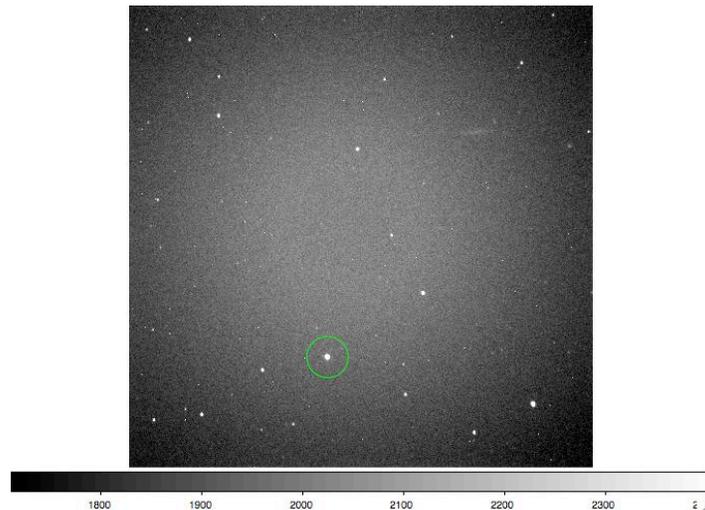


This summer, we looked at and tracked the positions of several objects: the 2005FY9, 2003EL61, and 2003UB313 KBOs; Asteroids 452 and 811; and the transits of several exo-planets. All of our data for the KBOs, asteroids, and some of the transits were taken using the 14-inch telescopes at the Wallace Astrophysical Observatory in Westford, MA. For the most part, we used a clear filter, with no autotone reduction, and we took our own biases, flats, and darks for each night.

We focused on the 2005FY9 KBO (also known as MakeMake), for which we are using the data to determine how the orbit of KBOs can be improved using a smaller type of telescope similar to that of the 14-inch. We tracked from 2005FY9 from late June all the way through early-mid August, at which point the KBO set too early for us to see. We took sets of 60 1-minute exposures each night. We then ran each frame through a Mathematica pipeline to approximate the right ascension/declination of the KBO. The pipeline has four significant parts. The first is creating the subnetwork of stars, which is a more specific network of stars for a set of frames, either for one night or various nights depending on how much the KBO has moved. Having created this subnetwork using one frame, we applied it to each remaining individual frame, so that we could fit all the stars in the frame. The figure shows a typical frame from one night, with the reference star that we used to more accurately fit the subnetwork to the specific frame in the centroiding portion of the pipeline.



This allowed us to obtain a center X,Y coordinate for every center RA/Dec. The astrometry notebook was then used to find a specific function that correlates the center X,Y coordinate to the center RA/Dec. Using this function, we then found the RA/Dec of the KBO, and then correspondingly, the position of the object according to that particular frame.

In addition to running the frames through the pipeline, we are also constructing light curves for the 2005FY9 data.

We have not finished analyzing and then interpreting the results of all the frames that we took over the past couple of months. However, we are continuing to work on this project

into the fall semester, and hope to publish an article concerning the role of a 14-inch sized telescope in improving the orbit of various objects.