Photometric Characteristics of the Etelman Observatory in St. Thomas, US Virgin Islands

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Abstract.
The College of Charleston and the University of the Virgin Islands are engaged in a collaborative program to operate an observatory on St. Thomas, in the US Virgin Islands. The facility has been equipped for students at either institution to complete research projects. This report describes the history of this collaboration, our efforts at refurbishing the equipment and instrumentation, our preliminary site survey, our initial research project, and future plans. We are especially interested in evaluating this unique site as a candidate for a future Automated Photometric Telescope.

1. Introduction

The Etelman Observatory sits on the top of Crown Mountain, at 1556 feet (473 meters) the highest point on the island of St. Thomas, US Virgin Islands. The facility was donated to the University of the Virgin Islands (UVI) by the Etelman family. It consists of a mountain-top house with a roof-top observatory, and it lies just a short drive from the St. Thomas campus of UVI. In addition to its undeniable natural beauty (overlooking that Atlantic Ocean to the north and the Caribbean Sea to the south), we believe it has tremendous potential as an astronomical site.

Since late 1994, UVI has had a collaborative agreement for student and faculty exchange with the College of Charleston (CofC; and with its graduate and research arm known as the University of Charleston, SC). UVI is a member of the South Carolina Space Grant Consortium. While on sabbatical from CofC, Drost began the refurbishment of the observatory. Harold Nations, formerly of CofC, installed a CCD camera and filter wheel and developed plans for conducting research at the site. Hurricane Marilyn caused substantial damage to the structure in 1995, but this has now been repaired. During the fall of 1996 and all of 1997, Aurin was an exchange student at UVI. Working under the supervision of Drost and Nations, he undertook the task of refurbishing the instrumentation and evaluating the astronomical characteristics of the site. Neff became involved with the project during the fall of 1997. Aurin and Neff revised their science program, and Aurin completed the observations for his senior thesis at CofC.

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2. Equipment and Instrumentation

The telescope, a 15" (38 cm) cassegrain reflector on a bronze German equatorial mount, was built in 1961. It is essentially identical to the 15" telescope at Villanova University. It is manually pointed with the assistance of JMI's "NGC-MAX" encoders and presently has no autoguiding capability. A 6" refractor, a 6" photographic rich-field telescope, and two small finder telescopes are co-mounted. The site infrastructure includes a road, power, water, telephone line, and a sleeping room. The remainder of the house could be developed for office space, meeting rooms, or labs.

The telescope is equipped with a computer-driven filter wheel, UBVRI filters, and a SBIG ST-6 CCD. A pentium-based PC is used to control the filter wheel and CCD and for "quick look" data analysis. We are developing IDL procedures for more detailed data analysis, both on-site and at CofC. Data is transferred from the site on 1.44 MB floppy or on 100 MB Zip disks.

3. Environmental Characteristics

Besides being a developed site with all the necessary infrastructure (and a beautiful view!), Etelman observatory has several noteworthy astronomical advantages. Perhaps foremost among these is its location approximately 65° west longitude and 18° north latitude. This is further south than the island of Hawaii and the Canary Islands and further east than anywhere in the continental US or Chile. It is surrounded by ocean with a steady temperature and wind direction and minimal artificial lighting. Its altitude (over 470 meters) places it above much of the local weather, although upslope winds can cause local cloud formation and rapidly changing conditions.

We monitored the weather, sky brightness, and seeing conditions at the observatory throughout 1997. We have also obtained meteorological records covering a much longer timeline. While we are still analyzing these data, several preliminary conclusions can be drawn. On the positive side, the sky is very dark except when local fogging conditions occur. City lights from Charlotte Amalie pose no problem, although a white strobe light on a nearby tower produces detectable interference. This problem could be minimized by reducing the strobe's power level at sunset, as permitted by the regulations. Perhaps the greatest astronomical strength of the site is steady and excellent seeing, typically better than an arc second, caused by the stable pattern of trade winds over the ocean. Local clouds forming from the upslope winds can, however, cause non-photometric conditions with little warning. We are attempting to quantify the fraction of photometric time available, but our impression is that photometric conditions seldom last for an entire night.

4. Preliminary Photometric Results

Throughout October and November 1997 we obtained UBVRI photometry of the single-lined spectroscopic binary system II Peg (HD 224085; K0 V, V=7.2 to 8.3; P$\sim$6.7 days) and suitable check stars (HD 224084 and HD 224016). Whenever possible, we also used standard stars to perform extinction measurements throughout the night. These data were obtained in support of a molecular band study of starspot parameters (Neff, O'Neal, & Saar 1995; O'Neal, Saar, & Neff 1998) using the Phoenix infrared echelle spectrograph at Kitt Peak 7-13 November 1997. Photometric results will be published later along with the infrared data. For his senior thesis, Aurin developed a suite of IDL programs for the reduction and analysis of these data. Further development of these procedures is being carried out by students at the College of Charleston.

5. Plans for Future Development of the Site

Through the on-going collaboration between CofC and UVI, we intend to continue our monitoring of the astronomical properties of the site. We plan to involve UVI students in obtaining the site-survey measurements as part of a long-term project. With further support from the South Carolina Space Grant consortium, we have recently begun a new program utilizing both the 16" reflector in Charleston and the 15" telescope at Etelman observatory to determine orbits and parallaxes of candidate near-Earth objects (NEO's). Our first observations will be obtained in the fall of 1998, and we intend to continue this as a long-term cooperative project involving students at both institutions. The telescope-CCD combinations at both facilities yield a relatively small field of view, so we have obtained a large-format CCD and we are investigating other CCD's, focal reducers, autoguiders, etc. Etelman observatory has also been considered as a site for an environmental center and public-education facility. Ultimately, depending on the results of our site survey, we would like to locate a larger, research-grade instrument at the site.

Acknowledgments. This project arose from the efforts of Don Drost and his colleagues at the University of the Virgin Islands. Harold Nations was responsible for much of the original site refurbishment and scientific definition. We gratefully acknowledge support from our administrations at UVI and CofC. Further funding has been provided by NASA through the South Carolina Space Grant Consortium, by the Research Corporation, and by the National Science Foundation.

References

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