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Erratum

Extrasolar planets and brown dwarfs around A–F type stars

V. A planetary system found with HARPS around the F6IV–V star HD 60532

M. Desort[1], A.-M. Lagrange[1], F. Galland[1], H. Beust[1], S. Udry[2], M. Mayor[2], and G. Lo Curto[3]

[1] Laboratoire d'Astrophysique de Grenoble, UMR5571 CNRS, Université Joseph Fourier, BP 53, 38041 Grenoble Cedex 9, France
e-mail: mdesort@obs.ujf-grenoble.fr
[2] Observatoire de Genève, Université de Genève, 51 chemin des Maillettes, 1290 Sauverny, Switzerland
[3] European Southern Observatory, Alonso de Cordova 3107, Vitacura, Santiago, Chile

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ABSTRACT

The dynamical analysis in the original paper was erroneous due to a mismatch in the choice of angular parameters. The calculations had been made by assuming a pole-on ($\sin i = 0$) instead of an edge-on $\sin i = 1$ orbit. In this framework, $\Omega_c - \Omega_b$ is just the mutual inclination between the orbital planes of the two planets. We also correct some stellar parameters given in the original paper ($\log g = +3.83$, $[\mathrm{Fe/H}]_{\mathrm{updated}} = -0.26$).

Key words. techniques: radial velocities – stars: early-type – stars: planetary systems – stars: oscillations – individual: HD 60532 – errata, addenda

In the original paper the calculations had been made by assuming a pole-on ($\sin i = 0$) instead of an edge-on ($\sin i = 1$) orbit. The dynamical study has been made again, but this time by assuming coplanarity of the orbits, hence $\Omega_c = \Omega_b$. The figures are changed but the main conclusions remain. Over 10^8 yr, the planetary system is chaotic but does not indicate any instability. The semi-major axes of the two planets oscillate between 0.754 AU and 0.752 AU for planet *b*, and between 1.568 AU and 1.595 AU for planet *c*. The eccentricity of planet *b* oscillates between 0.118 and 0.3, and that of planet *c* between 0.015 and 0.141. As before, we show that, given the error bars, the secular evolution of the semi-major axis of planet *b* should be detectable within ~10 years from now. This would constitute a strong indication of a resonant configuration. The sense of this variation is not constrained, because of the error bar on the argument of the planet *c* periastron. Figure 2 shows the secular evolution of the semi-major axis of planet *b* (a_b) in the same conditions as above, but for an initial choice of $\omega_c = -280°$ instead of $-209°$. The initial evolution sense is reversed compared to Fig. 1.

As in the initial calculations, the size of the error bars in Table 2 does even not ensure that the orbital configuration is actually resonant, but here again in non resonant configurations (Fig. 4), the variations of the semi-major axis of planet *b* achieve a much lower amplitude than in the resonant case.

Our basic conclusions are thus unchanged: i) the resonant configuration cannot be stated, but it is probable; ii) the system is significantly chaotic; iii) in a resonant configuration, we should be able to detect semi-major axis variations in planet *b*'s motion within ~10 yrs.

Recently, a global analysis of this system by Laskar & Correia (2009) confirmed the resonant status, using numerical integration and frequency analysis. In fact, non resonant systems appear less stable than resonant ones of Gyr timescales. This further indicates a resonant configuration.

We must also correct the $\log g$ of the star, which is +3.83. And we can update the estimated metallicity, which is now −0.26 according to new calibrations of the data from Holmberg et al. (2007), thus slightly more metallic than before. An estimation from Gray et al. (2006) (from which we took the $\log g$) gives [Fe/H] = −0.05.

