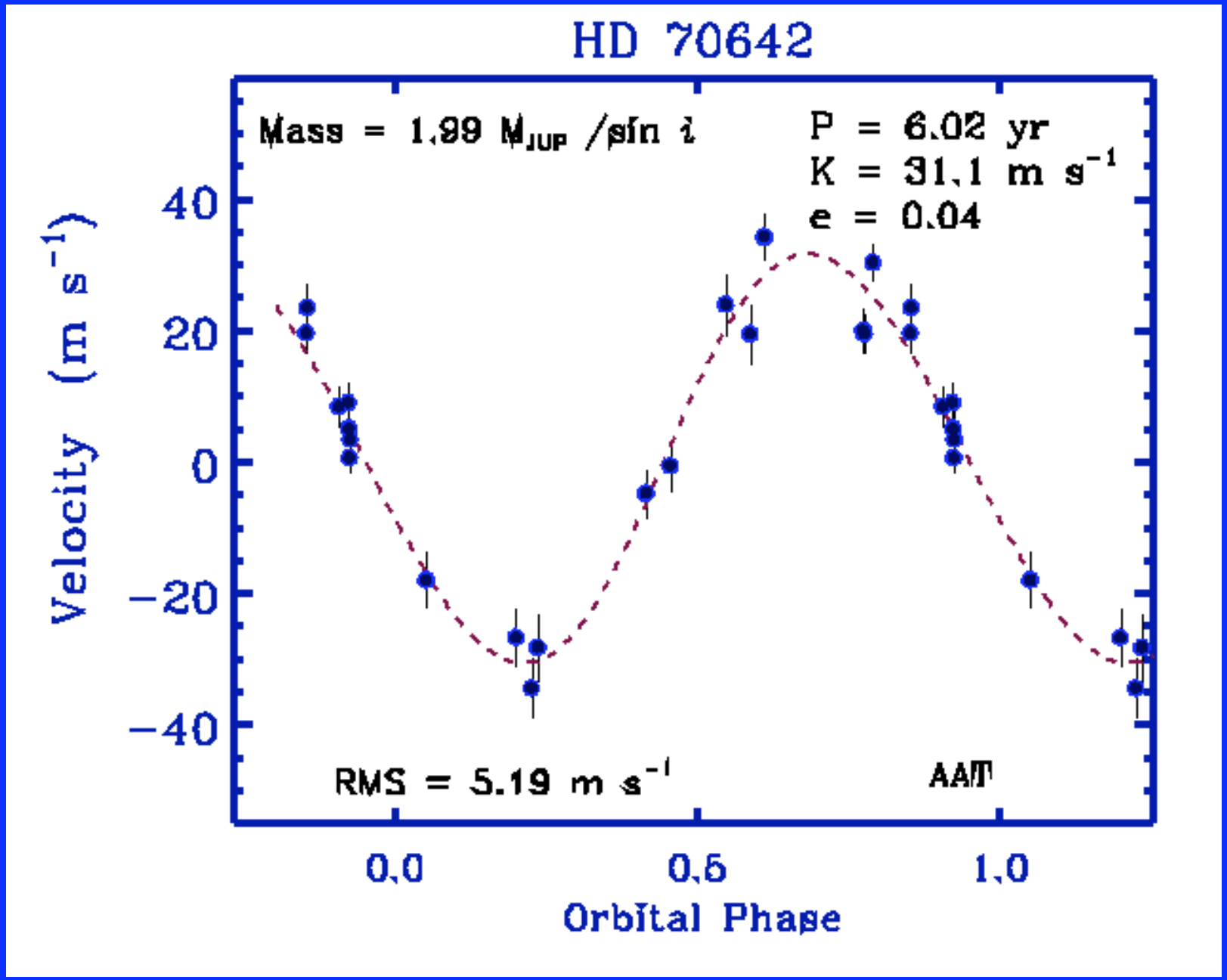
Il primo pianeta extrasolare venne scoperto nel 1995 da Mayor e Queloz, all'Osservatorio di Ginevra, intorno alla stella 51 Pegasi.
Ora sono oltre 200 i sistemi planetari extrasolari scoperti (in media se ne scopre 1 al mese).

