

**2009 Epsilon Aurigae
Eclipse Campaign Newsletter #3
Winter 2007/2008
January 2008**

Dear Colleagues,

One more year, actually around 18 months) before first contact. Time is swiftly passing. Now is the time to get equipment checked out, calibrated and techniques fine tuned. Now is also a good time to get in sync with the star system. By that I mean see what numbers it produces for your equipment. See how close your data is to other data for the same time. See what adjustments are needed to get your data to agree closer. Because the epsilon is around 5 degrees for the comparison star lambda Aurigae, extinction is important. You can use lambda to determine a rough extinction for each night. This is another item that can be worked out now before first contact.

News

The AAVSO has declared "Variable Star of the Year - Epsilon Aurigae." A writeup by Arne A. Henden and John R. Percy on this is on pages 274 - 275 of the "RASC Observer's Handbook 2008."

In addition the United Nations has declared "2009 The International Year of Astronomy."

See <http://www.iau.org/iau0702.486.0.html>

The AAVSO has plans for a "capstone" project for IYA 2009 involving the monitoring of epsilon Aurigae. See <http://www.aavso.org/aavso/iya.shtml>

For details see the AAVSO Poster Paper

<http://www.aavso.org/images/iya-aas-poster.pdf>

Campaign Members

Dr. Serdar Evren of Ege University Observatory in Izmir, Turkey writes he is using a Vilnius photometer with UBVR Johnson filters on a 48 cm Cassegrain telescope.

Dr. Lothar Schanne of Germany continues to do spectroscopy work. He is also looking for photometric help for two other stars, P Cyg and WE 140. If you are interested, please contact him directly at "Dr. Lothar Schanne" <l.schanne@arcor.de>

07 December 2007

Dr. Mukund Kurtadika of Maharashtra India writes that he is using an SSP-3 to do BVRI photometry of epsilon Aurigae. He is having trouble with star drift, but once that is solved the data should be very good.

31 December 2007

Hans-Göran Lindberg of Germany wrote: "I have a Starlight Express HX-516 B/W Camera (PIXEL 7.4*7.4) CCD 4.9*3.6mm and I planing to add a 50 mm camera lens to it which will give me around 5 deg. view around the star."

4 January 2008

Brian McCandless at the University of Delaware has offered to follow epsilon Aurigae in the JH infrared bands using his SS-4 and 14" Celestron.

The Project

Epsilon Aurigae is an ideal star system for backyard observers in light polluted suburban areas. It is bright (3rd magnitude) and easy to find and observe. The next eclipse of this 27.1 year variable star system will start in the summer (July/August) of 2009. The eclipse will last nearly two years. A strange mid-eclipse brightening was seen during the last eclipse. The star system is variable outside of the eclipse which make things even more interesting. The nature of these out-of-eclipse variations are still not understood. While the basic period seem to be around 60 to 70 days the exact period seems to vary.

It will be most important to get the best coverage during the contact points (1st, and 3rd and 4th) as well as the mid-eclipse. Because of weather concerns and sky position during the summer months, as many observers as possible will help complete the coverage. Because the declination of the system is +44 degrees, the higher the observer's latitude, the better the coverage during the summer months.

During the last eclipse, observers did not get excited until the eclipse started so there is few photometric data before and during first contact. Hopefully this time will produce better coverage.

Single Channel Equipment

It is also ideal for single channel photometers. These include home made PMT (Photomultiplier Tube) based UVB photon counting units, the Optec SSP-5 (UVB analog), solid state instruments such as the SSP-3 for BVRI observing and the SSP-4 for infrared JH bands observing. For solid state detector work the larger the telescope the better. While an 8" telescope may suffice for the SSP-3, at least a 12" is recommended for the SSP-4. For the PMT based UVB work, most anything from 6" up to 18" can be used. The larger telescopes may saturate the PMT, however.

For those who are interested in photon counting, I have received several requests for high voltage power supply and pulse conditioner printed wiring boards. I have prototype PWB for a regulated HVPS that I am still testing. This is based on the Boyd design using a band gap reference. If anyone else is interested in pursuing this, and if I get enough interest, I will make more PWB for both the HVPS and pulse conditioner. Several companies make very low cost (~\$15) low voltage power supplies that can be used to power these boards. Please contact me directly if you have questions or are interested in photon counting.

