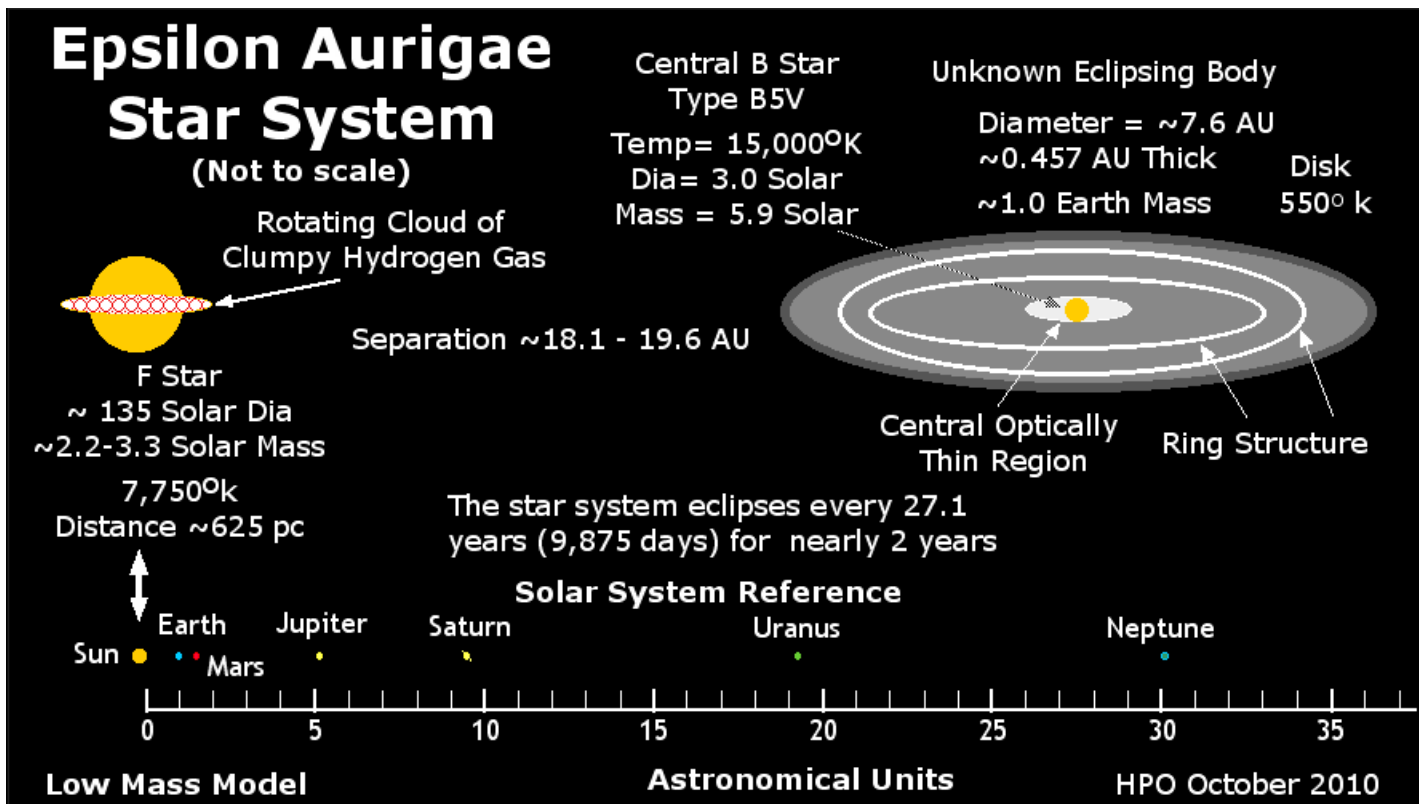


# 2009/2011

## Epsilon Aurigae Eclipse

International Campaign Newsletter #19

Fall 2010 - Totality



Jeffrey L. Hopkins, Editor  
Hopkins Phoenix Observatory

Dr. Robert E. Stencel, Co-editor  
University of Denver

Robin Leadbeater, Co-editor  
Three Hills Observatory

### Campaign Web Site

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

### Epsilon Aurigae Forum

<http://tech.groups.yahoo.com/EpsilonAurigae/>  
see also

[https://twitter.com/epsilon\\_Aurigae](https://twitter.com/epsilon_Aurigae)

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## FROM DR. BOB:

Dr. Robert Stencel, University of Denver

## INTERESTING PAPERS:

*A new ephemeris and an orbital solution of epsilon Aurigae*

*An Abundance Analysis of the Primary Star of the Peculiar Eclipsing*

*Binary epsilon Aurigae out of the Eclipsing Phase*

*A Five-year Spectroscopic and Photometric Campaign on the Prototypical alpha*

*Cygni Variable and A-type Supergiant Star Deneb*

# Editor's Remarks

Dear Colleagues,

A belated Happy Autumnal Equinox.

## New Observing Season

We are well into the new season for observing epsilon Aurigae. The star system is now transiting near dawn which means excellent pre-dawn photometry is now possible and even decent observing around midnight. The weather should also be more cooperative as we get into fall. Again, I wish to thank all the faithful observers who provided super human efforts to observe between seasons.

## UK BAA Meeting

Below is a picture of campaign spectroscopists Robin Leadbeater and Olivier Thizy at the UK BAA meeting the first week of September 2010 at the Norman Lockyer Observatory. Olivier is holding a photographic plate dated 1921 of a spectrum of epsilon Aurigae. More details in the spectroscopy section



## **New System Diagram**

If you look closely at the Newsletter's first page you will notice that the System Diagram is now the newer model (low mass model). The diagram summarizes what we know as of right now. Things may still change.

## **American Astronomical Society Meeting**

On 11 January 2011 at the 217th meeting of the American Astronomical Society in Seattle, Washington, there will be several talks and Poster Papers on epsilon Aurigae. While the cost of the meeting is not trivial, we are planning a special dinner apart from the AAS on Tuesday (11th) evening for those people interested in epsilon Aurigae. More details will be presented in the next Newsletter.

## **CHARA Trip Report**

On Tuesday, 21 September 2010 at the invitation of Bob Stencel and Brian Kloppenborg, I drove from Phoenix, Arizona to Mount Wilson California. The drive is a bit under 400 miles and took a little over 6 hours. The trip went well and the last 50 miles on Rt. 2 (Angeles Crest Highway) through the mountains was very scenic, but not a road you would want to travel a lot. As I approached the observatory site I was amazed at the antenna farm that shares the mountain top with the telescopes. They were really spectacular. I met Brian near the gate to the observatory and we went to the cabin we would share. It's a two bedroom unit, very nice right on the edge of the mountain. Looking over the back porch rail you are looking almost straight down and into the clouds.

The first night was a wash as the power company was switching a 33 kv line to a 65 kv line at 3:00 am that would mess up the run so the first evening was canceled. During the second day I got a bit of a tour. The 100" Hooker telescope is the largest on the mountain and at one time the largest in the world. I believe it saw first light around 1917. A couple of interesting facts about the telescope. The structure is built like a battleship and the observatory dome is monstrous. The main mirror is glass made from melted wine bottles. The bearings of the mount ride in a pool of mercury. The whole upper floor turns with the dome and is very large. A very impressive observatory, far from state-of-the-art, but still very impressive.

During the early evening of the second day we went to the CHARA control room. CHARA stands for Center for High Angular Resolution Astronomy and is run by Georgia State University. For a while it looked like a glitch was going to prevent any observing during the second night. It was getting close to midnight, but Brian was able to contact the Associate Director of the CHARA array, Theo ten Brummelaar, in France and the solution was figured out. We were all set. The previous night had another problem other than the power switching. Each of the six CHARA observatories has its own weather station and the humidity was approaching over 90% which would have negated any observing. That was moist air blowing in from the Pacific ocean. The top of Mount Wilson is normally just above the cloud layer. The second night was much better.

There is a fair amount of work to set everything up for an observing session and to get the telescopes imaging the right stars. P.J. Goldfinger was the technician handling all this. She had 6 large monitors and associated computers that handled everything. For this run, only four telescopes would be used. Each telescope has its own dome with 40" mirror, Maximum separation of the telescopes is just over 1,000 feet. First a calibration had to be done using a very distant star that cannot be resolved, I believe it was 45 Per. Once the calibration was done the telescopes switched to epsilon Aurigae. It was very interesting watching the monitors and seeing the star acquired and then centered and locked in for each telescope.

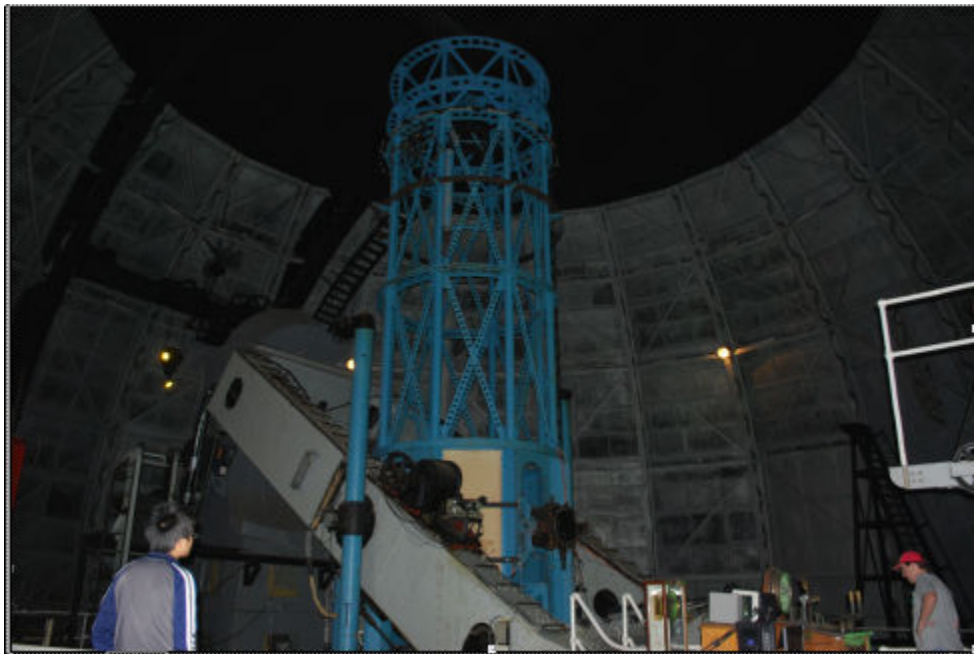
There is an Optical building separate from the Control building. The Optical building is where all the light from all the CHARA telescopes goes. There are long phase adjusting tubes and an area with

several large optical benches. Each bench has a different function. The one we used for the interferometry was called MIRC (Michigan Infrared Beam Combiner). The detector we used was sensitive to the H band (1,400 to 1,800 nm) and required liquid nitrogen cooling. It's a very special and highly sensitive detector. It has a CCD with only 16 rows X 160 columns of pixels of which only the lower left corner is used (8 rows and 80 columns of pixels) for the fringe data and the lower right corner (same amount of area) is used for photometric data.

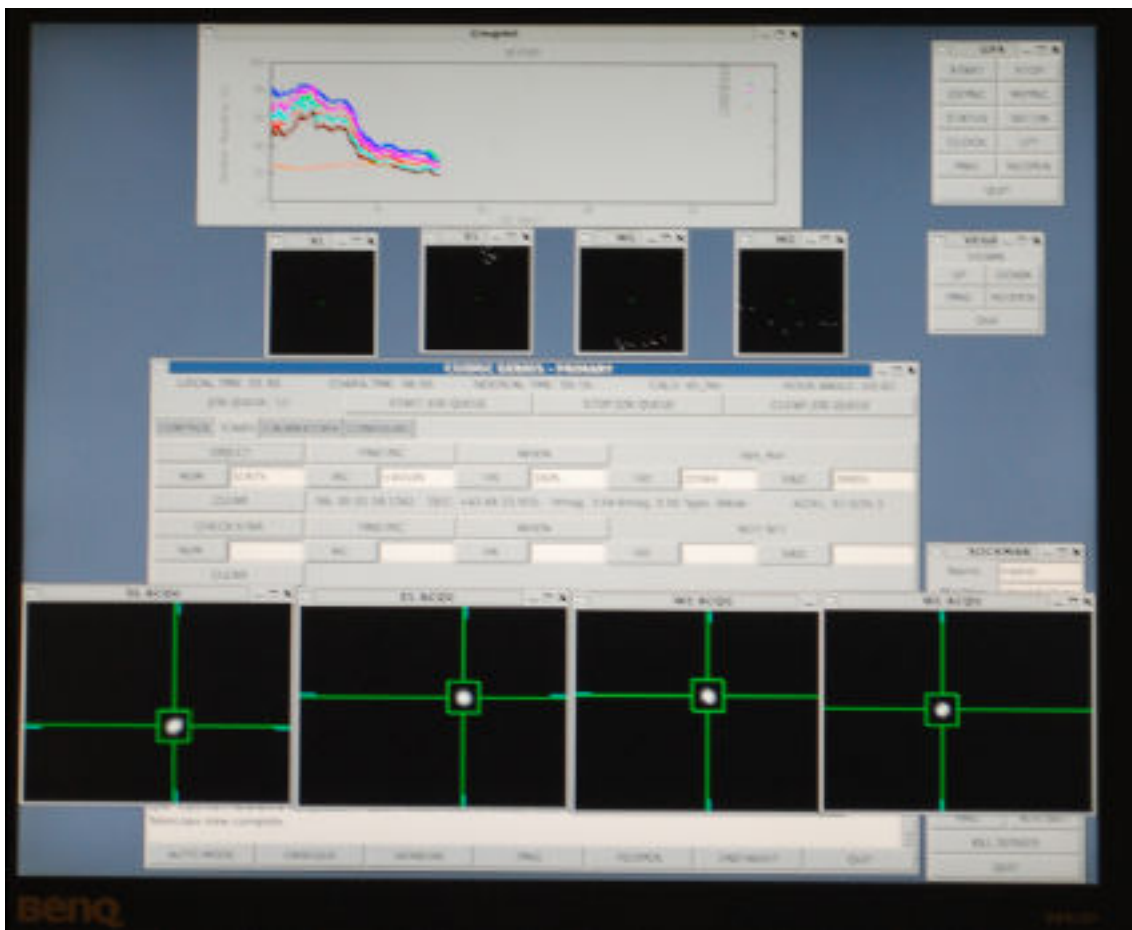
Once epsilon was centered and data started coming in, on Brian's display we could see fringes (diffraction patterns) from the four telescopes starting to build up. Sampling was done a 3.5 millisecond rate and we imaged for 25 minutes per run (there were several runs) so there was a vast amount of data. To the right of the diffraction patterns we could see the resulting Fourier transforms. Very interesting. Atmospheric scintillation is a big problem and one of the reasons for taking so much data.