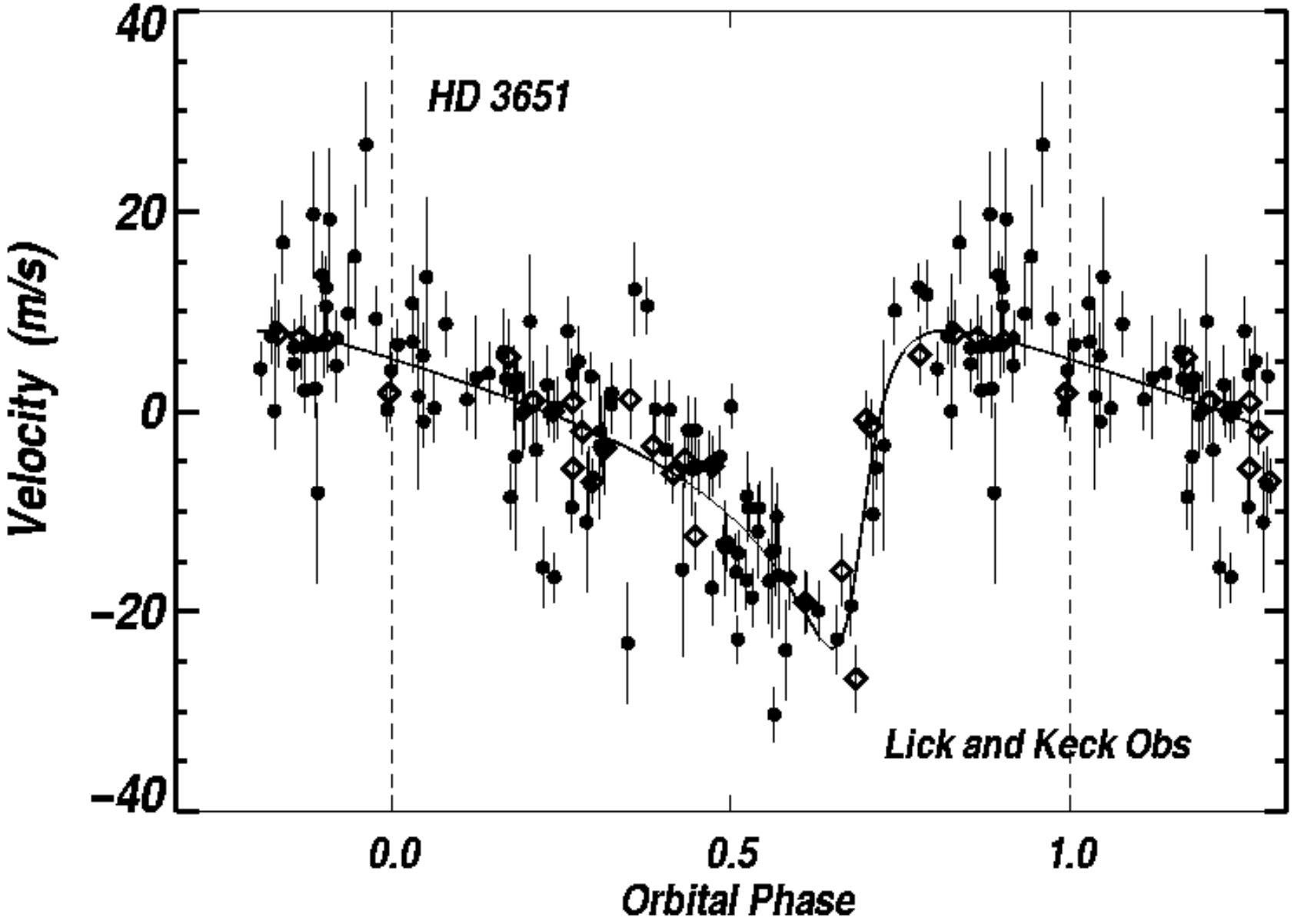


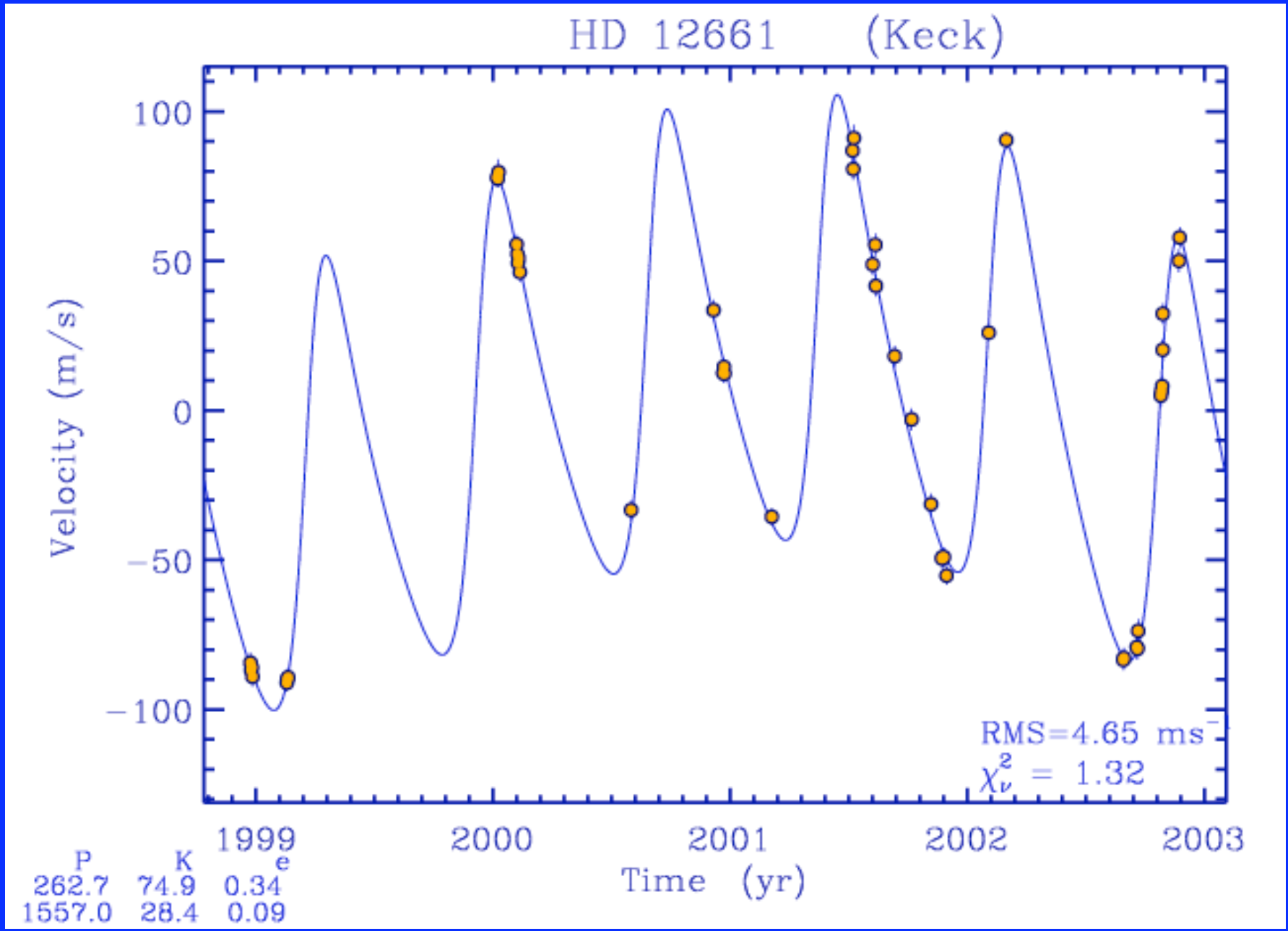


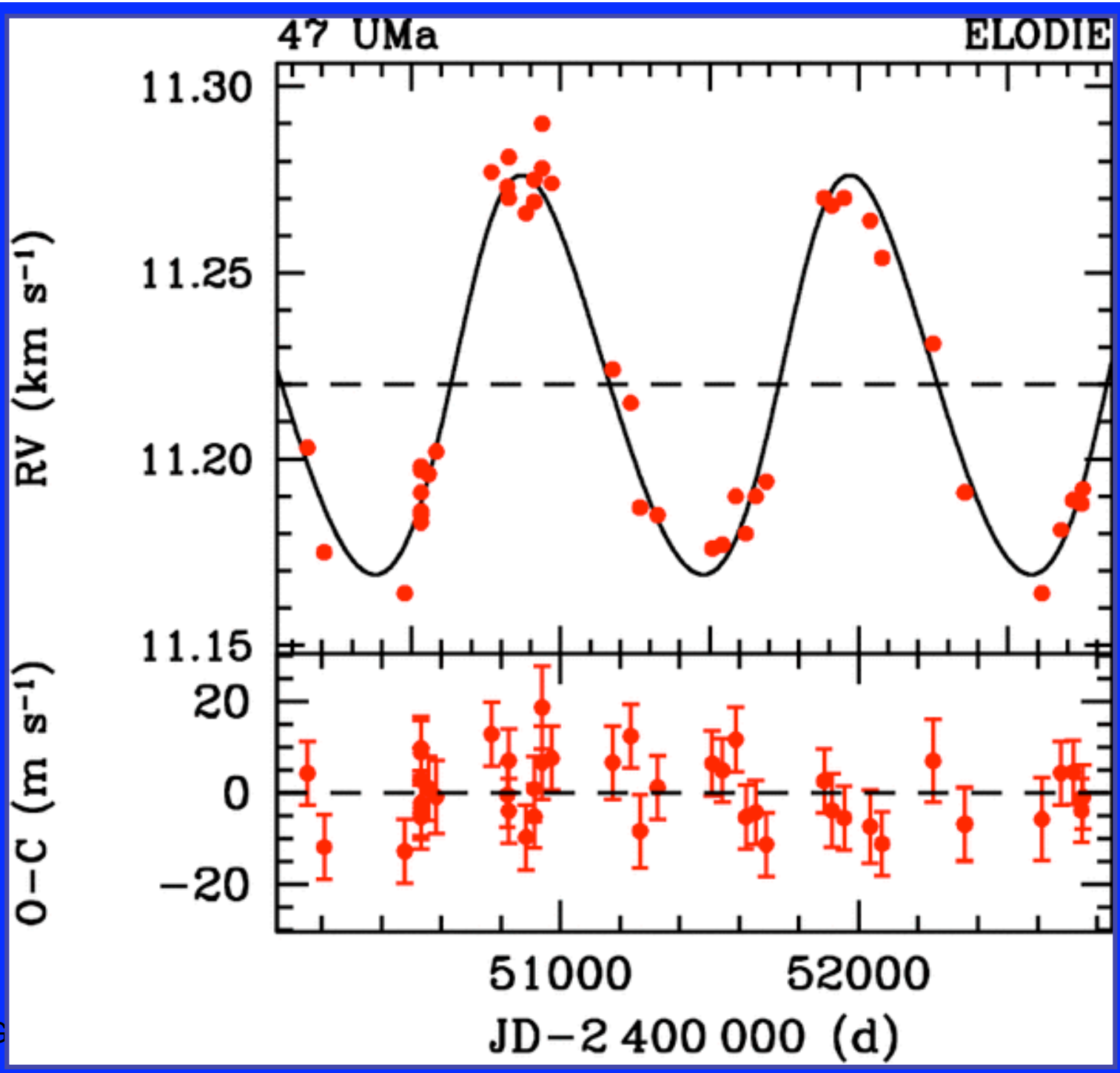
$$e = \sqrt{1 - \frac{b^2}{a^2}}$$

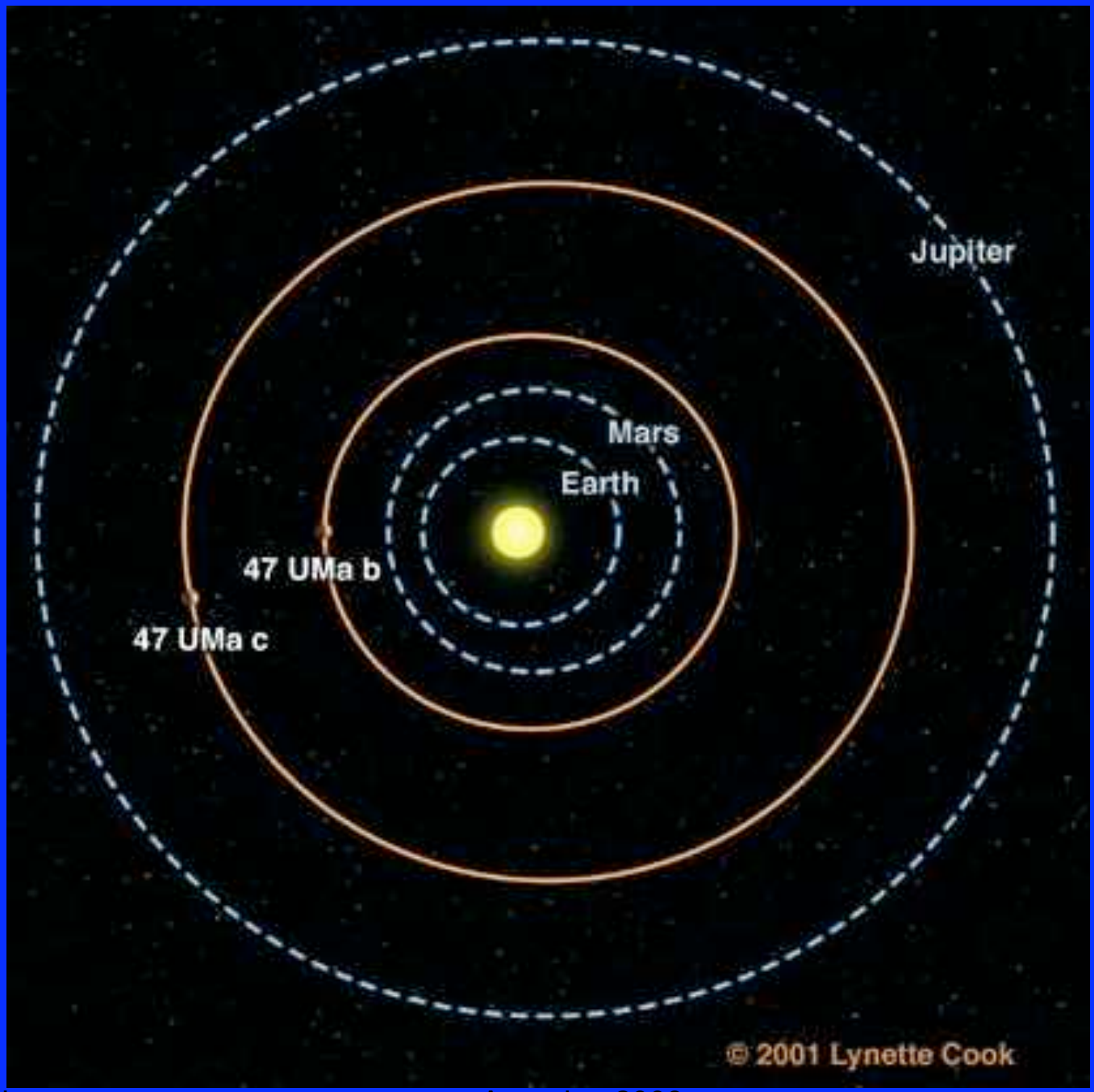

51 Pegasi
Mass = 0.46 M_{JUP} /sin i
P = 4.230 day
K = 54.9 m s^{-1}
e = 0.00
RMS = 5.60 m s^{-1}
Velocity (m s^{-1})
100
50
0
−50
−100
0.0
0.5
1.0
Orbital Phase


