

Siemens Competition

Math : Science : Technology

National Finalist

Name: Dominick Rowan

High School: Byram Hills High School

Mentor: Dr. Stefano Meschiari, The University of Texas at Austin

Project Title: *Determining The Frequency Of Jupiter Analogs And The Announcement Of A Jupiter Analog Orbiting HD32963.*

Using 109 radial velocity measurements from Keck Observatory for the Sun-like star HD32963, we identified a Jupiter analog with a 6.5-year period and a minimum mass of 0.70 Jupiter masses. Since Jupiter was a catalyst for the developing Solar System, calculating the frequency of Jupiter analogs is a precursor to determining the occurrence of Solar System analogs. Due to the long period of Jupiter analogs, an extensive baseline of observation is needed. Stars in the Keck radial velocity survey have accumulated baselines up to 18 years, providing ample data for analysis. We first fit planets using local minimization and the Markov-Chain Monte Carlo algorithm in the Systemic application. Planets with periods between 5 – 15 years and mass between $0.3 - 3 M_{Jup}$, with an eccentricity < 0.3 , are considered Jupiter analogs. The raw frequency was calculated to be .71%, since there are 8 Jupiter analogs within the Keck radial velocity survey. We then 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%.