The night went well and Brian got good data. While I had to return to Phoenix on Thursday, he stayed and got a second night's observing run with more good data. As I mentioned before there were several optical benches. What I found fascinating was since we were using the H band photons from epsilon Aurigae, the visible band photons went to a different optical bench and an observer in France used them remotely to do high resolution hydrogen alpha spectroscopy while Brian got his interferometry data. As I understand it they can also do polarimetry. A very interesting setup.

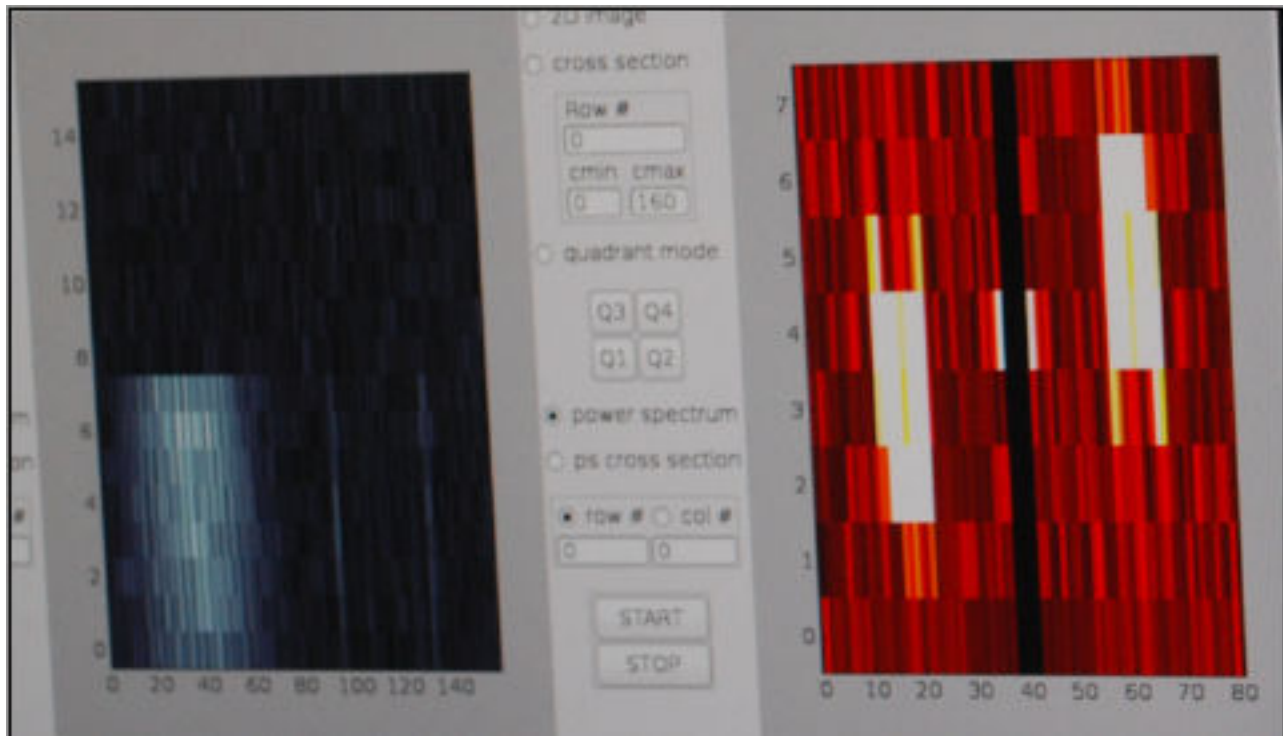
I have a web site of images from the trip. I have over 100 photos. See <http://www.hposoft.cpm.MW.html>. Below are a couple of teasers. from the trip, the 100" Hooker telescope and a couple shots from the CHARA Control Room.



100" Hooker Telescope  
Xiao Che at left and Brian Kloppenborg at right



Four Telescopes Tracking epsilon Aurigae (bottom)  
 Note Telescopes Humidity Chart at Top



Left - Fringes on Detector from 4 Telescopes  
 Right - Fourier Transforms of the Fringes

# IMPORTANT NOTICES

## Data Copyright

Data in this and other Newsletters and on the Campaign web site are provided for viewing and downloading. Use of any data in any papers requires approval from the observer(s). Please contact me at [phxjeff@hposoft.com](mailto:phxjeff@hposoft.com) or the specific observer(s) for more information and permission.

\*\*\*\*\*

## Standard Deviation versus Standard Error

There has been some discussion about whether to use standard deviation or standard error when reporting photometric observational data.

It is preferred that photometric observations include a standard deviation of at least three data points for each observed band for the session. The purpose is not to report an error, which is actually not what is important, but to give an idea of the quality of the observation and an idea of the data spread. That is all it does and all that it needs to do.

Standard error is the standard deviation divided by the square root of the number of samples. By have a large number of samples the standard can be much less than the standard deviation, yet the data spread can be the same. These means that while the standard error may look very good and much better than someone else's standard deviation, it is very misleading.

Please submit photometric data as an average of at least three data points with a standard deviation of the data. Thank you!

\*\*\*\*\*

## Yahoo Epsilon Aurigae Chat List Forum

As mentioned in the last Newsletter, we have started a chat list forum to enhance our communications. Lots of interesting things are happening and many time dependent. The Epsilon Aurigae Chat list will allow near instantaneous communication with everyone who is interested in the project. It's free and to sign up just go to

**<http://tech.groups.yahoo.com/EpsilonAurigae/>**

and sign up.

# Photometry Report

by  
**Jeffrey Hopkins**  
**Hopkins Phoenix Observatory**

Previous Newsletters listed ingress data and this Newsletter will list data beginning approximately just before second contact or RJD = 5180. This will help reduce the amount of data in the Newsletters.

## Plot Observer Key

**CH** - Colin Henshaw, Tabuk, Saudi Arabia  
**DES** - Des Loughney, Edinburgh, Scotland, UK  
**EAO** - Elizabeth Observatory of Athens, Iakovos Marios Strikis, Haldrf (Athens) Greece  
**EGO** - East Greenwood Observatory, Charles Hofferber, East Grand Forks, Minnesota, USA  
**EUO** - Ege University Observatory, Serdar Evren, Izmir, Turkey  
**FJM** - Frank J. Melillo, Holtsville, New York, USA  
**GHO** - Golden Hill Observatory, Richard Miles, Dorset, England  
**GO** - Laurent Corp, Garden Observatory, Rodez, France  
**GS** - Gerard Samolyk, Greenfield, Wisconsin, USA  
**GVO** - Grand View Observatory, Brian E. McCandless, Elkton, MD. USA  
**HPO** - Hopkins Phoenix Observatory, Jeff Hopkins, Phoenix, Arizona. USA  
**JBO** - Jim Beckmann Observatory, Paul J. Beckmann, Mendota Heights, MN. USA  
**JESO** - Jalna Education Society Observatory, Dr. Mukund Kurtadikar, Maharashtra, India  
**KO** - Hans-Goran Lindberg, Kaerrbo Observatory, Skultuna, Sweden  
**LO** - Lindarberg Observatory, Snaevarr Gudmundsson, Hafnarfjordur, Iceland  
**MSO** - Arvind Paranjpye, MVS IUCAA Observatory, Ganeshkhind Pune, India  
**NKO** - Nils Karlsen, Nils Karlsen Observatory, Umea, Sweden  
**NPO** - Gary Frey, North Pines Observatory, Mayer, Arizona. USA  
**RES** - Dr. Robert E. Stencel, University of Denver, Denver, Colorado. USA  
**RLO** - Roosbeek Lake Observatory, Hubert Hautecler, Boutersem Brabant, Belgium  
**SGGO** - S. Giovanni Gatano al Observatory, Tiziano Colombo, Pisa, Italy  
**TP** - Tom Pearson, Virginia Beach, Virginia, USA  
**VO** - Thomas Karlsson, Varberg Observatory, Varberg, Sweden  
**WWC**- Donald Collins, Warren Wilson College, Ashville, North Carolina, USA

**Note:** Full resolution images of the following plots can be seen at:

V Band Plot:

<http://www.hposoft.com/Plots09/VFall09.jpg>

UB Band Plots:

<http://www.hposoft.com/Plots09/UBFall09.jpg>

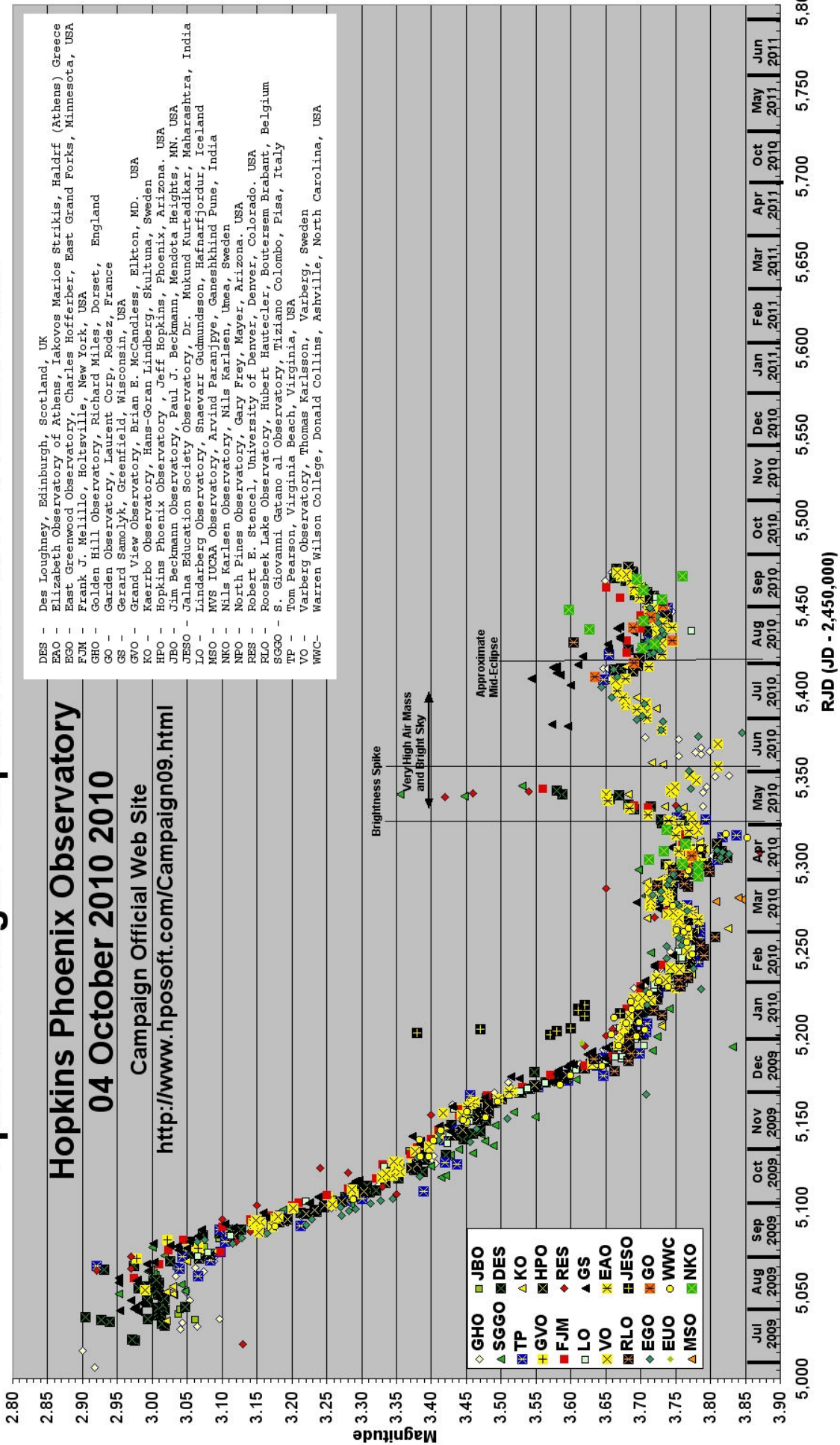
RI Band Plots:

<http://www.hposoft.com/Plots09/RIFall09.jpg>



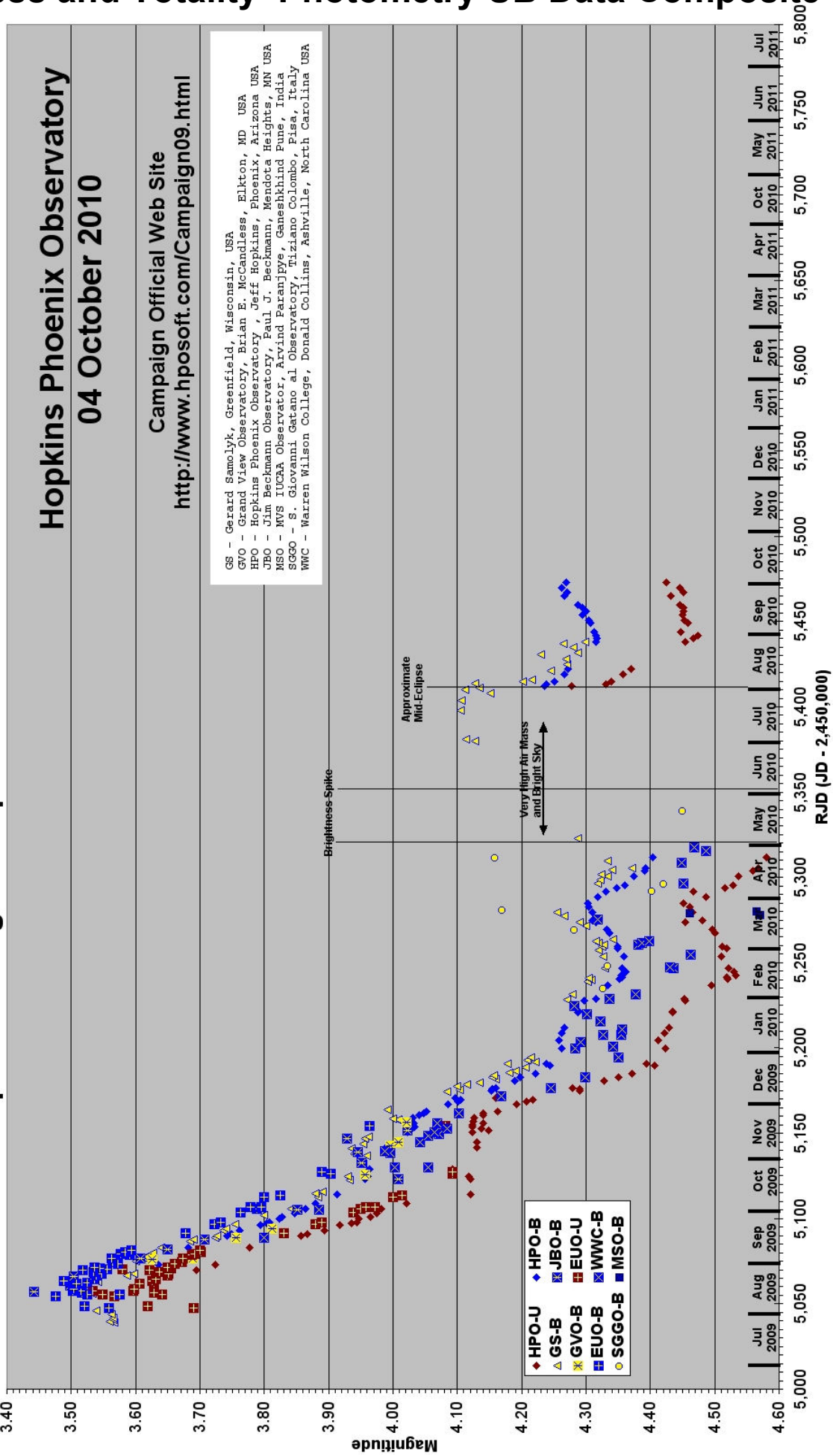
# Ingress and Totality Photometry V Data Composite Plot