HD 70642
Mass = 1.99 M_{JUP} /sin i
P = 6.02 yr
K = 31.1 m s^{-1}
e = 0.04
Velocity (m s^{-1})
40
20
0
−20
−40
RMS = 5.19 m s^{-1}
AAT
0.0
0.5
1.0
Orbital Phase

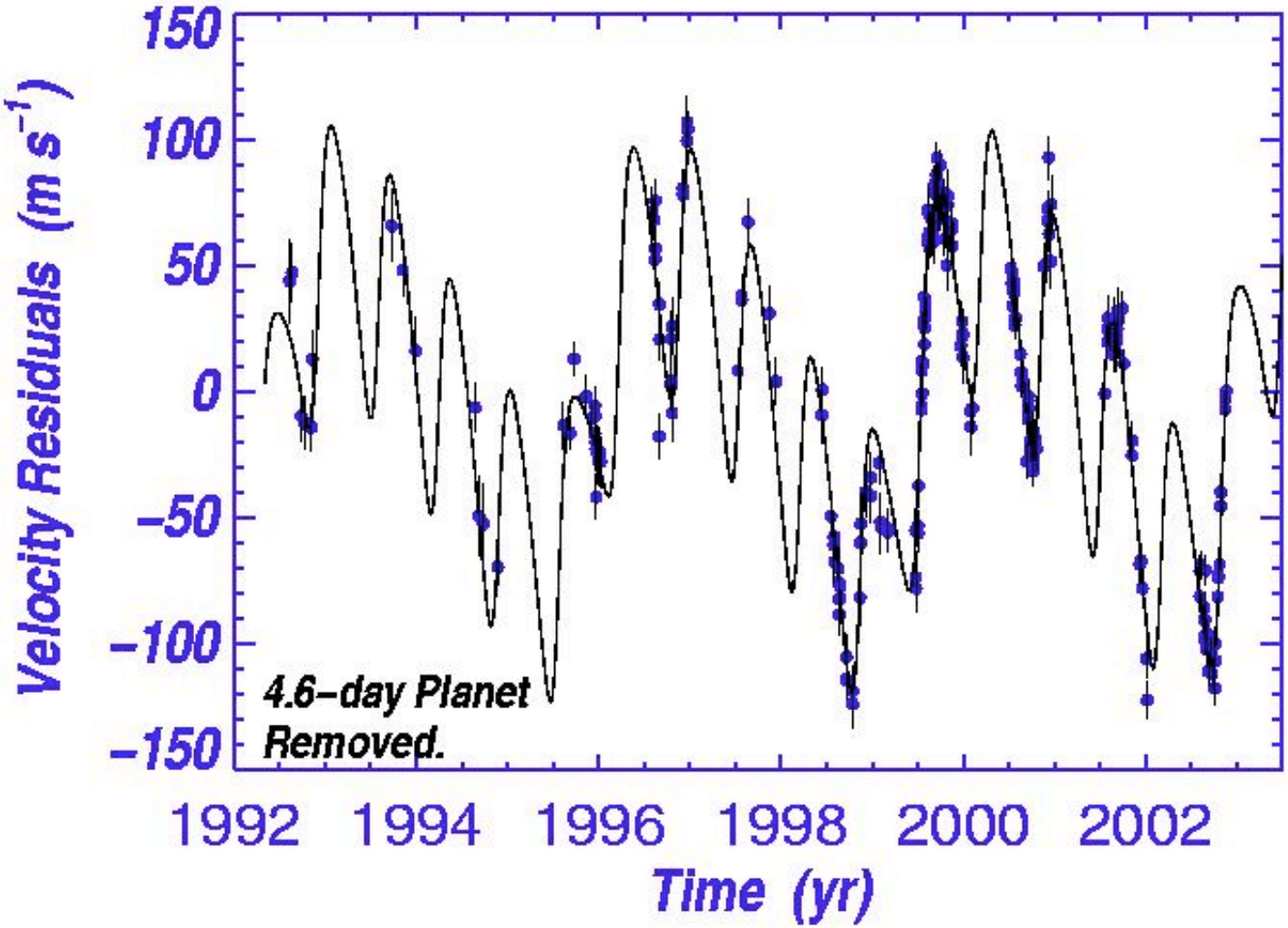

HD 3651
Lick and Keck Obs
Velocity (m/s)
Orbital Phase
40
20
0
−20
−40
0.0
0.5
1.0

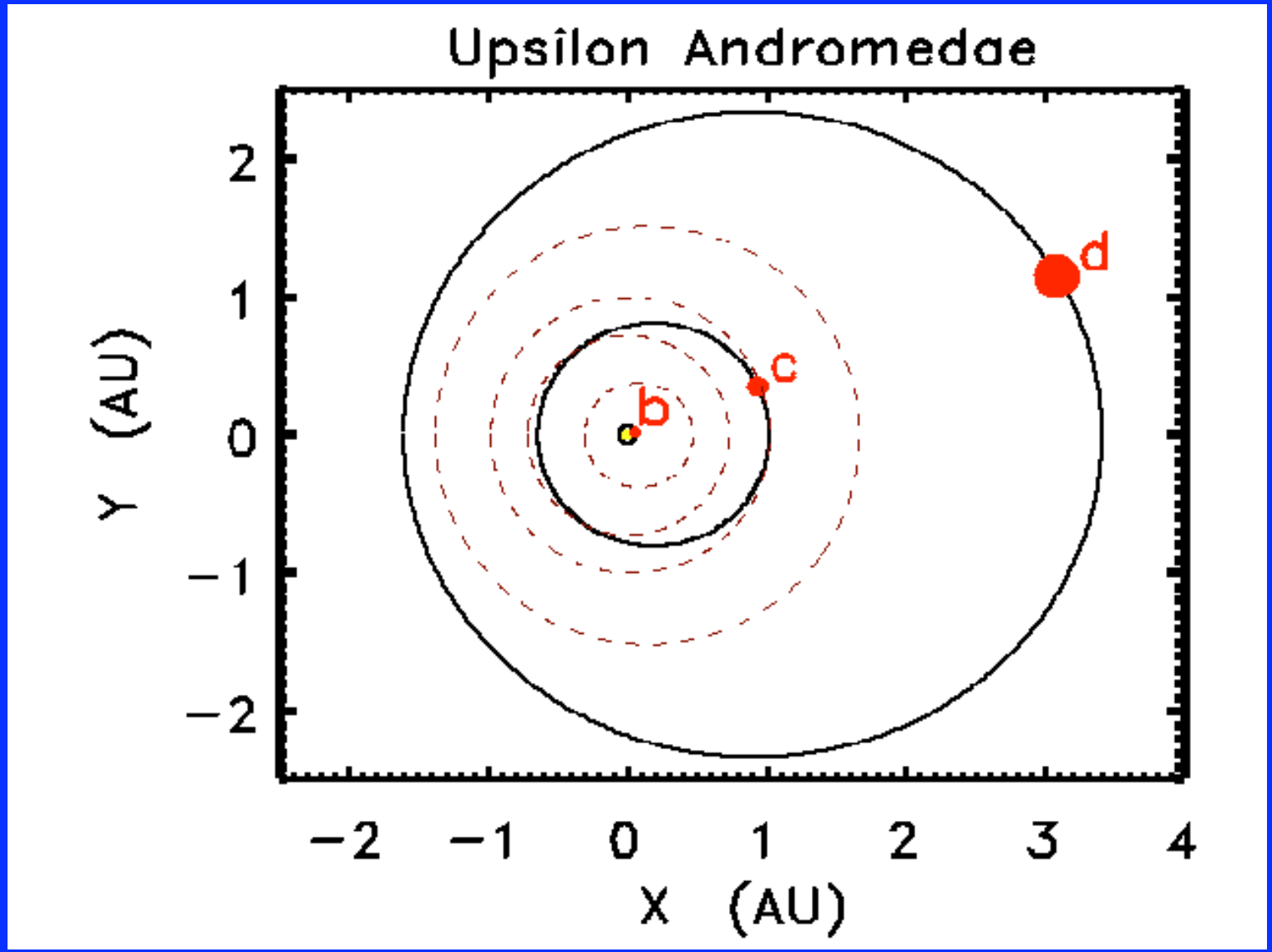

HD 12661 (Keck)
100
50
0
−50
−100
Velocity (m/s)
1999
2000
2001
2002
2003
Time (yr)
RMS=4.65 ms⁻¹
χ^2_ν = 1.32
P K e
262.7 74.9 0.34
1557.0 28.4 0.09


