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Towards A Student-led TTV Research Program at UND

Efforts are currently underway at The University of North Dakota to establish an exoplanet research program. The UND Space Studies Observatory houses two 16-inch telescopes, which are routinely used for astrometric, photometric, and spectroscopic observations, including the transits of hot Jupiters to model-fit light curves and extract mid-transit times for the purpose of TTV analysis. The past two years have been dedicated to demonstrating the suitability of UND's observatory for continued exoplanet transit observations, and as such, has proven a success. Over the next two years, the goal is to gather the necessary experience to create and develop a sustained TTV research program. Telescope operation, observations, data reduction and analyses of transit data is envisioned to be conducted by students and the output of these efforts would yield contributions towards a longer baseline of transit timing data, journal publications, and a sustainable production of trained exoplanet astronomers. The first steps in establishing a dedicated TTV program are: 1) identifying the full range of exoplanets (radius, orbital parameters) whose transits are within the capability of UND's telescopes; and 2) producing a streamlined data reduction and modeling pipeline. To meet the first objective, observations of a range exoplanets are scheduled to begin March 2018, building on an existing small set of hot Jupiter observations obtained between March – November 2016. In addition, data reduction using IRAF and model fitting routines using Python have already been created and successfully used to analyze the transits of hot Jupiters (McCloat 2017). Despite this progress, additional effort is necessary towards developing a more robust pipeline that can perform the reduction and analysis efficiently and more autonomously. The expected products of this research would be light curves for a variety of exoplanet types from which the planet parameters, including mid-transit times and periods, can be extracted and the limiting precision of UND's telescopes identified.