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Erratum: "Tilting Ice Giants with a Spin–Orbit Resonance" (2020, ApJ, 888, 60)

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We discovered an error in the published article that affects Figures 7 and 8. The expression for a planet's escape velocity under Equation (13) should be $V_{\rm esc}^2 = 2GM_{\rm P}/R_{\rm P}$, and this error was mistakenly incorporated into our collision code. When updating our code we also discovered an additional slight inaccuracy in how we calculate the distribution of impactors. We corrected these issues and have reproduced the figures below. The higher speeds and larger momentum carried by the impactors result in increased odds of significantly changing the Uranian spin state. Nevertheless, corrected likelihoods differ from our original erroneous results by only $\sim$30%, and the overall conclusions of our paper are unaltered.

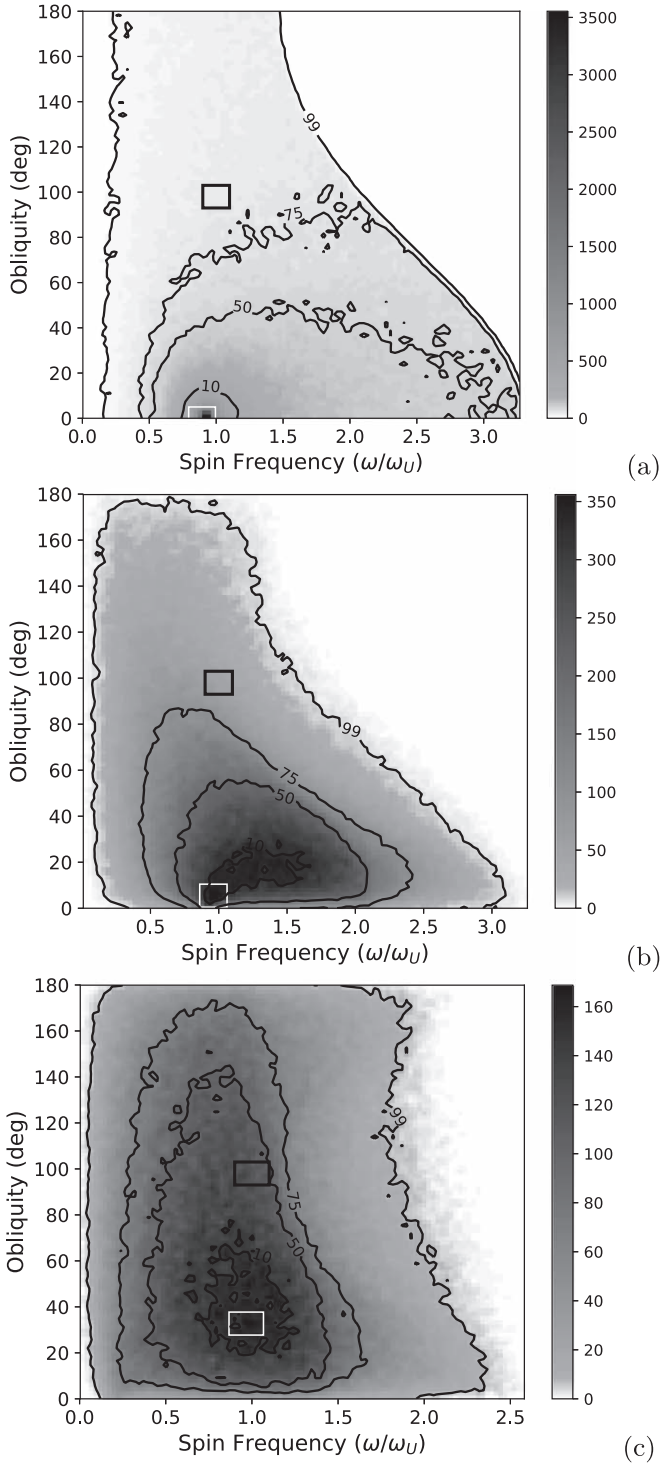

Figure 7. This is the corrected version of Figure 7 from the published article. (a) Density plot of Uranus's obliquity and spin rate after a 1 $M_\oplus$ strike if the planet's initial spin period is $T_i = 16$ hr at $\epsilon_i = 0^\circ$ obliquity. The likelihood, l, of the planet's final spin state ending up near its initial value is about 25 times greater than finding the planet within 10% of Uranus's current spin state ($l_{\rm U} = 0.0033$). (b) Two 0.5 $M_\oplus$ strikes on a $T_i = 16$ hr, $\epsilon_i = 0^\circ$ planet. It is now seven times more likely to find the planet near its initial value than within 10% of Uranus's current state ($l_{\rm U} = 0.0033$). (c) Two 0.5 $M_\oplus$ strikes on a $T_i = 68$ hr, $\epsilon_i = 0^\circ$ planet. It is now 1.3 times more likely to find the planet near the maximum of the distribution than within 10% of Uranus's current state ($l_{\rm U} = 0.0098$).

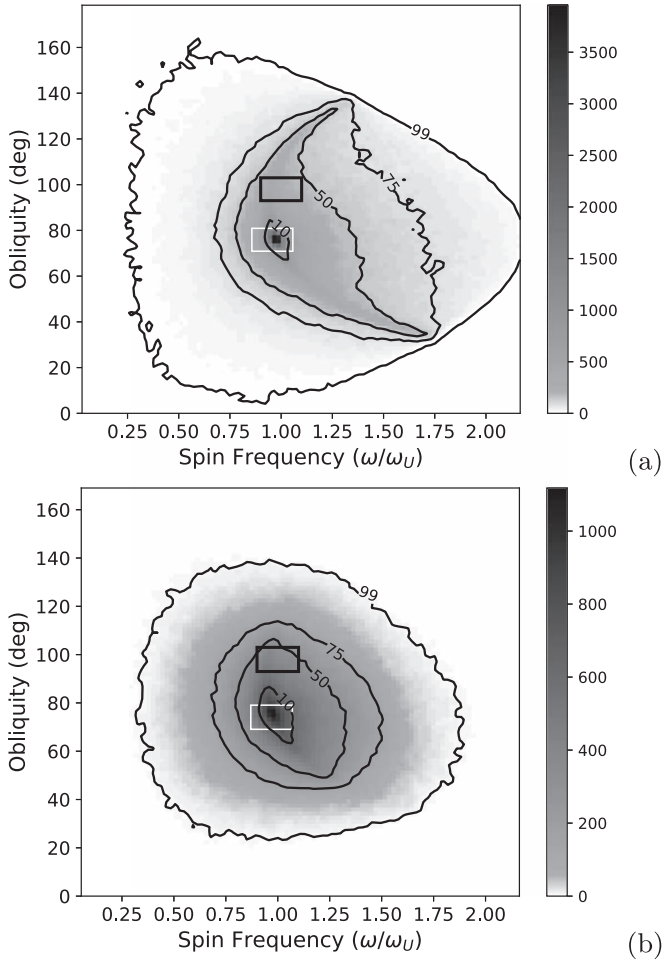

Figure 8. This is the corrected version of Figure 8 from the published article. (a) Here $T_i = 16$ hr, $\epsilon_i = 75°$, and Uranus is struck by one 0.5 $M_\oplus$ object. The likelihood, l, of the planet's final spin state being within 10% of its initial value is 4.5 times greater than finding Uranus within 10% of its current spin state ($l_U = 0.025$). (b) The same situation, but Uranus is struck by two 0.25 $M_\oplus$ objects and it is now 2.1 times greater to find the planet near the maximum than finding Uranus within 10% of its current spin state ($l_U = 0.038$).