47 UMa
ELODIE
11.30
11.25
11.20
11.15
RV (km s⁻¹)
20
0
−20
O−C (m s⁻¹)
51000
52000
JD−2 400 000 (d)

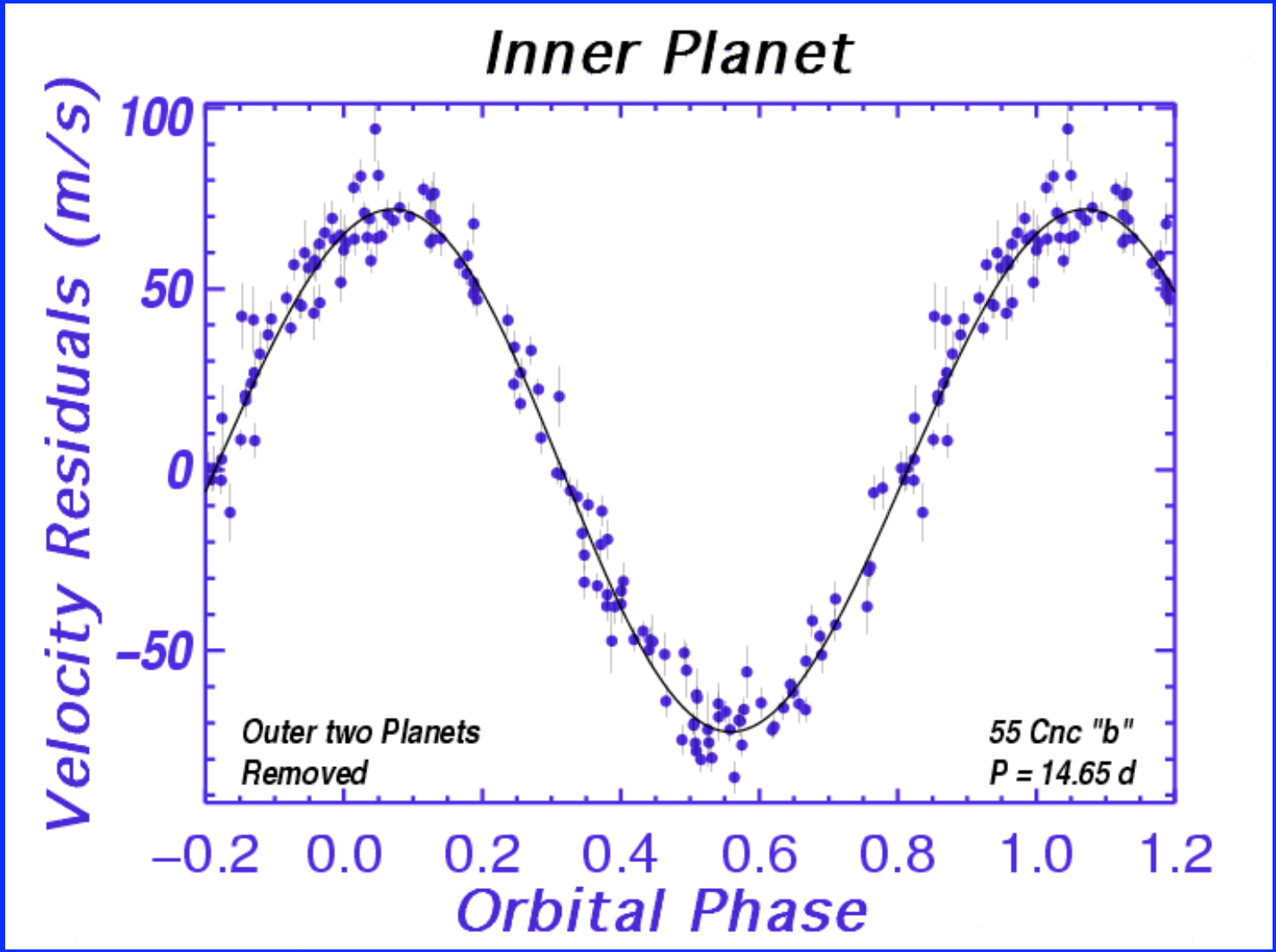

Jupiter
Mars
Earth
47 UMa b
47 UMa c
© 2001 Lynette Cook

Upsilon Andromedae

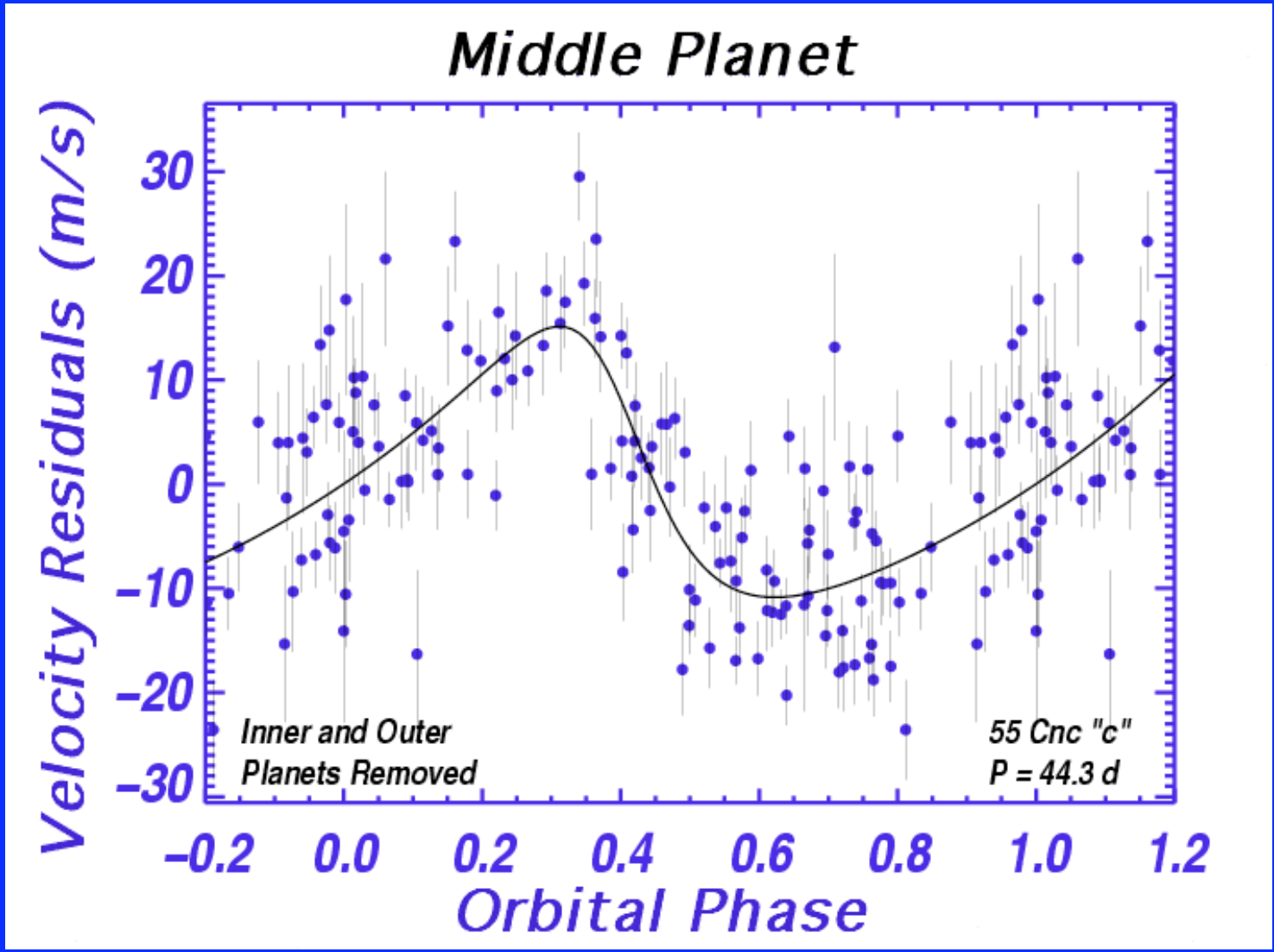


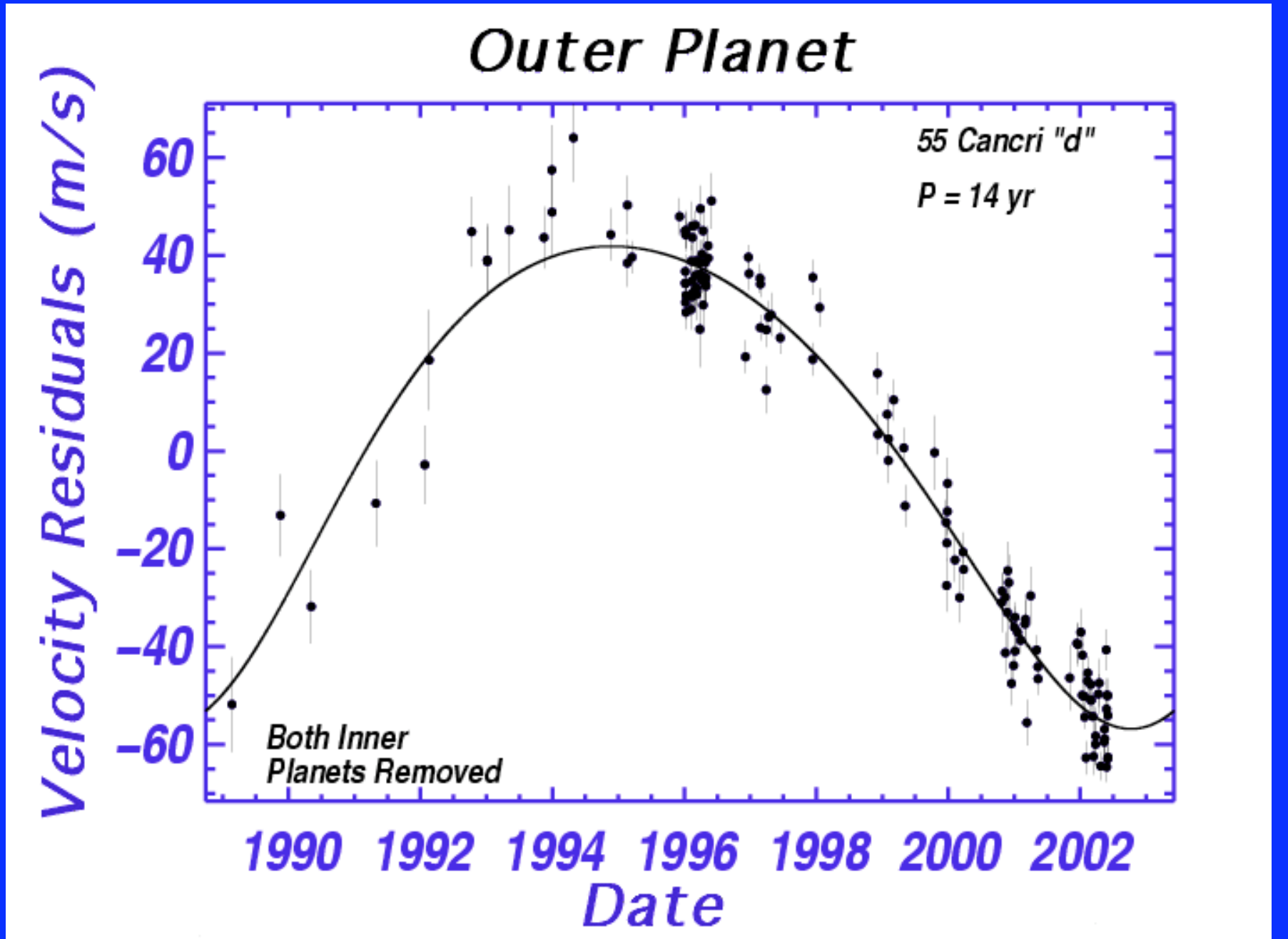

Upsilon Andromedae
Y (AU)
X (AU)
2
1
0
−1
−2
−2
−1
0
1
2
3
4
b
c
d