## Epsilon Aurigae Eclipse 2009/2011 V Band Data



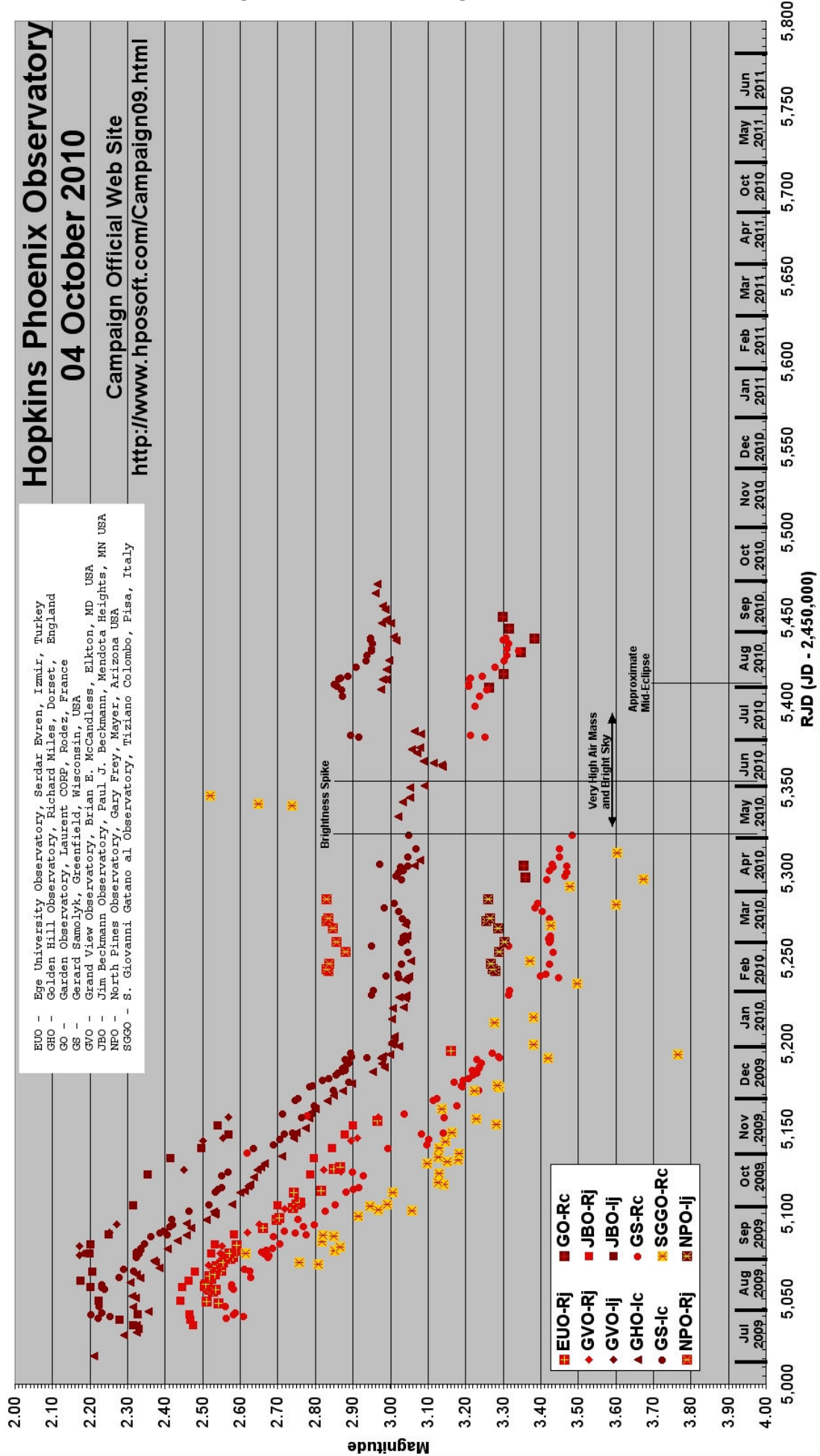
# Ingress and Totality Photometry UB Data Composite Plot

## Epsilon Aurigae Eclipse 2009/2011 B & U Band Data



# Ingress and Totality Photometry RI Data Composite Plot

## Epsilon Aurigae Eclipse 2009/2011 R & I Band Data



# Photometric Observers

**Note:** Bold data are data submitted since the last Newsletter.

## **Colin Henshaw (CH)**

Tabuk, Saudi Arabia

Canon 30D with Carl Zeis 135mm lens

Eta Aurigae Comparison V= 3.18

Note: Data not transformed or extinction corrected/

UT Date	RJD	V
02 <b>March 2008</b>	<b>4528.2</b>	<b>3.1146</b>
18 <b>March 2008</b>	<b>4544.2</b>	<b>3.191</b>
28 <b>March 2008</b>	<b>4554.2</b>	<b>3.1951</b>
01 <b>October 2008</b>	<b>4741.5</b>	<b>3.137</b>
09 <b>October 2008</b>	<b>4749.4</b>	<b>3.049</b>
16 <b>October 2008</b>	<b>4756.5</b>	<b>3.1633</b>
23 <b>October 2008</b>	<b>4763.4</b>	<b>3.1777</b>
30 <b>October 2008</b>	<b>4770.5</b>	<b>3.1853</b>
06 <b>November 2008</b>	<b>4777.3</b>	<b>3.1581</b>
16 <b>November 2008</b>	<b>4787.4</b>	<b>3.1999</b>
26 <b>November 2008</b>	<b>4797.3</b>	<b>3.105</b>
07 <b>December 2008</b>	<b>4813.5</b>	<b>3.149</b>
17 <b>December 2008</b>	<b>4818.4</b>	<b>3.1355</b>
24 <b>December 2008</b>	<b>4825.4</b>	<b>3.1788</b>
02 <b>January 2009</b>	<b>4834.2</b>	<b>3.0717</b>
12 <b>January 2009</b>	<b>4844.3</b>	<b>3.1248</b>
29 <b>January 2009</b>	<b>4861.4</b>	<b>3.1497</b>
07 <b>February 2009</b>	<b>4870.3</b>	<b>3.1601</b>
17 <b>February 2009</b>	<b>4880.3</b>	<b>3.2056</b>
01 <b>March 2009</b>	<b>4892.3</b>	<b>3.3209</b>
15 <b>March 2009</b>	<b>4906.3</b>	<b>3.2293</b>
23 <b>March 2009</b>	<b>4914.2</b>	<b>3.2612</b>
29 <b>March 2009</b>	<b>4920.3</b>	<b>3.2666</b>
08 <b>April 2009</b>	<b>4930.2</b>	<b>3.1913</b>
19 <b>August 2009</b>	<b>5063.5</b>	<b>3.0459</b>
27 <b>August 2009</b>	<b>5071.5</b>	<b>3.1444</b>
01 <b>September 2009</b>	<b>5076.5</b>	<b>3.1813</b>
04 <b>September 2009</b>	<b>5079.5</b>	<b>3.0664</b>
10 <b>September 2009</b>	<b>5085.6</b>	<b>3.2851</b>
14 <b>September 2009</b>	<b>5089.5</b>	<b>3.2804</b>
14 <b>September 2009</b>	<b>5089.5</b>	<b>3.2759</b>
17 <b>September 2009</b>	<b>5092.6</b>	<b>3.279</b>
22 <b>September 2009</b>	<b>5097.5</b>	<b>3.3014</b>
29 <b>September 2009</b>	<b>5104.5</b>	<b>3.4009</b>
03 <b>October 2009</b>	<b>5108.5</b>	<b>3.3809</b>
07 <b>October 2009</b>	<b>5112.5</b>	<b>3.4242</b>
12 <b>October 2009</b>	<b>5117.5</b>	<b>3.4589</b>
22 <b>October 2009</b>	<b>5127.5</b>	<b>3.4804</b>
28 <b>October 2009</b>	<b>5133.5</b>	<b>3.527</b>
02 <b>November 2009</b>	<b>5138.4</b>	<b>3.5014</b>
09 <b>November 2009</b>	<b>5145.4</b>	<b>3.5336</b>

### Colin Henshaw (continued)

13 November 2009	5149.4	3.5431
17 November 2009	5153.4	3.5167
22 November 2009	5158.3	3.5166
22 November 2009	5138.3	3.5436
25 November 2009	5161.4	3.5521
29 November 2009	5165.3	3.6166
04 December 2009	5170.3	3.6394
10 December 2009	5176.4	3.7438
15 December 2009	5181.3	3.6791
24 December 2009	5190.3	3.7968
26 December 2009	5192.3	3.7682
31 December 2009	5197.3	3.7891
04 January 2010	5201.3	3.8345
07 January 2010	5204.3	3.8083
11 January 2010	5208.3	3.814
22 January 2010	5219.3	3.8635
28 January 2010	5225.2	3.7918
04 February 2010	5232.2	3.8572
08 February 2010	5236.3	3.9291
13 February 2010	5241.3	3.9722
16 February 2010	5244.3	3.9246
19 February 2010	5247.3	3.919
24 February 2010	5252.3	3.9429
01 March 2010	5257.3	3.9027
03 March 2010	5259.3	3.8959
07 March 2010	5263.3	3.9143
17 March 2010	5273.2	3.9202
27 March 2010	5283.2	3.8709
30 March 2010	5286.3	3.9443
31 March 2010	5287.3	3.8795
05 April 2010	5292.2	3.8853
06 April 2010	5293.2	3.9266
12 April 2010	5299.2	3.9748
16 April 2010	5303.2	3.9027
20 April 2010	5307.2	3.9224
24 April 2010	5311.2	3.9712
02 May 2010	5319.2	3.9726

RJD = JD - 2,450,000

### Des Loughney (DES)

Edinburgh, Scotland, UK

Canon DSLR . 200 ISO . f4 . 85 mm lens. Exposure 5 seconds

Eta Aurigae used as the comparison star at  $V = 3.18$

Des uses a remote switch to activate the Canon 200 Digital Single Lens Reflex (DSLR) camera with 85 mm lens. He takes between 10 and 20 exposures stacks and processes 5 sets of them with AIP4WIN.

RJD	Date UT	V Mag	SD
5323.419	06/07 May 2010	3.731	0.022
5324.398	07/08 May 2010	3.761	0.005
5325.4012	08/09 May 2010	3.729	0.024
5331.41	14/15 May 2010	3.691	0.002
5333.409	16/17 May 2010	3.714	0.027
5334.406	17/18 May 2010	3.683	0.032

**Des Loughney (continued)**

5337.41	20/21 May 2010	3.656	0.019
5339.415	22/23 May 2010	3.669	0.035
5340.413	23/24 May 2010	3.588	0.023
5342.41	25/26 May 2010	3.579	0.005
5407.609	29/30 July 2010	3.676	0.017
5413.613	04/05 August 2010	3.672	0.007
5419.61	10/11 August 2010	3.697	0.014
5424.5691	16/17 August 2010	3.683	0.038
<b>5427.583</b>	<b>18/19 August 2010</b>	<b>3.707</b>	<b>0.012</b>
<b>5429.59</b>	<b>20/21 August 2010</b>	<b>3.729</b>	<b>0.008</b>
<b>5430.59</b>	<b>21/22 August 2010</b>	<b>3.726</b>	<b>0.007</b>
<b>5433.544</b>	<b>24/25 August 2010</b>	<b>3.716</b>	<b>0.009</b>
<b>5435.385</b>	<b>26/27 August 2010</b>	<b>3.710</b>	<b>0.009</b>
<b>5438.581</b>	<b>29/30 August 2010</b>	<b>3.736</b>	<b>0.009</b>
<b>5439.595</b>	<b>30/31 August 2010</b>	<b>3.728</b>	<b>0.006</b>
<b>5442.577</b>	<b>02/03 September 2010</b>	<b>3.715</b>	<b>0.008</b>
<b>5451.59</b>	<b>11/12 September 2010</b>	<b>3.719</b>	<b>0.010</b>
<b>5455.708</b>	<b>15/16 September 2010</b>	<b>3.719</b>	<b>0.011</b>
<b>5456.485</b>	<b>16/17 September 2010</b>	<b>3.692</b>	<b>0.014</b>
<b>5457.61</b>	<b>17/18 September 2010</b>	<b>3.703</b>	<b>0.004</b>
<b>5464.492</b>	<b>24/25 September 2010</b>	<b>3.679</b>	<b>0.010</b>
<b>5465.525</b>	<b>25/26 September 2010</b>	<b>3.680</b>	<b>0.008</b>
<b>5466.481</b>	<b>26/27 September 2010</b>	<b>3.663</b>	<b>0.023</b>
<b>5469.375</b>	<b>29/30 September 2010</b>	<b>3.689</b>	<b>0.006</b>
<b>5471.494</b>	<b>01/02 October 2010</b>	<b>3.665</b>	<b>0.009</b>
<b>5474.477</b>	<b>03/04 October 2010</b>	<b>3.683</b>	<b>0.007</b>

RJD = JD - 2,450,000

**Iakovos Marios Stkis, Elizabeth Observatory of Athens (EAO)**

Haldrf (Athens) Greece

ATIC Monochrome CCD Camera with 55 mm lens at f 6.3, 30 images, 9 second exposures

UT Date	RJD	V	SD
12/13 April 2010	5299.3368	3.783	0.003
13/14 April 2010	5300.3403	3.789	0.003
18/19 April 2010	5305.3021	3.780	0.003
20/21 April 2010	5307.3479	3.775	0.003
23/24 April 2010	5310.3438	3.766	0.003
29/30 April 2010	5316.3563	3.751	0.003
02/03 May 2010	5319.3368	3.769	0.003
05/06 May 2010	5322.3451	3.754	0.003
07/08 May 2010	5324.3403	3.743	0.003
08/09 May 2010	5325.3458	3.740	0.003
11/12 May 2010	5328.3472	3.710	0.003
15/16 May 2010	5332.3507	3.684	0.003
19/20 May 2010	5336.3451	3.653	0.003
<b>29/30 June 2010</b>	<b>5377.5888</b>	<b>3.731</b>	<b>0.012</b>
<b>06/07 July 2010</b>	<b>5384.5992</b>	<b>3.709</b>	<b>0.008</b>
<b>11/12 July 2010</b>	<b>5389.6054</b>	<b>3.694</b>	<b>0.009</b>
<b>18/19 July 2010</b>	<b>5396.6041</b>	<b>3.674</b>	<b>0.009</b>
<b>22/23 July 2010</b>	<b>5400.6061</b>	<b>3.667</b>	<b>0.001</b>
<b>29/30 July 2010</b>	<b>5407.6096</b>	<b>3.679</b>	<b>0.009</b>
<b>05/06 August 2010</b>	<b>5414.6062</b>	<b>3.712</b>	<b>0.009</b>

**Iakovos Marios Stkis (continued)**

12/13 August 2010	5421.6062	3.730	0.015
20/21 August 2010	5429.5749	3.747	0.006
28/29 August 2010	5437.5749	3.745	0.008
30/01 August 2010	5439.5888	3.732	0.003
03/04 September 2010	5443.5985	3.720	0.008
07/08 September 2010	5447.6096	3.712	0.009
14/15 September 2010	5454.5541	3.699	0.009
20/21 September 2010	5460.5576	3.690	0.011
24/25 September 2010	5464.5576	3.687	0.009

RJD = JD - 2,450,000

**Charles Hofferber, East Greenwood Observatory (EGO)**

East Grand Forks, Minnesota, USA

Nikon D100 DSLR , 50mm F1.4 stopped down, Sky Light filter to improve TC

8 sec exposures averaged, Lambda Epsilon V 4.705 / Eta Epsilon V 3.172 comparison.

