Paul Feder Observatory Upgrades and Exoplanet and Variable Star Data

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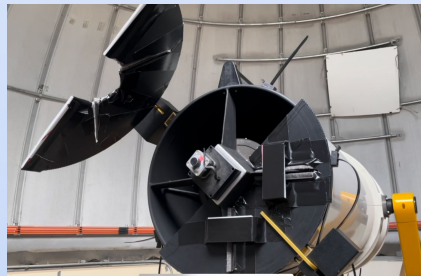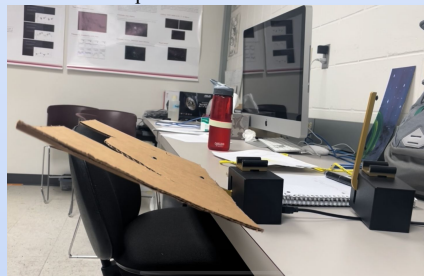Department of Physics & Astronomy

Summary

Over the past summer, Minnesota State University Moorhead's Paul P. Feder observatory implemented nearly full remote operation. The automation proved successful. Observatory use increased substantially compared to the past due to this upgrade. This has already had a positive impact on the observational astronomy course taught at MSUM this fall and allowed us to collect more data than was possible in the past.

Motivation

Before the upgrade to the dome and telescope, much of the work to use the telescope was done manually. One had to drive an hour round trip to the observatory at dusk and dawn to ensure that the telescope started up and shutdown properly. Proper startup included manually opening the lower dome flap via hand crank and briefly plugging in the top part of the dome to raise the upper slit. Shutting down the telescope during the summer required a person to be at the telescope by 5:00AM, before sunrise to make sure that the dome closed before the sun rose. Normally this prep work would take about 2 hour including driving time.

Changes

The changes we made are listed below. Information about vendors is in the "Vendors" section of the poster.

1. Dome Control
   a. Motorize lower dropout
   b. Power rails tagged to dome
   c. Add rain sensor and new controller
2. Internet-controlled power strip for camera/filter wheel/dome controller
3. Dust Flaps
4. Remote Desktop to Observatory
5. Flat Panel to be added at later date
6. Wrote custom ACP scripts to facilitate remote operation (need list)

Figures 1, below: The flap cover on the left is the cardboard prototype and on the right is the corrugated plastic,which is the final version. The flap covers prevent dust from getting into the telescope.

Results

Figure 2, right: Past usage of Feder Observatory from 2011 to present, and usage after the upgrade. The error bars indicate the range of nights used in that month. Typical past usage has been 2-3 nights per month. Since the update, typical usage has been 5 or more nights per month. The observatory has been used for the astronomy classes more after the upgrades have occurred because it is easier to collect and obtain data for those class examples and projects.
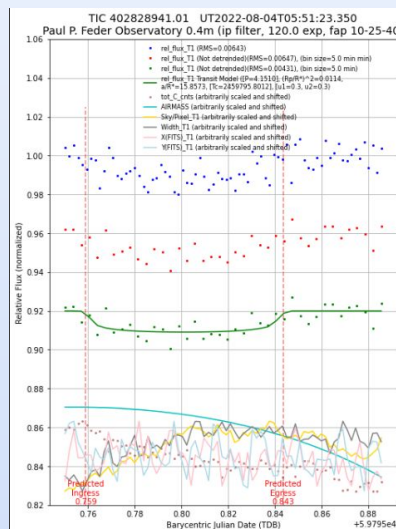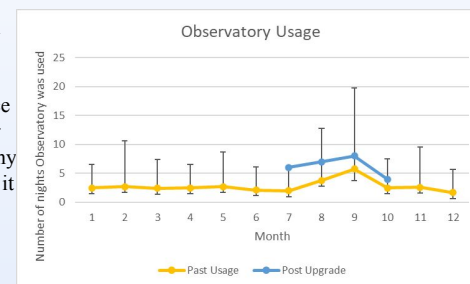

Figure 3, left: Measured transit of the candidate exoplanet TIC-402828941.01 after the observatory upgrades. The upgrade allowed us to observe more transits over the summer than in past summers.
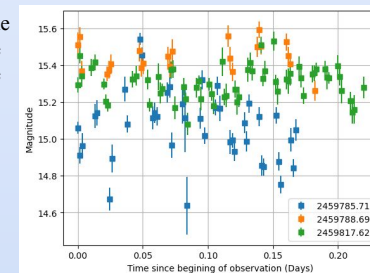
Figure 4 , below: During the process of the telescope upgrades several nights of data were taken on two variable stars. Below is data from V0533 Her taken across 3 nights. Each night is represented by a different color.

Vendors

Acknowledgements

astropy-powered
astropy.org