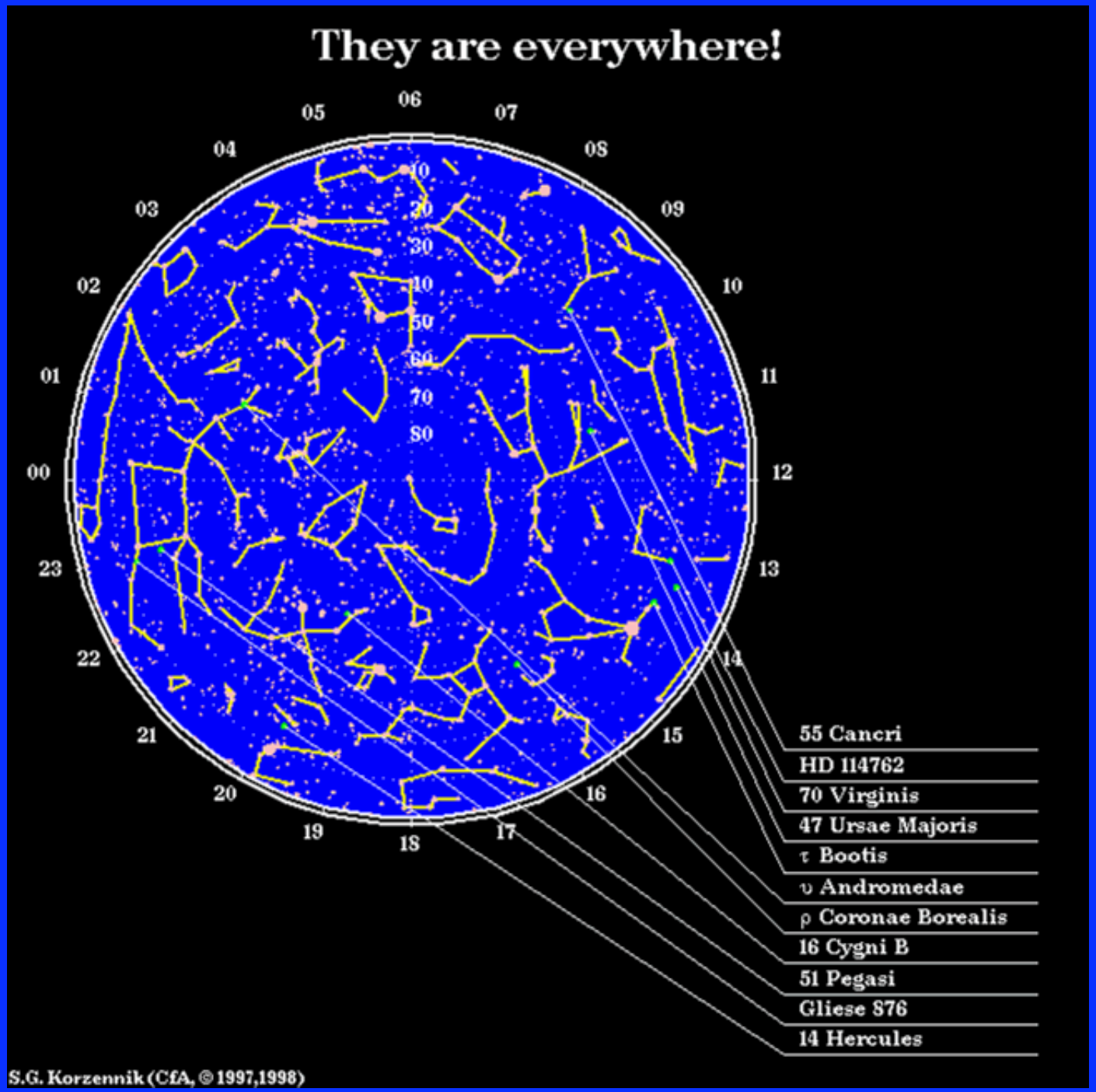
55 Cnc

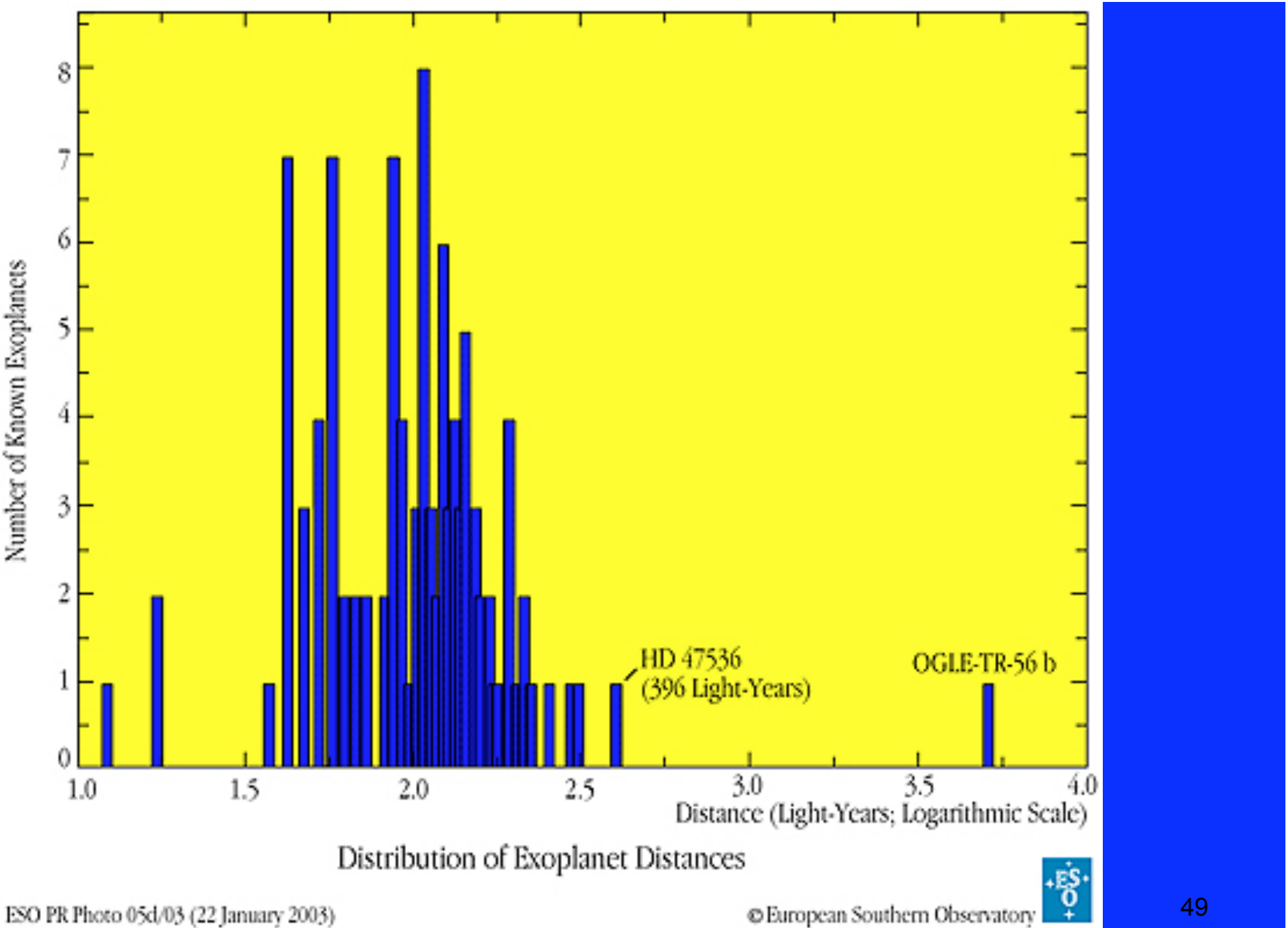

Inner Planet
Velocity Residuals (m/s)
100
50
0
-50
Outer two Planets
Removed
55 Cnc "b"
P = 14.65 d
–0.2
0.0
0.2
0.4
0.6
0.8
1.0
1.2
Orbital Phase

55 Cnc


Middle Planet
Velocity Residuals (m/s)
30
20
10
0
-10
-20
-30
-0.2
0.0
0.2
0.4
0.6
0.8
1.0
1.2
Orbital Phase
Inner and Outer
Planets Removed
55 Cnc "c"
P = 44.3 d