CCD Equipment

There are some problems with finding observers using single channel detectors. Most observers are now into the CCD world. While CCD instruments are certainly great, some of their advantages are actually disadvantages for the epsilon Aurigae project. The star system is too bright. Even with an 8" telescope to stay in the linear region of the CCD sub-second exposures are needed. this presents a problem with atmospheric scintillation. Typically at least 10 seconds of observing is needed to even out the scintillation variations. Most CCD photometry is done such that both the comparison and program stars are in the same image. The common comparison star is lambda Aurigae and is located some 5 degrees away. This is well beyond the field of view of

even large detectors. This means doubling the work and imaging the program star and then the comparison star. This negates much of the advantage of CCD photometry. While there are good comparison stars closer to epsilon Aurigae they are too faint to be imaged along with epsilon. Typically they are around 6th magnitude. The dynamic range of the CCDs is not sufficient to allow these stars to be imaged at the same exposure epsilon is imaged.

Can CCD instruments be used to observe epsilon Aurigae? Yes!

In The Society for Astronomical Sciences Newsletter Vol. 5 Number 3, Bob Buchheim discusses using an aperture mask to cut down the area yet retain resolution and scintillation reduction of a larger telescope. While this helps with the brightness issue, it does not solve the problem of getting the comparison and program star in the same image. See <http://www.socastrosci.org/>

At the Hopkins Phoenix Observatory we have been experimenting using a 50 mm camera lens with a DSI Pro CCD camera to do BVRI photometry of epsilon Aurigae. Even using the 50 mm lens requires the lens to be stopped down to F.4.0 to keep the R band data in the linear region of the detector. We found that using the 50 mm lens at F/4.0 with 5.7 second exposures for the BV and I bands and 2.0 second exposures for the R band worked well. Each image is a composite of 20 images stacked. Even at only 2.0 seconds the R band data peak ADU counts were over 36,000. Reduced data showed the data spread for 3 set of images for each filter to have a standard deviation of close to 0.01 magnitude. More data will be taken, but so far this looks like an excellent means to do CCD BVRI photometry of epsilon Aurigae.

A Mogg adapter was used to couple the DSI Pro camera to the 50 mm lens. While a filter wheel was tried, focus could not be achieved. We were required to use the original filter slide that came with the DSI Pro. While not as nice or easy to use as a filter wheel we were able to focus. Details of this project will be posted on our web site at a later date. For information on the Mogg adapter see <http://www.webcaddy.com.au/astro/adapter.asp>

Note: As an experiment an Orion equatorial mount (\$50) was tried with this and it worked fine. No telescope needed and it's powered by a 9 V battery. See: http://www.telescope.com/control/product/~category_id=mounts_and_tripods/~pcategory=accessories/~product_id=09055