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References

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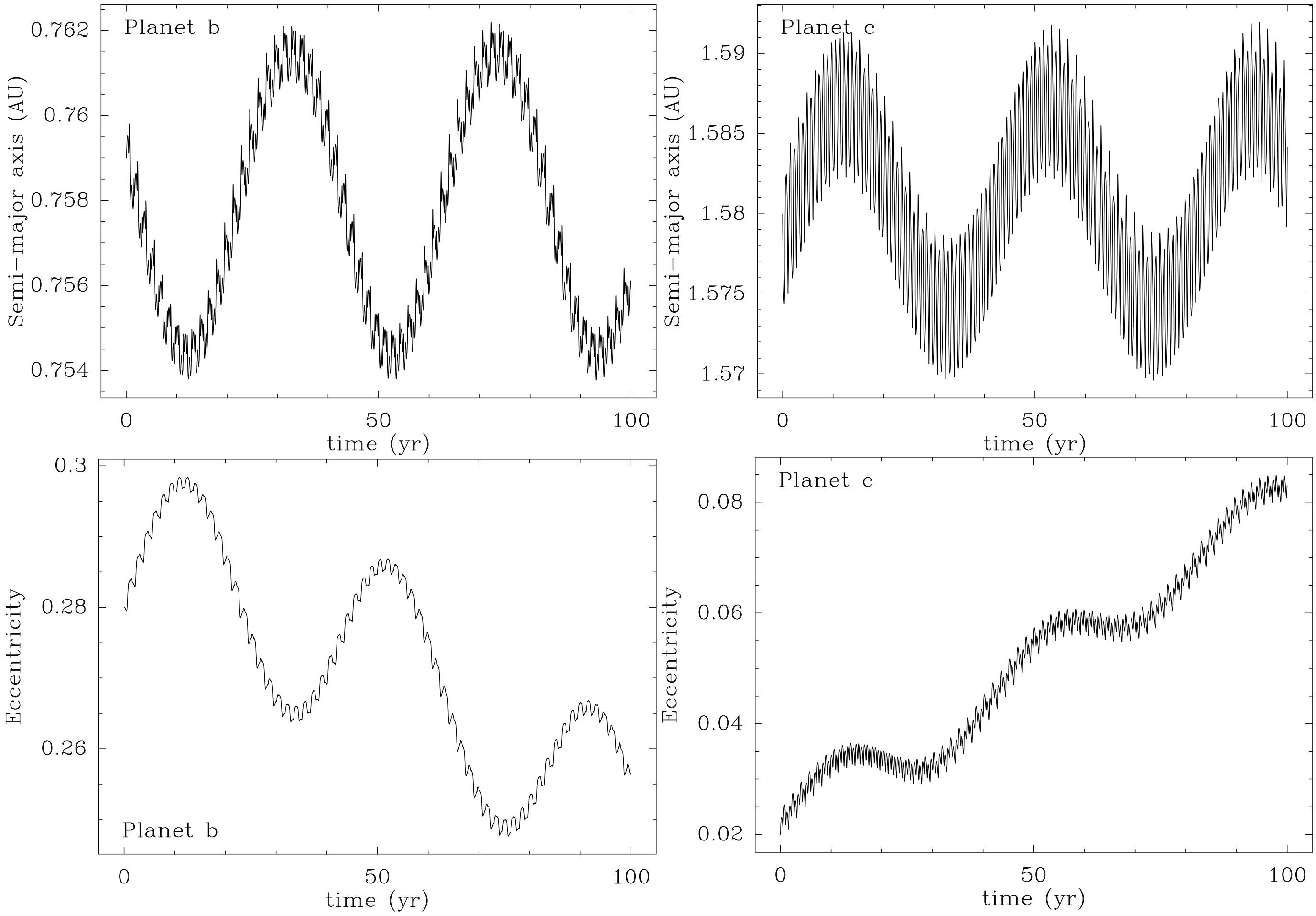

Fig. 1. Orbital evolution over 100 yr of the semi-major axes (*top*) and eccentricities (*bottom*) for planets *b* (*left*) and *c* (*right*), under their mutual perturbations, in a 3:1 resonance configuration.

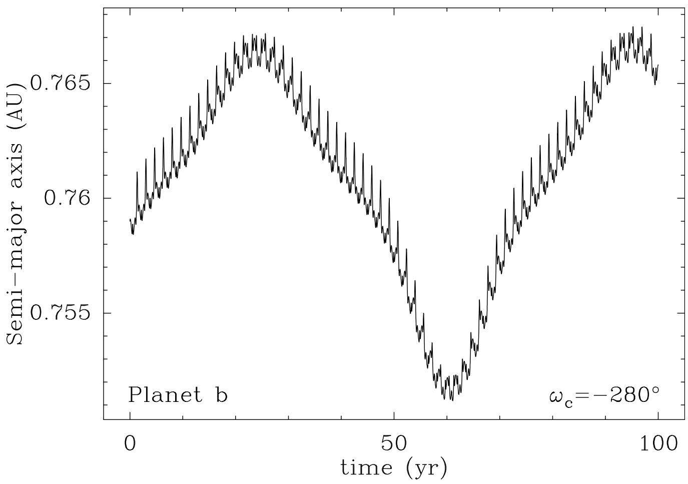

Fig. 2. Evolution of semi-major axis if planet *b* in the same conditions as in Fig. 1, but assuming an initial $\omega_c = -280°$ instead of $-209°$.

