

Erratum: Multiplicity of disc-bearing stars in Upper Scorpius and Upper Centaurus-Lupus

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The paper ‘Multiplicity of disc-bearing stars in Upper Scorpius and Upper Centaurus-Lupus’ was published in MNRAS, 480, 480, 5099–5112 (2018) (hereafter ‘the original paper’).

In the explanation of simulating the radial velocity curves in Section 3.1 of Kuruwita et al. (2018), equation (2) was incorrect. This error only refers to the reproduced text of the paper, while the actual numerical implementation of the Equation was done correctly, and hence the conclusions of the paper remain the same. In this erratum we explain the error in the equation and what the correct equation should be.

The equation for radial velocity, v_r , that was published is:

$$v_r = K[\cos(\omega + \Omega) + e \cos \omega] + v_{\text{sys}}, \quad (1)$$

where K is a constant described by equation (3) in the original paper, ω is the longitude of periastron, Ω is the position angle of the line of nodes, e is the eccentricity of the system and v_{sys} is the system velocity. The position angle of the line of nodes should not have been used and Ω should also be removed from Table 4 of the original paper. The correct equation is:

$$v_r = K[\cos(\omega + \theta) + e \cos \omega] + v_{\text{sys}}, \quad (2)$$

where θ is the true anomaly of the system.

The true anomaly is given by:

$$\theta = 2 \arctan \left(\sqrt{\frac{1+e}{1-e}} \tan \frac{E}{2} \right), \quad (3)$$

where E is the eccentric anomaly. The eccentric anomaly is given by:

$$E = \mu + e \sin E \quad (4)$$

where μ is the mean anomaly which can be calculated directly from the period, P , and time to periastron, T_0 , using:

$$\mu = \frac{2\pi}{P} T_0. \quad (5)$$

There is no analytical solution to calculating the eccentric or true anomaly from the period, P , eccentricity and time to periastron, T_0 . We approximate the eccentric anomaly using the series expansion (Morrison 1883):

$$E = \mu + e \sin(\mu) + \frac{e^2}{2} \sin(2\mu). \quad (6)$$

The estimation of the eccentric anomaly can be refined using Newton-Rapson iterations in the form of:

$$E_{n+1} = E_n + \frac{\mu - E_n + e \sin E_n}{1 - e \cos E_n}. \quad (7)$$

The code used for simulating the radial velocity (which can be found here: <https://github.com/PyWiFeS/tools>, as cited in the original paper). The code used carried out 5 iterations to produce an estimate of the eccentric anomaly, at a level of convergence of $\ll 10^{-10}$. The true anomaly was then calculated using equation (3). While an input for a prior on Ω can be set, it is not considered in the calculation of RV curves. Therefore, the results of the original paper remain unchanged.

REFERENCES

- Kuruwita R. L., Ireland M., Rizzuto A., Bento J., Federrath C., 2018, *MNRAS*, 480, 5099
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