HPO Fall 2007 UBV Observations

	JD	V	B	U
09/18/2007	4362.8275	3.059	3.638	3.714
09/19/2007	4363.8011	3.052	3.615	3.675
09/23/2007	4367.8011	3.044	3.622	3.679
09/24/2007	4368.8157	3.060	3.631	3.708
09/25/2007	4369.8059	3.052	3.624	3.694
09/26/2007	4370.8108	3.036	3.620	3.701
09/29/2007	4373.8018	3.060	3.623	3.689
10/11/2007	4385.7788	3.056	3.616	3.688
10/13/2007	4387.7816	3.045	3.615	3.684
10/14/2007	4388.7837	3.051	3.613	3.688
10/15/2007	4389.7816	3.048	3.613	3.672
10/19/2007	4393.7837	3.036	3.600	3.686
10/22/2007	4396.7802	3.034	3.595	3.670
10/23/2007	4397.7851	3.031	3.595	3.689
10/24/2007	4398.7983	3.038	3.592	3.687
10/26/2007	4400.7795	3.028	3.588	3.689
11/01/2007	4406.6872	3.043	3.597	3.650
11/01/2007	4406.7865	3.037	3.611	3.722
11/13/2007	4418.8024	3.074	3.645	3.802
11/14/2007	4419.8115	3.066	3.656	3.803
11/18/2007	4423.7816	3.085	3.668	3.814
11/19/2007	4424.7136	3.084	3.664	3.799
11/19/2007	4424.7948	3.075	3.669	3.830
11/20/2007	4425.7830	3.083	3.676	3.835
11/05/2007	4410.7837	3.030	3.586	3.696
11/23/2007	4428.7788	3.099	3.686	3.834
12/02/2007	4437.7219	3.096	3.685	3.835
12/03/2007	4438.7330	3.082	3.686	3.822
12/04/2007	4439.7240	3.096	3.679	3.829
12/08/2007	4443.7219	3.085	3.665	3.805
12/12/2007	4447.7441	3.073	3.655	3.805
12/13/2007	4448.7240	3.075	3.650	3.787
12/15/2007	4450.7399	3.068	3.641	3.776
12/17/2007	4452.7205	3.067	3.634	3.764
12/18/2007	4453.7240	3.057	3.631	3.780
12/21/2007	4456.7913	3.049	3.614	3.769
12/22/2007	4457.7205	3.051	3.613	3.750
12/23/2007	4458.7254	3.041	3.601	3.742
12/23/2007	4458.7427	3.046	3.605	3.754
12/25/2007	4460.6892	3.040	3.605	3.720
12/26/2007	4461.7101	3.048	3.606	3.748
12/29/2007	4464.6906	3.044	3.614	3.735
12/30/2007	4465.7212	3.039	3.608	3.754
12/31/2007	4466.7177	3.040	3.603	3.739

Report from Bob Stencel:
[<http://www.du.edu/~rstencel/epsaur.htm>]

The science goals for observing epsilon Aur are several and include:

[1] photometry: help determine whether the ~0.1 mag quasi-periodic, out of eclipse light variation is due to the F supergiant star, or related to excitation of disk material (UV and infrared spectra); and, have that variation determined well enough to constrain whether the mid-eclipse brightening seen previously is merely F supergiant variation or could be a central clearing in an inclined disk;

[2] spectroscopy: a “disk trailing wake” appears to influence the light curve and spectra only after mid-eclipse (Canavaggia 1980, Ferluga and Mangiacapra, 1991), but pre-eclipse observations are needed to determine whether material is symmetrically distributed about the disk along the orbit;

[3] directly test the Huang disk model interferometrically, to witness whether the single F supergiant stellar disk (2.1 milli-arc seconds measured diameter) does bifurcate into a pseudo-binary during eclipse due to the dark disk superpositioning;

[4] confirm the polarimetry results obtained during the previous 1984 eclipse (Kemp et al. 1986).

Interferometric measures were conducted twice so far during autumn/winter 2007 using the Palomar Testbed Interferometer, first on Oct.19 then on Dec.27, 2007. Reduction of data from the October measurement, obtained during local V maximum light, confirmed published values close to 0.002 arc seconds diameter for the F star. The late December data have not yet been fully processed, but they too were obtained during a local maximum in V band, although the U-B color was slightly redder than during the October maximum light. More observations are scheduled for the coming weeks to examine pulsation-related diameter changes.

The AAVSO and IAU have become interested in the epsilon Aurigae eclipse campaign. We have been informed that AAVSO is preparing to highlight epsilon Aurigae as one of its Variable star of the season entries at web site:

[<http://www.aavso.org/vstar/vsots/>]and encourage eclipse campaign participants to visit the site for further information. The IAU recently won United Nations approval to conduct an International Year of Astronomy, IYA, in 2009. The US committee wants to adopt epsilon Aurigae for its Citizen Science activity, among others in 2009 and beyond: [www.astronomy2009.us]. Watch for news about these developments in future campaign newsletters.

Anyone wishing to contribute to the Newsletter, is most welcome. Please send contributions to me at phxjeff@hposoft.com.

In addition to sending this directly to those who have expressed an interest in epsilon Aurigae, I will post this on the campaign's web site.

Anyone not desiring to receive these Newsletters, please e-mail me and I will remove your name from the list.

<http://www.hposoft.com/Campaign09.html>

Jeff