Double Date	RJD	V	SD	#
14/15 May 2010	5331.6454	3.754	0.010	
26/27 May 2010	5343.6514	3.772	0.050	
05/06 June 2010	5353.6699	3.769	0.040	
25/26 June 2010	5373.8430	3.782	0.047	
27/28 June 2010	5375.8513	3.845	0.014	
29/30 June 2010	5377.8591	3.729	0.027	
04/05 July 2010	5382.8643	3.732	0.032	
05/06 July 2010	5383.8648	3.695	0.005	
07/08 July 2010	5385.8667	3.702	0.005	
14/15 July 2010	5392.8834	3.705	0.011	
18/19 July 2010	5396.8769	3.658	0.020	
24/25 July 2010	5402.8666	3.644	0.012	
30/21 July 2010	5408.8623	3.667	0.013	
03/04 August 2010	5412.8968	3.661	0.009	
07/08 August 2010	5416.8970	3.689	0.007	
12/13 August 2010	5421.7909	3.713	0.011	
13/14 August 2010	5422.8345	3.719	0.016	
14/15 August 2010	5423.8506	3.728	0.012	
16/17 Aug 2010	5425.8878	3.710	0.009	
18/19 Aug 2010	5427.9131	3.706	0.018	
20/21 Aug 2010	5429.8819	3.711	0.027	
21/22 Aug 2010	5430.8936	3.725	0.011	
22/23 Aug 2010	5431.9024	3.728	0.016	
24/25 Aug 2010	5433.9141	3.733	0.013	
26/27 Aug 2010	5435.9001	3.730	0.006	
30/31 Aug 2010	5439.9070	3.725	0.010	
03/04 Sep 2010	5443.9049	3.724	0.014	
07/08 Sep 2010	5447.9228	3.715	0.013	
08/09 Sep 2010	5448.8974	3.713	0.018	

RJD = JD - 2,450,000

**Gerard Samolyk (GS)**

Greenfield, Wisconsin . USA

Equipment, CCD Camera and Camera Lens , ST9XE + 50 mm lens

Comparison star lambda Aurigae; B= 5.329; V= 4.705; Rc= 4.340; Ic= 3.998

RJD	V	SD	B	SD	Rc	SD	Ic	SD
5322.5919	3.740	0.027	4.287	0.026	3.485	0.022	3.050	0.030
5379.8717	3.596	0.020	4.127	0.055	3.253	0.017	2.916	0.029
5380.8468	3.573	0.034	4.113	0.068	3.214	0.032	2.894	0.048
5397.8906			4.105	0.078	3.227	0.043		
5403.8516	3.600	0.017	4.106	0.028	3.239	0.026	2.874	0.019
5407.8424	3.544	0.027	4.152	0.023	3.258	0.023	2.871	0.025
5409.8715	3.585	0.023	4.112	0.05	3.210	0.021	2.858	0.027
5410.8803	3.579	0.046	4.134	0.025	3.209	0.034	2.852	0.054
5413.8849	3.574	0.035	4.127	0.053	3.211	0.026	2.864	0.023
5414.8851	3.580	0.015	4.202	0.023	3.214	0.026	2.869	0.031
5415.8903	3.610	0.037	4.216	0.018	3.246	0.033	2.888	0.014
5420.8862	3.617	0.008	4.246	0.025	3.279	0.013	2.909	0.012
5424.8890	3.654	0.024	4.270	0.020	3.303	0.011	2.937	0.011
5427.8902	3.653	0.031	4.269	0.018	3.310	0.013	2.938	0.022
5430.7975	3.670	0.057	4.230	0.029	3.341	0.027	2.951	0.015
5431.8909	3.671	0.034	4.288	0.040	3.310	0.013	2.950	0.017

**Gerard Samolyk (continued)**

5434.8858	3.690	0.020	4.280	0.024	3.316	0.011	2.954	0.028
5436.8337	3.666	0.032	4.265	0.038	3.301	0.014	2.949	0.011
5437.8678	3.670	0.040	4.298	0.023	3.309	0.014	2.947	0.022

RJD = JD - 2,450,000

**Frank J. Melillo (FJM)**

Holtsville , NY USA

Lat:+ 40d 40' Long: 73 W Elevation: 100'

Instrument: Optec SSP-3, Telescope: C-8 8"

Gate Time: 10 Seconds

RJD	Date	UT	V Mag	SD
5322.5645	05/06 May 2010	01:35	3.78	0.020
5332.5711	15/16 May 2010	01:40	3.71	0.037
5333.5711	16/17 May 2010	01:40	3.69	0.040
5343.5528	26/27 May 2010	01:15	3.56	0.283
5422.8239	13/14 August 2010	07:75	3.68	0.012
<b>5429.8160</b>	<b>20/21 August 2010</b>	<b>07:35</b>	<b>3.68</b>	<b>0.012</b>
<b>5436.7935</b>	<b>27/28 August 2010</b>	<b>07:10</b>	<b>3.70</b>	<b>0.018</b>
<b>5444.7729</b>	<b>04/05 September 2010</b>	<b>06:35</b>	<b>3.70</b>	<b>0.020</b>
<b>5454.7340</b>	<b>14/15 September 2010</b>	<b>06:40</b>	<b>3.67</b>	<b>0.023</b>
<b>5460.7366</b>	<b>20/21 September 2010</b>	<b>05:25</b>	<b>3.65</b>	<b>0.033</b>

RJD = JD - 2,450,000



**Richard Miles, Golden Hill Observatory (GHO)**

Stourton Caundle, Dorset, England

Latitude/Longitude/Altitude (ASL): West 2.405 deg, North 50.931 deg

Time Zone: GMT = 0 hours

Telescope: 0.06-m Refractor (Takahashi FS60C)

Filters: Johnson V=4.71 for lambda Aurigae, Cousins Ic= 3.99 for HD32655

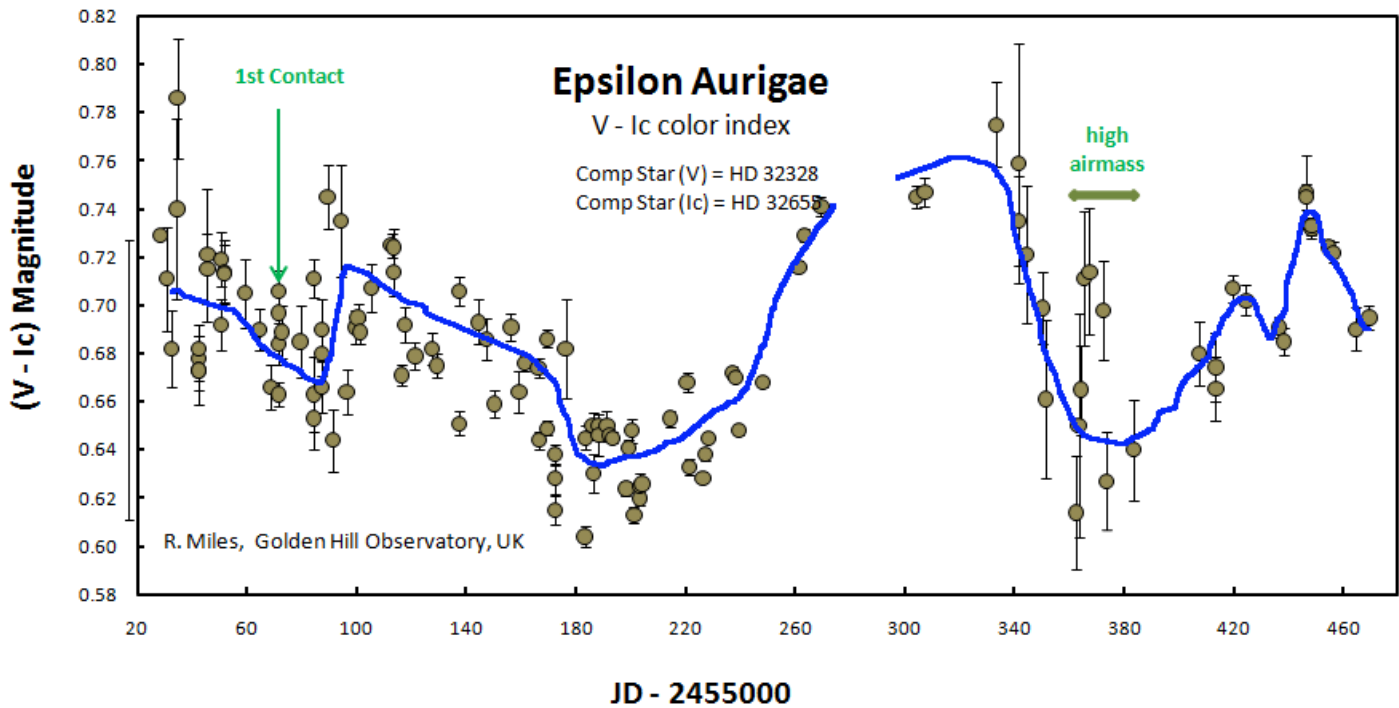
Detector: CCD Camera (Type: Starlight Xpress SXV-H9)

**Note:** as of 01 January 2010 all previous data has been corrected. The following data is an updated list of the correct data. Some V band data was calculated using lambda Aurigae and some HD32655. It appears HD32655 may be variable. For data 94 August 2010 and after the comparison stars used were HD 72328 for V band with magnitude V= 7.64 and HD 32655 for Ic band with Ic= 5.65.

Observation Date	RJD	V mag	SD	Ic	SD
05/06 March 2010	5261.3370	3.763	0.002	3.040	0.004
07/08 March 2010	5263.3090	3.767	0.004	3.044	0.004
13/14 March 2010	5269.4210	3.761	0.005	3.039	0.008
17/18 April 2010	5304.3450	3.803	0.008	3.065	0.007
20/21 April 2010	5307.3460	3.812	0.009	3.079	0.008
16/17 May 2010	5333.3760	3.789	0.019	3.021	0.034
24/25 May 2010	5341.4140	3.789	0.043	3.032	0.060
27/28 May 2010	5344.4230	3.794	0.009	3.053	0.027
02/03 June 2010	5350.4080	3.806	0.012	3.051	0.009
03/04 June 2010	5351.4110	3.827	0.016	3.086	0.030
14/15 June 2010	5362.493	3.754	0.050	3.140	0.055
15/16 June 2010	5363.474	3.787	0.039	3.137	0.096
16/17 June 2010	5364.478	3.779	0.034	3.114	0.043
17/18 June 2010	5365.491	3.799	0.026	3.088	0.023
19/20 June 2010	5367.461	3.786	0.037		
22/23 June 2010	5370.530			3.072	0.056
24/25 June 2010	5372.498	3.754	0.055	3.056	0.010
25/26 June 2010	5373.488	3.706	0.037	3.079	0.018
03/04 July 2010	5381.465			3.081	0.038
05/06 July 2010	5383.457	3.705	0.057	3.065	0.023
29/30 July 2010	5407.523	3.654	0.037	2.974	0.018
<b>04/05 August 2010</b>	<b>5413.460</b>	<b>3.653</b>	<b>0.017</b>	<b>2.980</b>	<b>0.012</b>
<b>10/11 August 2010</b>	<b>5419.519</b>	<b>3.696</b>	<b>0.013</b>	<b>2.989</b>	<b>0.012</b>
<b>15/16 August 2010</b>	<b>5424.560</b>	<b>3.698</b>	<b>0.013</b>	<b>2.996</b>	<b>0.009</b>
<b>27/28 August 2010</b>	<b>5436.509</b>	<b>3.707</b>	<b>0.005</b>	<b>3.016</b>	<b>0.008</b>
<b>29/30 August 2010</b>	<b>5438.473</b>	<b>3.694</b>	<b>0.008</b>	<b>3.009</b>	<b>0.009</b>
<b>06/07 September 2010</b>	<b>5446.430</b>	<b>3.725</b>	<b>0.010</b>	<b>2.978</b>	<b>0.029</b>
<b>06/07 September 2010</b>	<b>5446.476</b>	<b>3.745</b>	<b>0.006</b>	<b>3.000</b>	<b>0.008</b>
<b>08/09 September 2010</b>	<b>5448.488</b>	<b>3.722</b>	<b>0.008</b>	<b>2.990</b>	<b>0.004</b>
<b>08/09 September 2010</b>	<b>5448.515</b>	<b>3.721</b>	<b>0.007</b>	<b>2.989</b>	<b>0.003</b>
<b>14/15 September 2010</b>	<b>5454.546</b>	<b>3.710</b>	<b>0.008</b>	<b>2.986</b>	<b>0.004</b>
<b>16/17 September 2010</b>	<b>5456.507</b>	<b>3.702</b>	<b>0.008</b>	<b>2.980</b>	<b>0.005</b>
<b>24/25 September 2010</b>	<b>5464.4885</b>	<b>3.649</b>	<b>0.009</b>	<b>2.959</b>	<b>0.020</b>
<b>29/30 September 2010</b>	<b>5469.4675</b>	<b>3.659</b>	<b>0.007</b>	<b>2.964</b>	<b>0.009</b>

RJD = JD - 2,450,000

**A plot of V - Ic by Richard Miles**



**Laurent Corp, Garden Observatory (GO),**  
 Rodez, France  
 SBIG ST7 Cooled CCD - temp -20°C  
 50mm f/2.2 non diaphragmé  
 Comparisons: 3.261 / 2.949

Date	RJD	V	SD	Rc	SD
30/31 July 2010	5408.6329	3.635	0.001	3.263	0.001
07/08 August 2010	5416.6153	3.696	0.001	3.301	0.001
<b>20/21 August 2010</b>	<b>5429.6400</b>	<b>3.745</b>	<b>0.001</b>	<b>3.348</b>	<b>0.001</b>
<b>28/29 August 2010</b>	<b>5437.55701</b>	<b>3.689</b>	<b>0.001</b>	<b>3.384</b>	<b>0.001</b>
<b>03/04 September 2010</b>	<b>5443.3460</b>	<b>3.768</b>	<b>0.002</b>	<b>3.3168</b>	<b>0.001</b>
<b>10/11 September 2010</b>	<b>5450.5789</b>	<b>3.732</b>	<b>0.002</b>	<b>3.2976</b>	<b>0.002</b>

RJD = JD - 2,450,000

## Jeff Hopkins, Hopkins Phoenix Observatory (HPO)

Phoenix, Arizona USA

Latitude: 33.5017 North, Longitude: 112.2228 West, Altitude: 1097 feet ASL

Time Zone: MST (UT -7) Telescope: C-8 8" SCT, Filter Set: UBV Standard

Detector: 1P21 PMT in Photon Counting Mode, Differential Photometry

lambda Aurigae as Comparison star: V= 4.71; B= 5.34; U= 5.46

Data transformed and corrected for nightly extinction.

