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## Detecting a Possible Planetary companion of HAT-P-12b through Transit Timing Variations.

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We present Transit Timing Variations (TTVs) of HAT-P-12b, a low-density sub-Saturn mass planet orbiting a metal-poor K4 dwarf star. Using 14 years of observational data, we analyzed 46 lightcurves with various models, including linear, orbital decay, apsidal precession, and sinusoidal models, to investigate the presence of additional planets. Frequency analysis using the Generalized Lomb-Scargle (GLS) periodogram identified a significant periodic signal at 0.00415 cycles/day (FAP =  $5.1 \times 10^{-6}$  %), suggesting the influence of an additional planetary companion. The sinusoidal model provides the best fit among the tested models, resulting in the lowest reduced  $\chi^2_r$  of 3.2. Sinusoidal fitting of the timing residuals suggests that the companion has an estimated mass of approximately  $0.02 M_J$ , assuming it is in a 2:1 Mean-Motion Resonance (MMR) with HAT-P-12b.

### Section

Solar System/Exoplanets

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