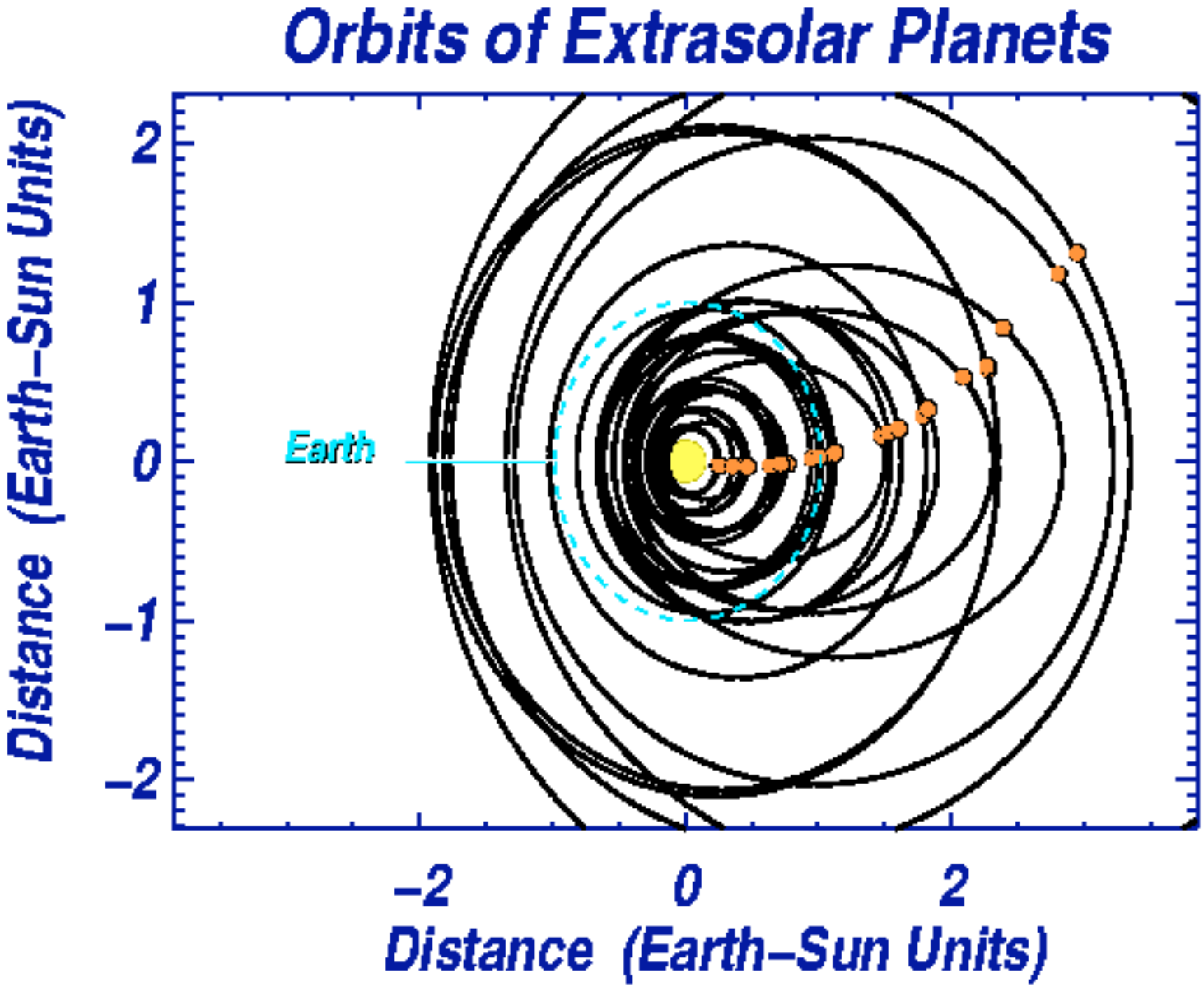

Outer Planet
Velocity Residuals (m/s)
60
40
20
0
-20
-40
-60
55 Cancri "d"
P = 14 yr
Both Inner
Planets Removed
1990
1992
1994
1996
1998
2000
2002
Date

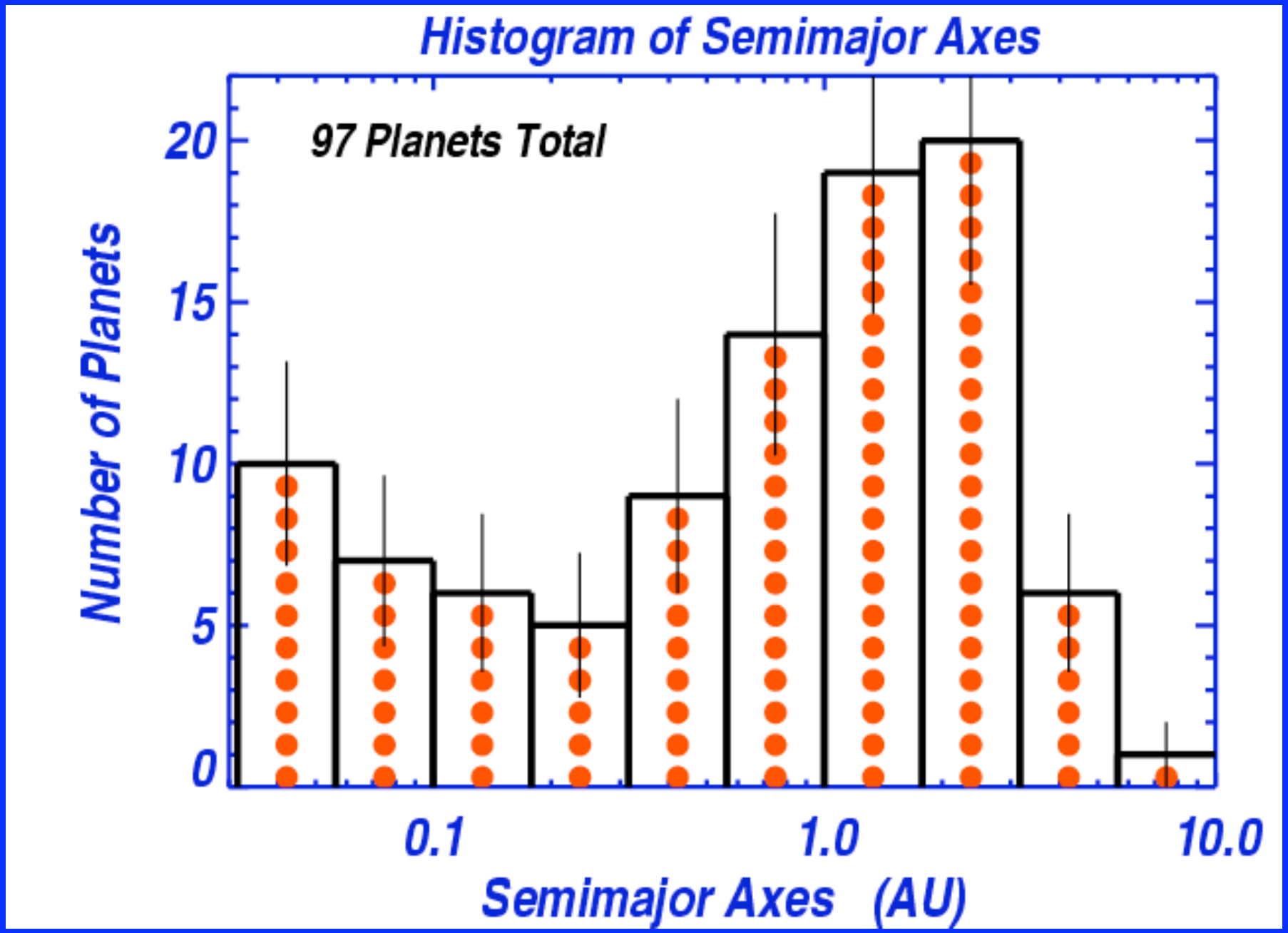

They are everywhere!
00
01
02
03
04
05
06
07
08
09
10
11
12
13
14
15
16
17
18
19
20
21
22
23
10
20
30
40
50
60
70
80
55 Cancri
HD 114762
70 Virginis
47 Ursae Majoris
τ Bootis
υ Andromedae
ρ Coronae Borealis
16 Cygni B
51 Pegasi
Gliese 876
14 Hercules
S.G. Korzennik (CfA, © 1997,1998)