UT Date	RJD	U	SD	B	SD	V	SD
02/03 August 2010	5411.9753	4.2775	0.0394	4.2364	0.0166	3.6890	0.0105
03/04 August 2010	5412.9531	4.3304	0.0108	4.2377	0.0112	3.6626	0.0108
05/06 August 2010	5414.9461	4.3387	0.0118	4.2503	0.0128	3.6956	0.0055
09/10 August 2010	5418.9517	4.3570	0.0058	4.2657	0.0119	3.6981	0.0192
12/13 August 2010	5421.9503	4.3695	0.0168	4.2725	0.0032	3.7147	0.0013
<b>28/29 August 2010</b>	<b>5437.9524</b>	<b>4.4536</b>	<b>0.0081</b>	<b>4.3158</b>	<b>0.0059</b>	<b>3.7319</b>	<b>0.0036</b>
<b>30/31 August 2010</b>	<b>5439.9600</b>	<b>4.4663</b>	<b>0.0096</b>	<b>4.3167</b>	<b>0.0061</b>	<b>3.7378</b>	<b>0.0036</b>
01/02 September 2010	5441.9572	4.4732	0.0057	4.3160	0.0094	3.7385	0.0059
03/04 September 2010	5443.9579	4.4468	0.0206	4.3121	0.0041	3.7365	0.0060
08/09 September 2010	5448.9628	4.4584	0.0056	4.3066	0.0008	3.7238	0.0034
10/11 September 2010	5450.9461	4.4529	0.0075	4.3049	0.0029	3.7230	0.0030
13/14 September 2010	5453.9413	4.4495	0.0036	4.2941	0.0015	3.7113	0.0033
15/16 September 2010	5455.9538	4.4513	0.0061	4.2998	0.0069	3.7158	0.0059
17/18 September 2010	5457.9427	4.4517	0.0074	4.2940	0.0004	3.7095	0.0029
19/20 September 2010	5459.9454	4.4461	0.0106	4.2873	0.0080	3.7029	0.0040
24/25 September 2010	5464.9434	4.4311	0.0095	4.2667	0.0046	3.6858	0.0083
26/27 September 2010	5466.9371	4.4519	0.0135	4.2707	0.0019	3.6855	0.0065
29/30 September 2010	5469.9420	4.4455	0.0037	4.2617	0.0208	3.6871	0.0068
02/03 October 2010	5472.9038	4.4253	0.0069	4.2691	0.0010	3.6828	0.0039

RJD = JD - 2,450,000

## Hans-Goran Lindberg, Kaerbo Observatory (KO)

Skultuna, Sweden

Observation using: (50 mm fl camera lens, HX-516 B/W Camera, y2-filter

Exp 30\*3 sec, .fits images stacked, TeleAuto software, with Superstar)

Comp star lambda Aurigae at V= 4.71

RJD	CV
5322.4167	3.773
5323.4236	3.771
5324.4208	3.769
5327.4583	3.768
5328.4514	3.765
5332.4576	3.761
5333.4722	3.734
5340.4583	3.682
5357.4993	3.732
5358.4931	3.716
5390.4861	3.723
5392.4688	3.708
5396.4958	3.674
5398.4986	3.668
5405.4993	3.659
5414.4988	3.678
5415.4956	3.697

**Hans-Goran Lindberg (continued)**

<b>5428.4444</b>	<b>3.736</b>
<b>5430.4028</b>	<b>3.742</b>
<b>5442.3754</b>	<b>3.722</b>
<b>5444.3333</b>	<b>3.716</b>
<b>5446.3517</b>	<b>3.707</b>
<b>5449.4507</b>	<b>3.708</b>
<b>5452.4458</b>	<b>3.704</b>
<b>5461.5208</b>	<b>3.701</b>

RJD = JD - 2,450,000

**Snaevarr Gudmundsson, Lindarberg Observatory (LO)**

Hafnarfjordur, Iceland

Location (WGS 84) Latitude: +64d 03.740 Longitude: 21d 55.297

Optec SSP-3 on 12" Meade LX 200

<b>Double Date</b>	<b>RJD</b>	<b>V</b>	<b>#</b>	<b>SD</b>	<b>X</b>
16/17 February 2010	5244.4471	3.760	3	0.000	1.10
18/19 February 2010	5245.3728	3.760	3	0.000	1.12
21/22 February 2010	5249.3796	3.755	3	0.006	1.07
22/23 February 2010	5230.4699	3.763	3	0.006	1.08
23/24 February 2010	5251.4296	3.778	3	0.010	1.12
18/19 March 2010	5274.4815	3.753	3	0.019	1.39
25/26 March 2010	5280.4366	3.722	3	0.004	1.30
26/27 March 2010	5281.4619	3.720	3	0.021	1.40
28/29 March 2010	5284.4977	3.733	3	0.036	1.57
30/31 March 2010	5286.4797	3.720	3	0.018	1.52
03/04 April 2010	5290.4443	3.746	3	0.005	1.42
04/05 April 2010	5291.4373	3.744	3	0.009	1.40
07/08 April 2010	5294.4629	3.756	3	0.009	1.54
<b>26/27 August 2010</b>	<b>5435.5852</b>	<b>3.773</b>	<b>3</b>	<b>0.064</b>	<b>1.63</b>
<b>12/13 September 2010</b>	<b>5452.6212</b>	<b>3.723</b>	<b>3</b>	<b>0.008</b>	<b>1.30</b>
<b>15/16 September 2010</b>	<b>5455.5837</b>	<b>3.723</b>	<b>3</b>	<b>0.010</b>	<b>1.39</b>

RJD = JD - 2,450,000

**Nils Karlsen, Nils Karlsen Observatory (NKO)**

Umea, Sweden

Latitude 63, Longitude 19 east,

EOS 1000D, Obj 18-55mm, TeleAuto. Photometri, 2" and 5" exp 6

Double Date	RJD	V mag	SD	UT
20/21 April 2010	5307.4375	3.733	0.072	22:30
24/25 April 2010	5311.4583	3.764	0.199	23:00
02/03 May 2010	5319.4583	3.767	0.225	23:00
<b>15/16 August 2010</b>	<b>5425.4951</b>	<b>3.702</b>	<b>0.184</b>	<b>24:00</b>
<b>17/18 August 2010</b>	<b>5427.5159</b>	<b>3.720</b>	<b>0.091</b>	<b>24:30</b>
<b>26/27 August 2010</b>	<b>5436.4951</b>	<b>3.626</b>	<b>0.132</b>	<b>24:00</b>
<b>01/02 September 2010</b>	<b>5441.4583</b>	<b>3.704</b>	<b>0.132</b>	<b>23:00</b>
<b>06/07 September 2010</b>	<b>5447.4951</b>	<b>3.597</b>	<b>0.084</b>	<b>24:00</b>
<b>13/14 September 2010</b>	<b>5453.4792</b>	<b>3.730</b>	<b>0.090</b>	<b>23:30</b>
<b>19/20 September 2010</b>	<b>5459.4167</b>	<b>3.704</b>	<b>0.140</b>	<b>22:00</b>
<b>25/26 September 2010</b>	<b>5465.4167</b>	<b>3.694</b>	<b>0.009</b>	<b>22:00</b>
<b>27/28 September 2010</b>	<b>5467.3958</b>	<b>3.760</b>	<b>0.006</b>	<b>22:30</b>

RJD = JD - 2,450,000

**Robert E. Stencel, University of Denver (RES)**

Denver, Colorado USA

DSLR V Band Data, Comparison Star eta Aurigae assumed to be V-3.17

RJD	V	SD
5333.64	3.75	0.32
5338.65	3.42	0.16
5340.65	3.46	0.16
5341.66	3.54	0.16
5378.92	3.69	0.05
5392.91	3.67	0.12
5416.94	3.62	0.15

RJD = JD - 2,450,000

**Hubert Hautecler, Roosbeek Lake Observatory (RLO)**

Boutersem , Brabant, Belgium

DSLR Camera - Canon 400D w/85 mm lens

Five sets of 10 images.

UT Date	RJD	V Mag	SD
20/21 August 2010	5428.6271	3.604	0.034

RJD = JD - 2,450,000

**Dr. Tiziano Colombo . S. Giovanni, Gatano al Observatory (SGGO)**

Pisa, Italy

CCD Camera: Mead DSI Pro, 2 sec exposures, 20 images stacked , F 2.8

RJD	B Mag	SD	V Mag	SD	Rc Mag	SD
5339.3403	4.450	0.200	3.447	0.200	2.738	0.200
5340.3403			3.356	0.200	2.648	0.200
5345.3438	5.004	0.200	3.530	0.200	2.519	0.200

RJD = JD - 2,450,000

**Tom Pearson (TP)**

Virginia Beach, Virginia USA

DSLR Canon 20 D, 400 ISO, f5.6, 58 mm lens/70 mm FL,

Exposure 5 seconds 30 Images Stacked

RJD	UT Date	UT	V Mag	SD	X
5325.5444	08/09 May 2010	01:04	3.793	0.027	2.4906
5326.5368	09/10 May 2010	00:53	3.752	0.042	2.3842
5406.8979	28/29 July 2919	09:33	3.646	0.022	1.3200
5411.8833	02/03 August 2010	09:12	3.661	0.024	1.4564
<b>5421..8924</b>	<b>12/13 August 2010</b>	<b>09:25</b>	<b>3.654</b>	<b>0.024</b>	<b>1.2575</b>
<b>5429.8931</b>	<b>20/21 August 2010</b>	<b>09:26</b>	<b>3.712</b>	<b>0.020</b>	<b>1.1724</b>
<b>5437.9021</b>	<b>28/29 August 2010</b>	<b>09:39</b>	<b>3.723</b>	<b>0.020</b>	<b>1.1889</b>
<b>5443.9125</b>	<b>03/04 September 2010</b>	<b>09:54</b>	<b>3.735</b>	<b>0.019</b>	<b>1.0437</b>
<b>5448.9174</b>	<b>08/09 September 2919</b>	<b>10:01</b>	<b>3.738</b>	<b>0.015</b>	<b>1.0234</b>

RJD = JD - 2,450,000

**Thomas Karlsson, Varberg Observatory (VO)**

Varberg, Sweden

Observation using: Canon 450D 6 second exposures EF 35 - 80 mm

Comparison star is lambda Aurigae V= 4.705

Date	RJD	V	SD
05/06 May 2010	5322.4132	3.777	0.013
10/11 May 2010	5327.4000	3.773	0.010
23/24 May 2010	5340.4687	3.650	00000
24/25 May 2010	5341.4674	3.746	0.038
25/26 May 2010	5342.4521	3.742	0.010
27/28 Mat 2010	5344.4604	3.749	0.021
31/01 May/June 2010	5348.4674	3.780	0.039
03/04 June 2010	5351.4583	3.770	0.027
08/09 June 2010	5356.4604	3.810	0.036
21/22 June 2010	5369.3958	3.810	0.032
10/11 July 2010	5388.4576	3.709	0.028
14/15 July 2010	5392.4618	3.678	0.019
15/16 July 2010	5393.4383	3.708	0.020
16/17 July 2010	5394.4556	3.679	0.030
26/27 July 2010	5405.4569	3.668	0.013
27/28 July 2010	5406.4576	3.664	0.012
<b>19/20 August 2010</b>	<b>5428.4785</b>	<b>3.730</b>	<b>0.046</b>
<b>24/25 August 2010</b>	<b>5433.3924</b>	<b>3.724</b>	<b>0.018</b>
<b>26/27 August 2010</b>	<b>5435.3646</b>	<b>3.730</b>	<b>0.006</b>
<b>30/31 August 2010</b>	<b>5439.4035</b>	<b>3.723</b>	<b>0.016</b>
<b>31/01 Aug/Sep 2010</b>	<b>5440.4208</b>	<b>3.727</b>	<b>0.013</b>
<b>01/02 September 2010</b>	<b>5441.4375</b>	<b>3.723</b>	<b>0.015</b>
<b>02/03 September 2010</b>	<b>5442.3840</b>	<b>3.720</b>	<b>0.012</b>
<b>01/05 September 2010</b>	<b>5444.3931</b>	<b>3.714</b>	<b>0.015</b>
<b>07/08 September 2010`</b>	<b>5447.4208</b>	<b>3.716</b>	<b>0.014</b>
<b>08/09 September 2010</b>	<b>5448.3917</b>	<b>3.717</b>	<b>0.018</b>
<b>19/20 September 2010</b>	<b>5459.3979</b>	<b>3.690</b>	<b>0.022</b>
<b>21/22 September 2010</b>	<b>5461.3639</b>	<b>3.698</b>	<b>0.053</b>
<b>27/28 September 2010</b>	<b>5467.3958</b>	<b>3.672</b>	<b>0.006</b>
<b>28/29 September 2010</b>	<b>5468.3826</b>	<b>3.680</b>	<b>0.010</b>
<b>29/30 September 2010</b>	<b>5469.3819</b>	<b>3.666</b>	<b>0.006</b>

RJD = JD - 2,450,000

**Donald Collins, Warren Wilson College (WWC)**

Ashville, North Carolina USA

DSLR - Canon XT1, 35 mm lens , f 5.6

All data corrected for extinction and transformed

<b>RJD</b>	<b>V mag</b>	<b>SD</b>	<b>B mag</b>	<b>SD</b>	<b>X</b>
5296.5418	3.769	0.061	4.452	0.061	1.3442
5308.5583	3.786	0.032	4.448	0.041	1.7305
5315.5557	3.855	0.055	4.487	0.084	1.9435
5317.5500	3.823	0.020	4.468	0.063	1.9146

**RJD = JD - 2,450,000**

**Wasatonic and Guinan**

No information available.

