Determining the Frequency of Jupiter Analogs and the Announcement of a New Jupiter Analog Orbiting HD32963

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Since Jupiter was a catalyst for the development of the Solar System, calculating the frequency of Jupiter like planets, known as Jupiter analogs, is a precursor to determining the occurrence of Solar System analogs. Stars in the Keck radial velocity survey have accumulated baselines of up to 18 years, providing ample data for the analysis of long-period Jupiter analogs. Planets are fit using local minimization and the Markov-Chain Monte Carlo algorithm in the Systemic Console. A planet with a period between 5 – 15 years and a mass between 0.3 – 3 MJup, with an eccentricity < 0.3, is considered a Jupiter analog. After detecting 8 Jupiter analogs within the 1,122 stars in the Keck radial velocity survey, we calculated the raw frequency of Jupiter analogs to be .71%. In order to improve this value, we calculated the detection limit to assess the ability to recover Jupiter analogs within the parameter space for each star in the sample. Using this information to correct the raw frequency for detectability, we found the frequency of Jupiter analogs to be 3.0%. Since Jupiter was responsible for the Solar System's architecture, this value of 3.0% could be used in future studies to determine how many stars host systems similar to the Solar System. Additionally, using 109 radial velocity measurements for the Sun-like star HD32963, I personally identified a previously undiscovered Jupiter analog with a 6.5-year period and a minimum mass of 0.70 Jupiter masses. This Jupiter analog is one of less than 30 detected thus far.

Awards Won:

First Award of $5,000