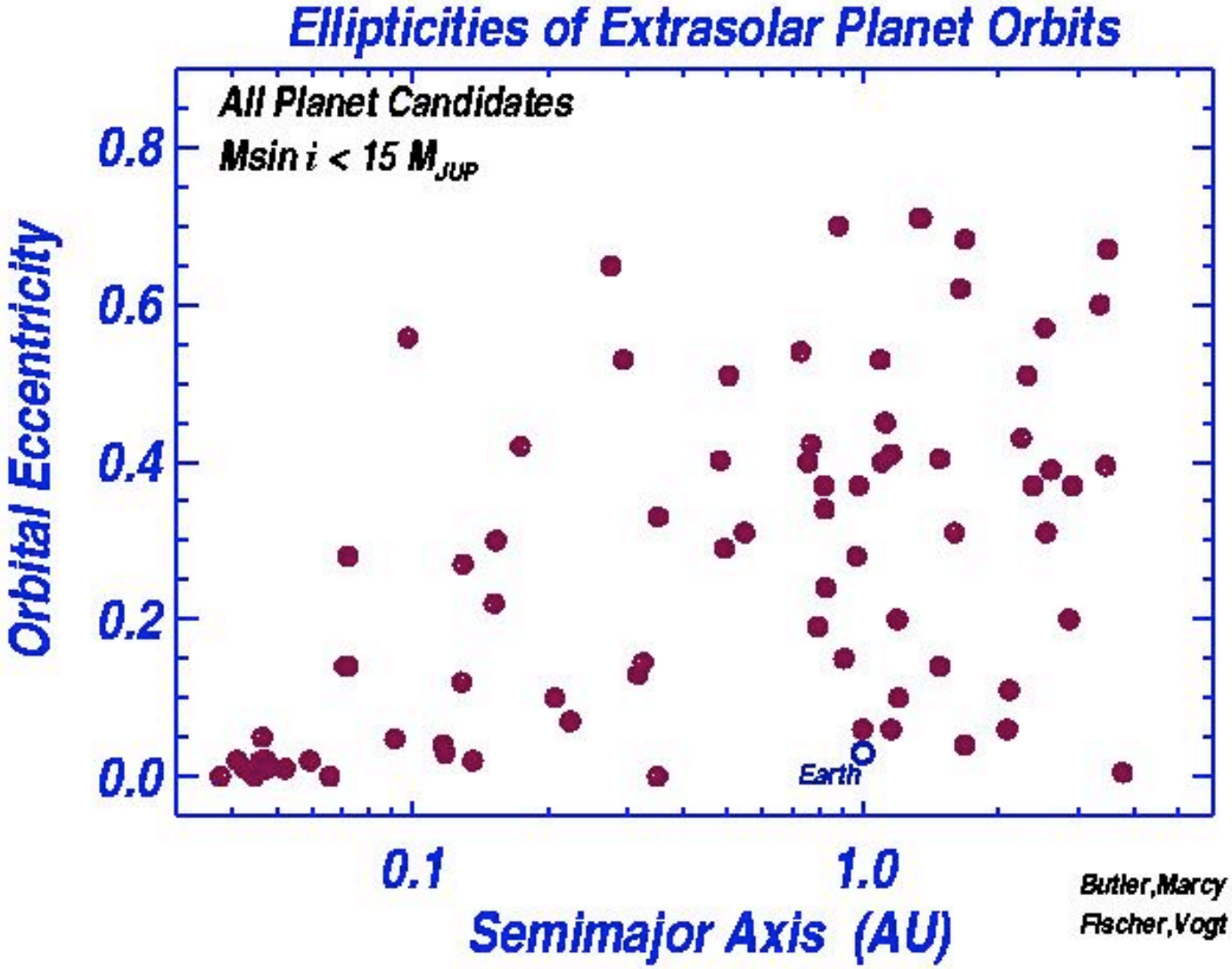


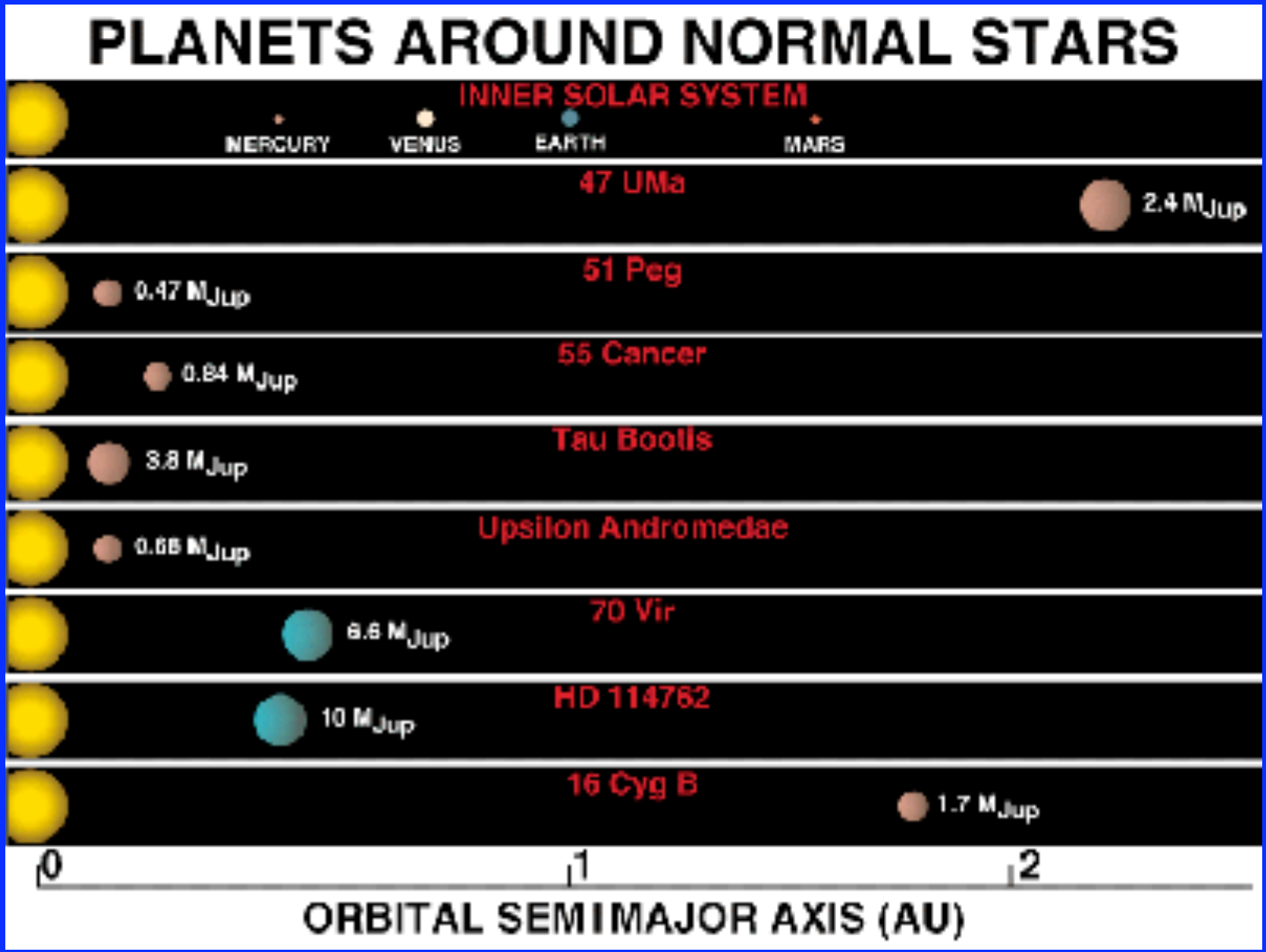
Distribution of Exoplanet Distances

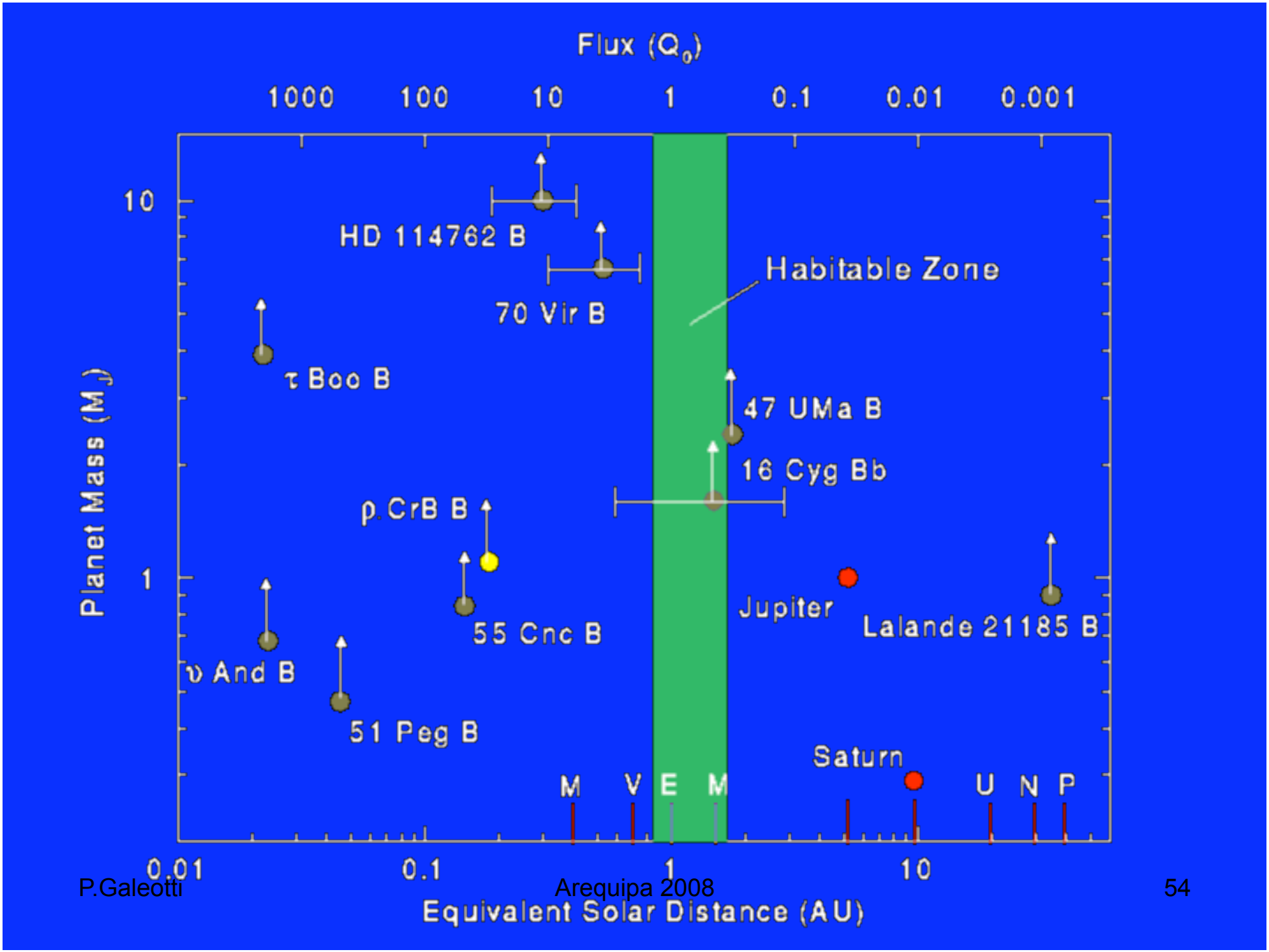
ESO PR Photo 05d/03 (22 January 2003)