<b>UT Date</b>	<b>RJD</b>	<b>V mag</b>	<b>SD</b>	<b>Wing C Mag</b>	<b>SD</b>
07/08 August 2010	5416.83	3.579	0.006	2.561	0.008

# Spectroscopy Report

by



**Robin Leadbeater**  
**Three Hills Observatory**  
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[robin\\_astro@hotmail.com](mailto:robin_astro@hotmail.com)

## Overview

Since the last newsletter a further 40 amateur spectra have been submitted to the campaign. These are listed in the table below and are accessible on line via the campaign list of spectra. [http://www.threehillsobservatory.co.uk/epsaur\\_spectra.htm](http://www.threehillsobservatory.co.uk/epsaur_spectra.htm)  
 Further information for observers wanting to contribute spectra or researchers wishing to use the data can be found here on the main campaign website <http://www.hposoft.com/EAur09/Robin.html>

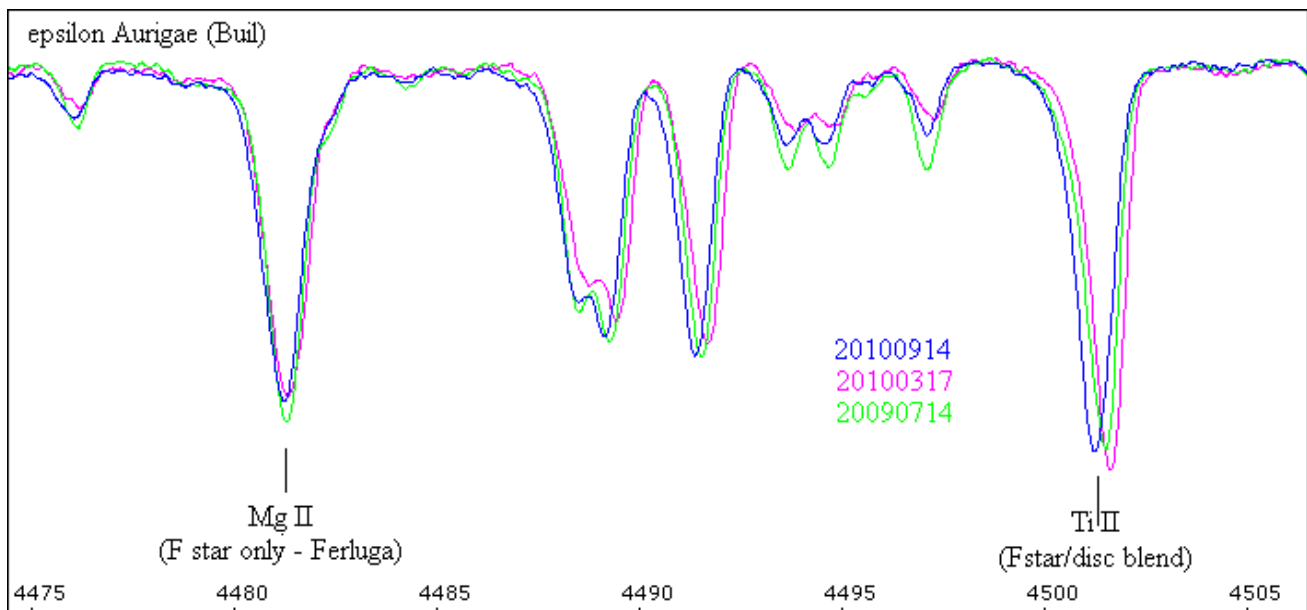
### Spectra 16th August – 2nd October 2010

JD (2400000+)	DATE	TIME (UT)	WAVELENGTH		RANGE (A)	DISP (A/pixel)	OBSERVER
			START (A)	END (A)			
55471.540	02-Oct-10	00:58	6500	6610	110	0.17	<a href="#">Garrel</a>
55471.469	01-Oct-10	23:15	6524	6611	87	0.08	<a href="#">Ribeiro</a>
55469.484	29-Sep-10	23:37	7675	7726	51	0.09	<a href="#">Leadbeater</a>
55469.448	29-Sep-10	22:45	4280	7114	2834	0.1	<a href="#">Buil</a>
55468.453	28-Sep-10	22:52	4280	7114	2834	0.1	<a href="#">Buil</a>
55468.449	28-Sep-10	22:47	6500	6610	110	0.17	<a href="#">Garrel</a>
55466.565	27-Sep-10	01:34	4280	7114	2834	0.1	<a href="#">Buil</a>
55465.512	26-Sep-10	00:17	6500	6610	110	0.17	<a href="#">Garrel</a>
55465.487	25-Sep-10	23:41	4280	7114	2834	0.1	<a href="#">Buil</a>
55464.501	25-Sep-10	00:01	7675	7726	51	0.09	<a href="#">Leadbeater</a>
55463.808	24-Sep-10	07:23	5798	5992	194	0.13	<a href="#">Gorodenski</a>
55460.504	21-Sep-10	00:06	4280	7114	2834	0.1	<a href="#">Buil</a>
55459.487	19-Sep-10	23:41	4280	7114	2834	0.1	<a href="#">Buil</a>



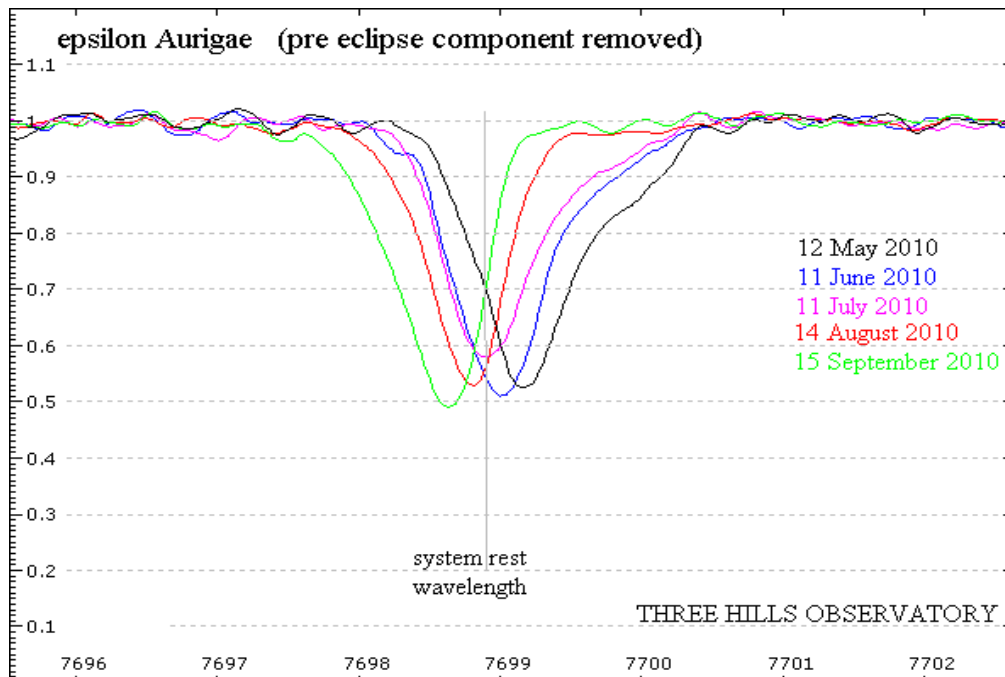
55455.494	15-Sep-10	23:51	7676	7725	49	0.09	<a href="#">Leadbeater</a>
55454.494	14-Sep-10	23:51	4280	7114	2834	0.1	<a href="#">Buil</a>
55454.449	14-Sep-10	22:47	7676	7725	49	0.09	<a href="#">Leadbeater</a>
55454.432	14-Sep-10	22:22	6500	6610	110	0.17	<a href="#">Garrel</a>
55453.486	13-Sep-10	23:40	4280	7114	2834	0.1	<a href="#">Buil</a>
55451.599	12-Sep-10	02:22	7676	7725	49	0.09	<a href="#">Leadbeater</a>
55450.542	11-Sep-10	01:00	4280	7114	2834	0.1	<a href="#">Buil</a>
55450.485	10-Sep-10	23:38	6500	6610	110	0.17	<a href="#">Garrel</a>
55450.433	10-Sep-10	22:24	6539	6603	64	0.08	Lopez
55444.595	05-Sep-10	02:17	4280	7114	2834	0.1	<a href="#">Buil</a>
55443.557	04-Sep-10	01:22	4280	7114	2834	0.1	<a href="#">Buil</a>
55442.556	03-Sep-10	01:21	4280	7114	2834	0.1	<a href="#">Buil</a>
55441.545	02-Sep-10	01:05	4280	7114	2834	0.1	<a href="#">Buil</a>
55440.598	01-Sep-10	02:21	3720	8260	4540	4.5	<a href="#">Mauclaire</a>
55440.549	01-Sep-10	01:10	7674	7724	50	0.09	<a href="#">Leadbeater</a>
55440.543	01-Sep-10	01:02	6500	6610	110	0.17	<a href="#">Garrel</a>
55440.500	01-Sep-10		3800	6700	2900	3	Strikis
55439.574	31-Aug-10	01:47	4280	7114	2834	0.1	<a href="#">Buil</a>
55438.503	30-Aug-10	00:04	7674	7724	50	0.09	<a href="#">Leadbeater</a>
55436.492	27-Aug-10	23:48	6500	6610	110	0.17	<a href="#">Garrel</a>
55434.563	26-Aug-10	01:31	4280	7114	2834	0.1	<a href="#">Buil</a>
55434.555	26-Aug-10	01:19	7674	7724	50	0.09	<a href="#">Leadbeater</a>
55433.480	24-Aug-10	23:31	6500	6610	110	0.17	<a href="#">Garrel</a>
55430.546	22-Aug-10	01:06	6500	6610	110		<a href="#">Garrel</a>
55429.610	21-Aug-10	02:38	4230	7100	2870	2.1	<a href="#">Teyssier</a>
55429.522	21-Aug-10	00:32	7674	7724	50	0.09	<a href="#">Leadbeater</a>
55429.512	21-Aug-10	00:17	6500	6610	110	0.17	<a href="#">Garrel</a>

We are now well into the second half of the eclipse and the lines generated by absorption within the rotating eclipsing disc have moved to the blue side of the system rest wavelength. Most lines are a blend of the F star photospheric component and absorption from the eclipsing object. A few lines (for example the neutral Potassium line at 7699A) have no stellar component so can be used to directly observe the disc material while others (eg Mg 4481) show no absorption from the eclipsing disc so can be used as a reference. The difference in behaviour between blended and purely stellar lines can be seen in these spectra extracted from Echelle spectra produced by Christian Buil



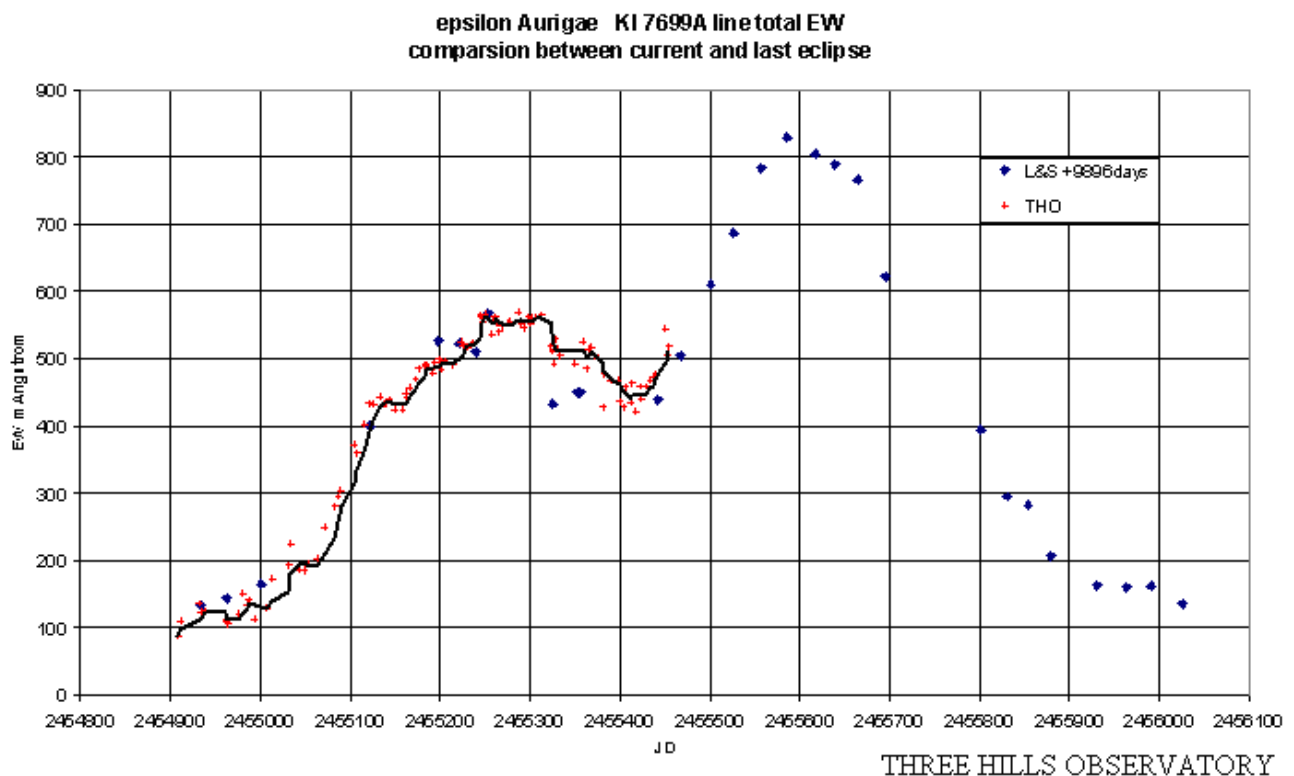
## The 7699A Potassium line

The plot below shows the continuing evolution since NL#18 of the neutral Potassium line profile at 7699A after subtraction of the interstellar component.