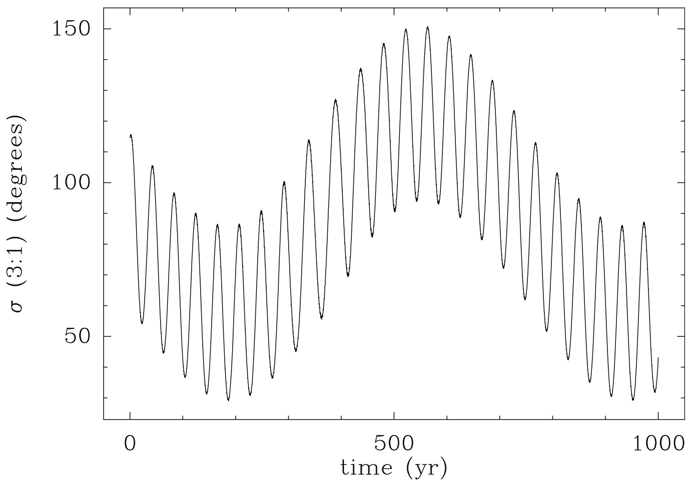

Fig. 3. Evolution of the 3:1 critical argument σ over 1000 yr, in the same condition as described in Fig. 1. We note the σ-libration characteristic for resonant motion.

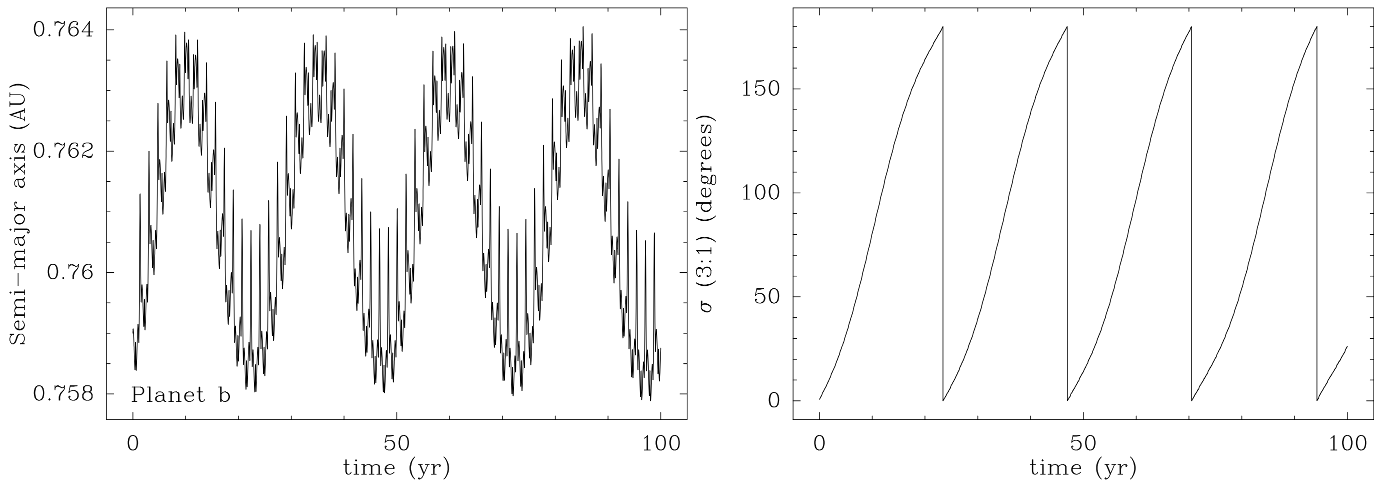

Fig. 4. Evolution of the semi-major axes of planet *b* and of the critical angle σ for 3:1 resonance in the same conditions as described in Fig. 1, but with a_c = 1.56 AU. This is a non-resonant configuration.