Orbits of Extrasolar Planets
Distance (Earth–Sun Units)
2
1
0
–1
–2
Earth
–2
0
2
Distance (Earth–Sun Units)

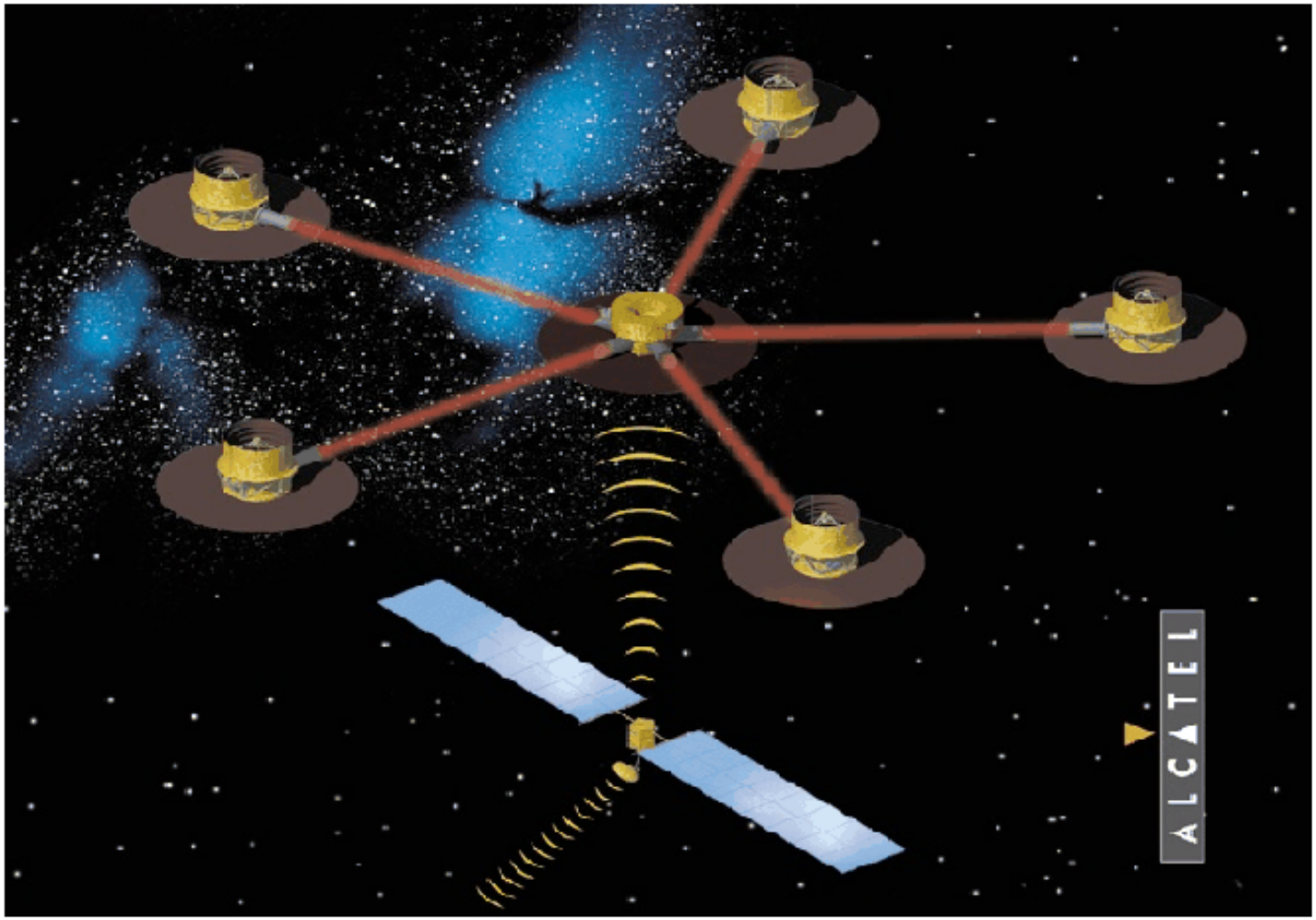

Histogram of Semimajor Axes
97 Planets Total
Number of Planets
20
15
10
5
0
0.1
1.0
10.0
Semimajor Axes (AU)


Ellipticities of Extrasolar Planet Orbits
All Planet Candidates
Msin i < 15 M_JUP
Orbital Eccentricity
0.0
0.2
0.4
0.6
0.8
Earth
0.1
1.0
Semimajor Axis (AU)
Butler,Marcy
Fischer,Vogt

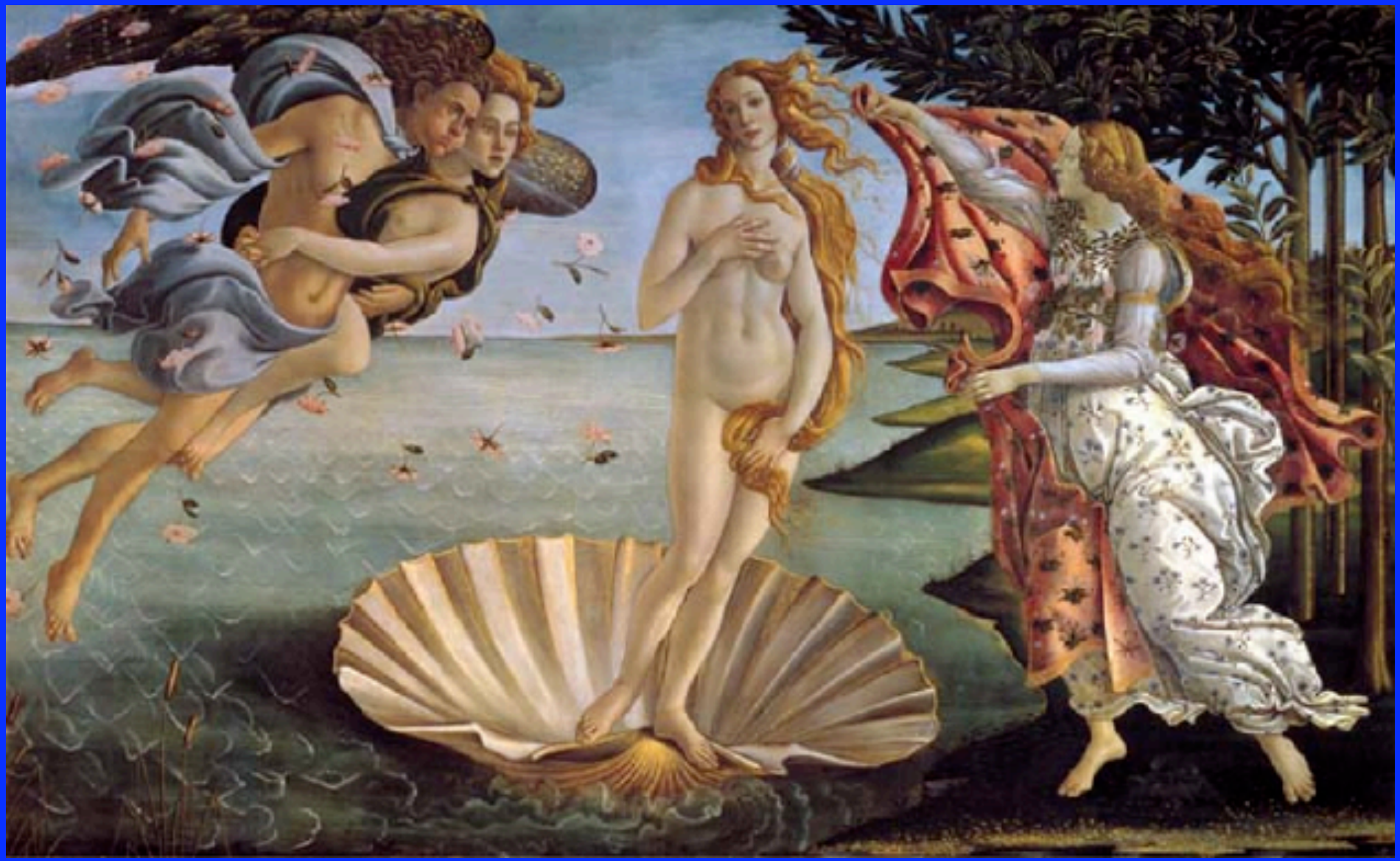

PLANETS AROUND NORMAL STARS
INNER SOLAR SYSTEM
MERCURY
VENUS
EARTH
MARS
47 UMa
2.4 MJup
51 Peg
0.47 MJup
55 Cancer
0.84 MJup
Tau Bootis
3.8 MJup
Upsilon Andromedae
0.68 MJup
70 Vir
6.6 MJup
HD 114762
10 MJup
16 Cyg B
1.7 MJup
0
1
2
ORBITAL SEMIMAJOR AXIS (AU)


Flux (Q_o)
1000
100
10
1
0.1
0.01
0.001
10
1
Planet Mass (M_J)
HD 114762 B
70 Vir B
Habitable Zone
τ Boo B
47 UMa B
16 Cyg Bb
ρ CrB B
55 Cnc B
Jupiter
Lalande 21185 B
υ And B
51 Peg B
Saturn
M
V
E
M
U
N
P
0.01
0.1
1
10
Equivalent Solar Distance (AU)

Alcatel IRSI Free-flyer concept



1998-10-30



Botticelli, 1484 - La nascita di Venere