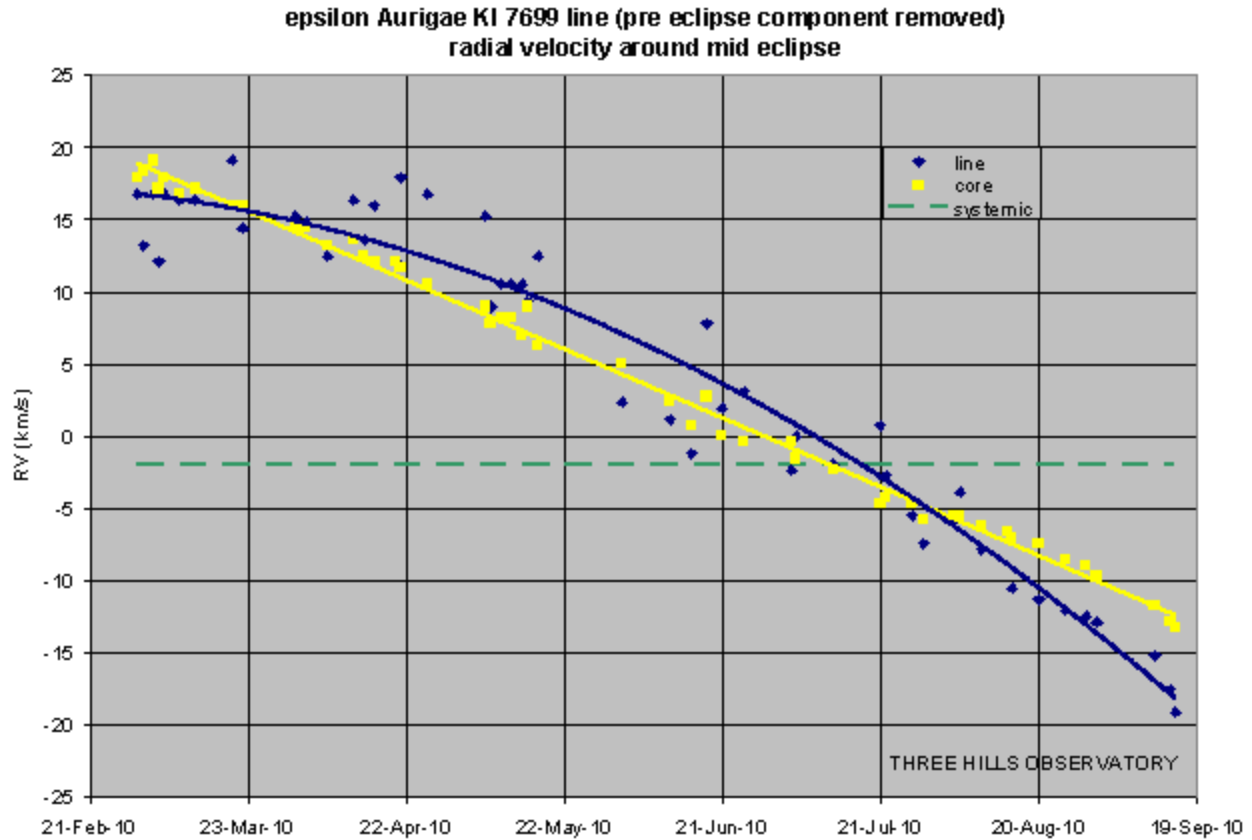
The continuing shift to the blue side of the rest wavelength is clear. The residual absorption wing on the red edge has now also disappeared. There is some sign of a blue wing slowly developing.

The graph below shows the total line strength (ie including the pre eclipse component) for comparison with data produced by Lambert and Sawyer last eclipse



The line intensity has started to increase following the mid eclipse dip. This may have occurred perhaps 10-15 days earlier than seen last eclipse.

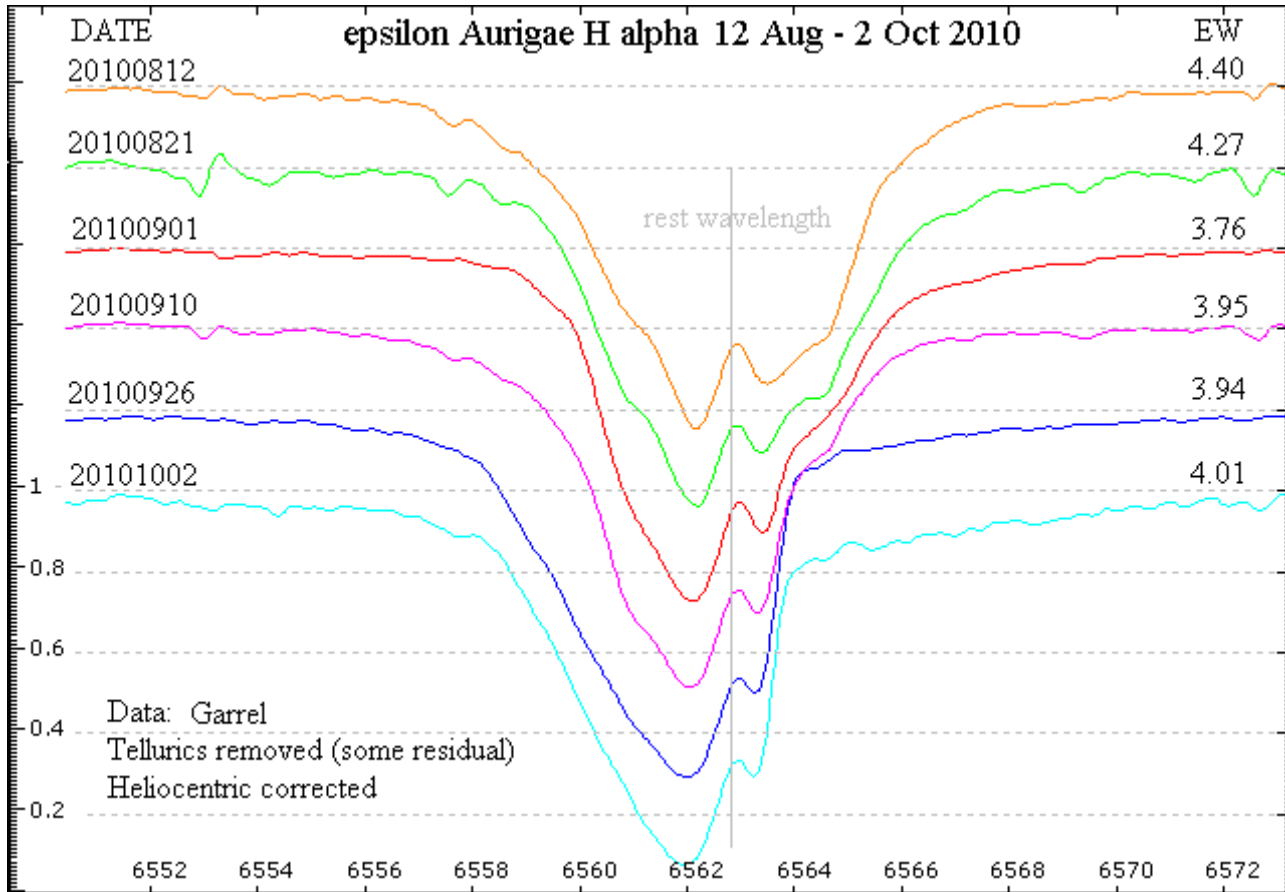
By plotting the radial velocity (RV) of the line it is possible to see when the mean radial velocity of the disc material in front of the F star was centred on the systemic rest wavelength. For a perfectly symmetric system, this would correspond to the mid eclipse point when the disc centre and the F star are aligned along our line of sight.



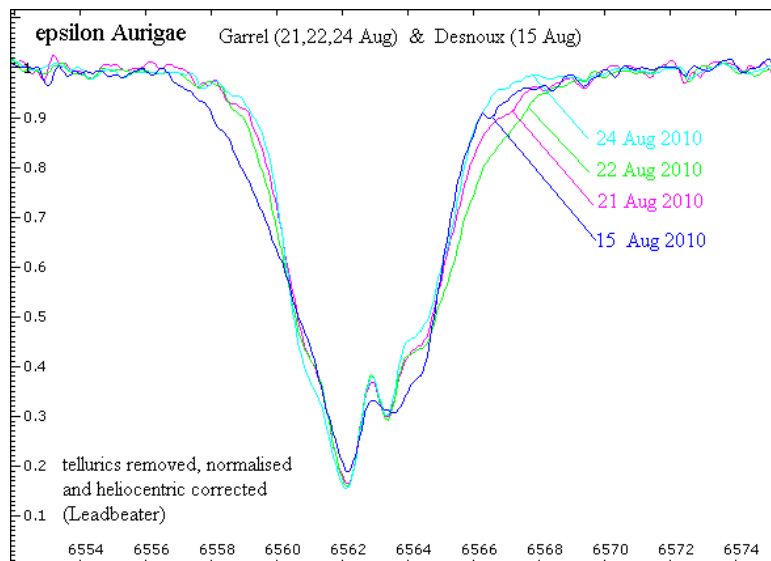
The graph shows the RV for the whole line and just the core, which is less affected by higher RV inner disc material. The whole line RV shows significant scatter due to variability in the outer wings of the line. The residual variations about the fit to the line core however are exceptionally low at typically just  $\pm 1$  km/s. The systemic RV matched the line core RV on 12th July and the whole line RV on 17th July. The point where the two lines cross could be interpreted as the point of maximum symmetry of the line. This occurred on 31st July

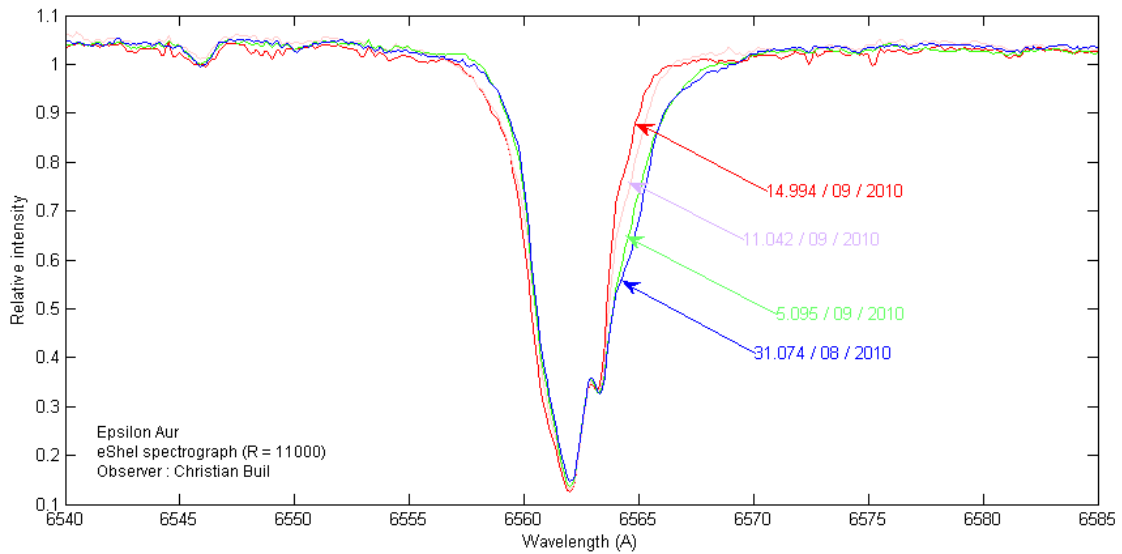
## The H alpha line

The interpretation of the H alpha line is complicated by the out of eclipse emission wing features which vary in magnitude. The absorption core depth is also variable outside eclipse. The general trend as shown by the typical spectra plotted below has been a continuing move to the blue with a loss of the absorption wing on the red edge.

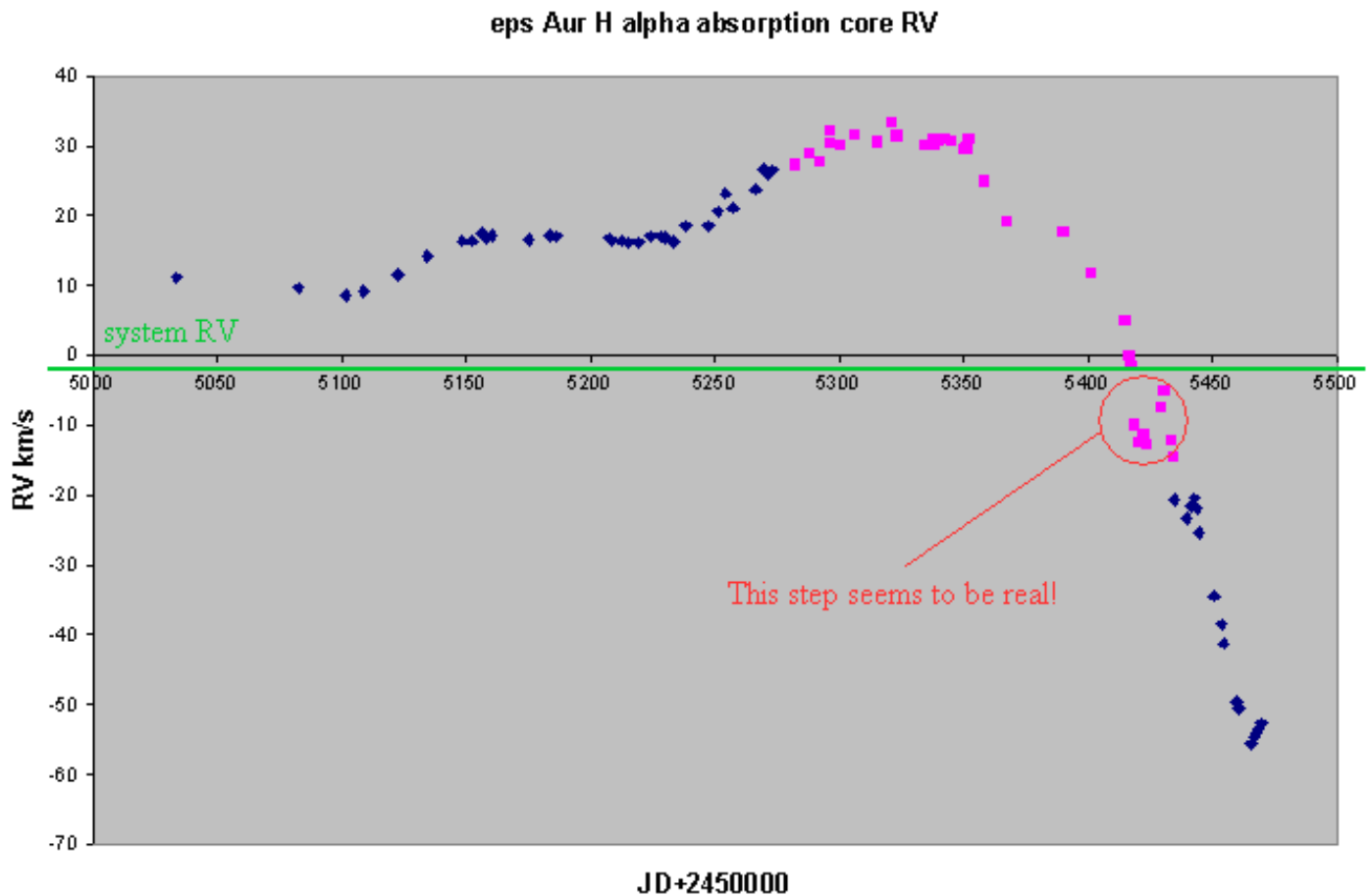


There has been significant variability in the pace of this trend however with even reversals of the general trend taking place within a few days. Two examples are shown below.





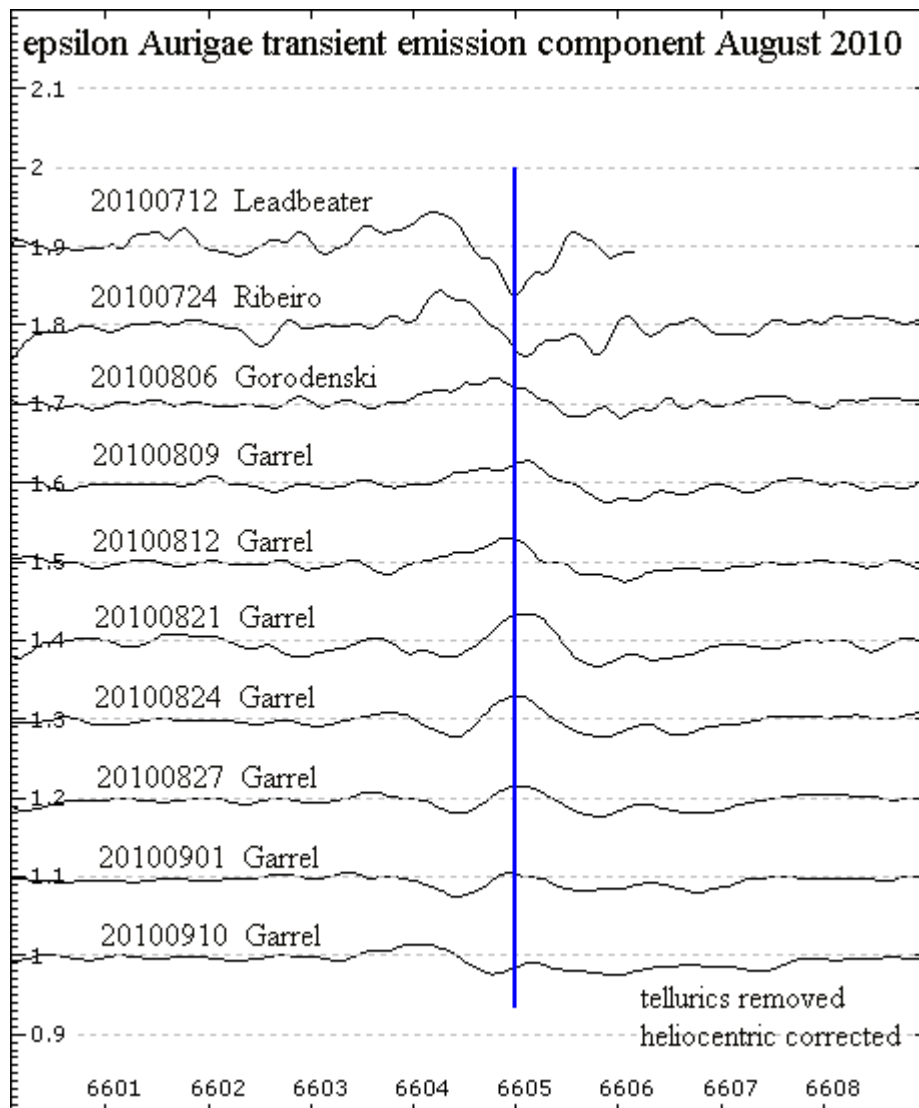
A plot of the radial velocity of the absorption core of the H alpha line (a mix of absorption within the disc and the complex stellar/circumstellar line profile) crossed the systemic RV around JD 2455418 (9<sup>th</sup> August 2010)



The steps/discontinuities in the curve correspond to the line profile variability already mentioned.

## Transient emission at 6605 A

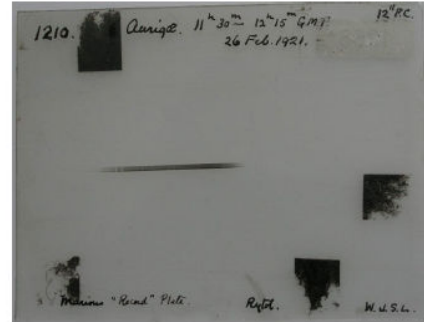
The transient emission at 6605 A seen previously in March 2010 and reported in NL#17 returned for a few weeks during August.



The emission feature may be part of a complex variability in the line profile in this part of the spectrum.

**Report by Olivier Thizy on an epsilon Aurigae spectrum found in the archives at the Norman Lockyer Observatory 5 Sept 2010**

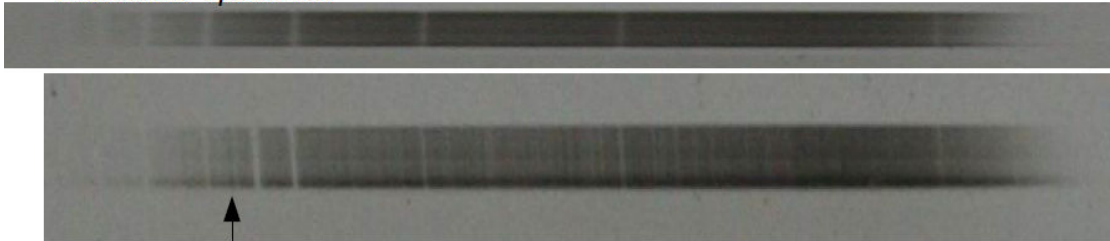
## Epsilon Aurigae spectrum Norman Lockyer Observatory



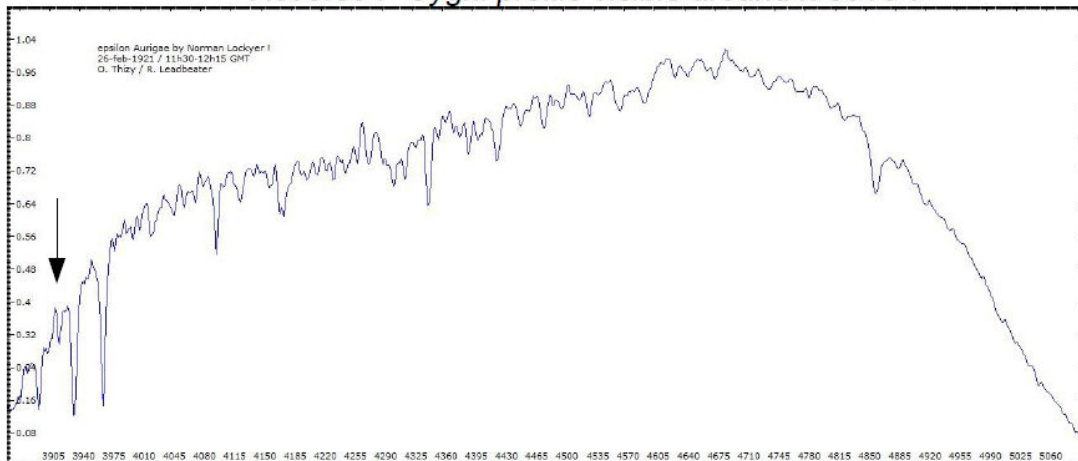
Top: original plate: 26-feb-1921 !  
Thanks to David Strange from NLO  
for making this archive available.

Left: Robin Leadbeater and Olivier Thizy show  
the original glass plate of eps Aurigae spectrum  
at Norman Lockyer Observatory (Sidmouth, UK)  
in front of Lockyer 6.25inch refractor which was  
used to discover helium back in 1868!  
(BAA out-of-London meeting)

Bottom: Alcyone  
reference spectrum



Enlarged spectrum (top) and calibrated (bottom).  
Reverse P Cygni profile visible around  $\lambda$  3915 ?



## From Dr. Bob



**Dr. Robert E. Stencel . Co- Editor**  
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[https://twitter.com/epsilon\\_Aurigae](https://twitter.com/epsilon_Aurigae)

September 2010 featured a variety of observations possible with epsilon Aurigae rising earlier, nightly. The star brightened slightly during the month, somewhat at variance with post-mid-eclipse expectations of fading. Among other key observations made during the month were:

A Hubble Space Telescope far-UV spectrum obtained with the Cosmic Origins Spectrograph, on 9/1/2010. The analysis will help confirm the identification of the central star inside the dark disk, claimed by Hoard, Howell and Stencel to be a hot, B5V star. Follow-on observations are scheduled for Dec 2010 and April 2011.

Next, a second CHARA interferometric imaging run of the fall season at Mt. Wilson resulted in images on the mornings of Sept. 23/24. Jeff Hopkins was able to participate in part of this run. These images are being compiled in the PhD dissertation of Brian Kloppenborg at the University of Denver. Initial analysis shows that the disk is thin enough to allow some light to show from the southernmost regions of the F star.

Finally, a second NASA Infrared Telescope Facility spectrum of the near infrared was obtained with the SpeX instrument, covering the 0.8 to 4 micron region. The goal here involves searching for the appearance of CO bands expected after mid-eclipse.

Much of this work will be featured in a series of papers submitted at the end of September for the January 2011 meeting of the American Astronomical Society in Seattle, WA.

Again, we thank all the observers who are helping to make this campaign the best ever.



## Interesting Papers

### ***CHARACTERISTICS OF AN IMAGING POLARIMETER FOR THE POWELL OBSERVATORY***

by Shannon W. Hall, Department of Astronomy, Whitman College, Walla Walla, WA 99362  
and Gary D. Henson Department of Physics and Astronomy, East Tennessee State University,  
Johnson City, TN 37614

Journal of the Southeastern Association for Research in Astronomy, 4, 2–6, 2010 July 1  
<http://jsara.org/JSARA-V04/ms0401-Hall.pdf>

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#### **ABSTRACT:**

A dual-beam imaging polarimeter has been built for use on the 14-inch Schmidt-Cassegrain telescope at the ETSU Harry D. Powell Observatory. The polarimeter includes a rotating half-wave plate and a Wollaston prism to separate light into two orthogonal linearly polarized rays. A thermoelectrically cooled CCD camera is used to detect the modulated polarized light. We present here measurements of the polarization of polarimetric standard stars. By measuring unpolarized and polarized standard stars we are able to establish the instrumental polarization and the efficiency of the instrument. The polarimeter will initially be used as a dedicated instrument in an ongoing project to monitor the eclipsing binary star, Epsilon Aurigae.

**Subject headings:** Polarization — Stars: eclipsing binaries — Methods: observational — Techniques: photometric, polarimetry

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### ***An Abundance Analysis of the Primary Star of the Peculiar Eclipsing Binary epsilon Aurigae out of the Eclipsing Phase***

by K. Sadakane, et al. (Astronomical Institute, Osaka Kyoiku University, Okayama Japan)  
(Note: Accepted for publication in the Jan 2011 issue of Astronomical Society of Japan)

#### **ABSTRACT:**

A detailed abundance analysis of the primary star of epsilon Aur before the eclipse has been carried out using a very high SN ratio optical region spectrum. An A Iab supergiant HD 81471, presumably a member of the Vela OB association, is used as a reference. We obtained atmospheric parameters (Teff, log g and microturbulence) to be 8025K, 1.0 and 10 km/s and 8050K, 1.0 and 7 km/s for epsilon Aur and HD 81471, respectively. The abundances of Mg, Si, S, Ca, Sc, Ti, Cr and Fe are very close to the solar abundances in both stars. Light elements C and O are underabundant, while N and Na are overabundant in both stars, after correcting for the nonLTE effects. Definite under-abundances of Sr are detected in both stars. Slight but definite overabundances are found in epsilon Aur for the s-process elements Y, Zr and Ba, when compared with the results of HD 81471. Enhancements in abundances of N, Na and s-process elements might indicate the occurrences of thermal dredge-up and the s-process nucleosynthesis in epsilon Aur during the past evolution.

Editor's note: this is a very important new study of the abundances in epsilon Aurigae, using modern NLTE methods and not carefully redone since Castelli 1978. We look forward to subsequent reports from this research team.

\*\*\*\*\*

***A Five-year Spectroscopic and Photometric Campaign on the Prototypical alpha Cygni Variable and A-type Supergiant Star Deneb***

by N. D. Richardson, N. D. Morrison, E. E. Kryukova, S. J. Adelman

Georgia State University, University of Toledo, University of Toledo, The Citadel

**ABSTRACT:**

Deneb is often considered the prototypical A-type supergiant, and is one of the visually most luminous stars in the Galaxy. A-type supergiants are potential extragalactic distance indicators, but the variability of these stars needs to be better characterized before this technique can be considered reliable. We analyzed 339 high resolution echelle spectra of Deneb obtained over the five-year span of 1997 through 2001 as well as 370 Stromgren photometric measurements obtained during the same time frame. Our spectroscopic analysis included dynamical spectra of the H-alpha profile, H-alpha equivalent widths, and radial velocities measured from Si II 6347, 6371. Time-series analysis reveals no obvious cyclic behavior that proceeds through multiple observing seasons, although we found a suspected 40 day period in two, non-consecutive observing seasons. Some correlations are found between photometric and radial velocity data sets, and suggest radial pulsations at two epochs. No correlation is found between the variability of the H-alpha profiles and that of the radial velocities or the photometry. Lucy (1976) found evidence that Deneb was a long period single-lined spectroscopic binary star, but our data set shows no evidence for radial velocity variations caused by a binary companion.

**Reference:** Astronomical Journal

**Status:** Manuscript has been accepted

**Weblink:** <http://arxiv.org/abs/1009.5994>

**Email:** richardson@chara.gsu.edu

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Anyone wishing to contribute to the Newsletter, is most welcome. Please send contributions to me at [phxjeff@hposoft.com](mailto:phxjeff@hposoft.com). Please send spectroscopic data to Robin Leadbeater at [robin@leadbeaterhome.fsnet.co.uk](mailto:robin@leadbeaterhome.fsnet.co.uk) or [robin\\_astro@hotmail.com](mailto:robin_astro@hotmail.com)

Clear Skies!



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