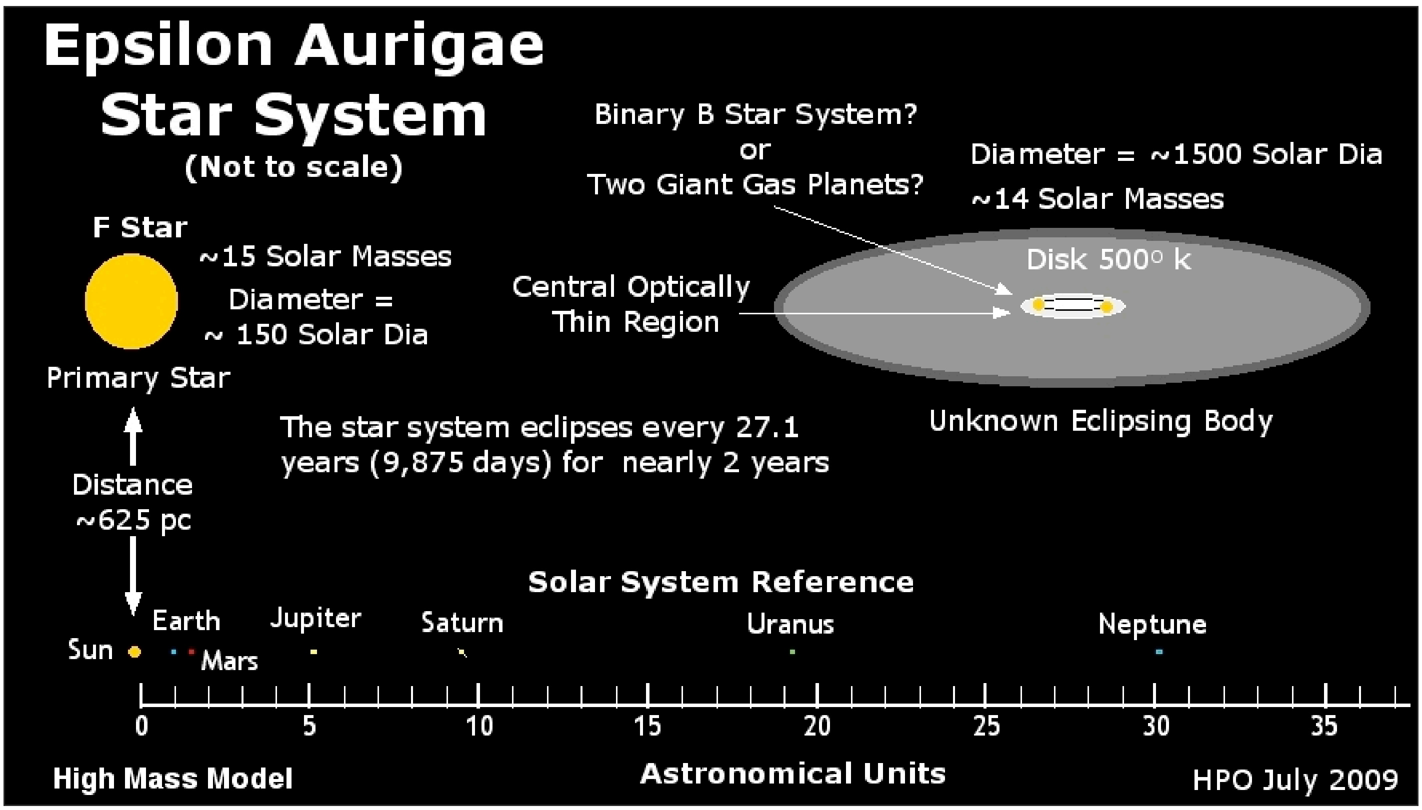
2009/2011
Epsilon Aurigae Eclipse
International Campaign Newsletter #16
Winter 2009/2010
Second Contact



Jeff Hopkins, Editor
Hopkins Phoenix Observatory

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

Campaign Web Site
http://www.hposoft.com/Campaign09.html

see also
https://twitter.com/epsilon_Aurigae

In This Newsletter

Editor's Remarks

Dear Colleagues,

The Campaign now has 55 registered members from 18 countries plus 25 signed up for the Epsilon Aurigae Campaign Yahoo List Forum.

We are now into totality. I have done some preliminary linear regression calculations to determine first and second contact times. These times assume a linear ingress and are dependent on the average out-of-eclipse and average Totality magnitudes. For the average out-of-eclipse magnitudes data from HPO from December 2003 to April 2009 were used. For the average Totality magnitudes, data from the 1982-1984 eclipse were used. For more accurate second contact times we will need to get more data to determine an average totality magnitude. I do not have sufficient data for determining contact times in the RIJH bands.

RJD Dates are JD - 2,400,000

First Contact Estimations
Out-of-Eclipse Averages are assumed to be:
V = 3.0360 B = 3.6050 U = 3.7264
From the Linear Regression Calculation, First Contact:
V Band = 55,056.345 12 August 2009
B Band = 55,054.465 10 August 2009
U Band = 55,054.208 10 August 2009

Second Contact Estimations (Preliminary)
Totality Averages are assumed to be:
V = 3.746 B = 4.305 U = 4.516
These magnitudes will be updated when we have more totality data.
From the Linear Regression Calculation, Second Contact:
V Band = 55,213.003 16 January 2010
B Band = 55,214.268 17 January 2010
U Band = 55,237.185 09 February 2010

Jeff Hopkins, Editor
Hopkins Phoenix Observatory
phxjeff@hposoft.com

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 or the specific observer(s) for more information and permission.

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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!

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Yahoo Epsilon Aurigae Chat List Forum

We have start 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 to stay abreast of the latest developments.

Photometry and Shooting
Precision versus Accuracy

Jeff Hopkins
Hopkins Phoenix Observatory

I like to shoot and even reload my own ammunition. I find an interesting comparison between shooting and photometry.

When I first get a rifle (photometer) I must get familiar with it and understand how everything works. I also must sight-in the rifle (calibrate the photometer).

One of the first things I do is put the rifle in a gun vise and shoot at a target. This is to eliminate the human factor. I aim at the center of the bull and shoot three groups of 3 shots (5 shots if you can afford the extra ammunition) for each type of ammunition I am considering using with the rifle. Even though the ammunition is all the same caliber there can be different weight and bullet designs, and different powder and amounts of powder. If this is done at an outdoor range, one must wait for a calm day with no wind or only shoot when the wind has died down.

Precision

Upon completing the initial firings I will have target with sets of three holes, three sets for each type of ammunition. At this point it is not important where on the target I hit, just the size of the hole groupings. I then note the ammunition type, the maximum spread of each set, minimum spread and average spread. Then for the three sets for each ammunition type I calculate a standard deviation. It can be quickly seen that some ammunition is much more precise than others in this gun. The results is an indication of the precision of the rifle. This is like calibrating a photometer and photometric data. This is also how gun magazines do it.

Accuracy

Next comes the actual sighting-in. After selecting the ammunition, I use only that type. Still using the gun vise, I repeat the 3 shots and note where on the target relative to the center of the bull I hit. I then adjust the sights to move the group toward the center of the bull. Once I have the sights adjust for consistent hit near the center of the target's bullseye, the gun is ready (calibrated). It now has the best accuracy.

Use

The next test is to fire the rifle myself. Here is where my skill comes in. If I do not hit the bullseye, it will not be the rifle's fault. This is where practice and procedure come into play. To be considered a rifleman, one must be able to consistently hit a man-sized target at a distance of 500 yards. There are some rifleman who can consistently hit the same size target at 1,000 yards and further. I am not one of them.

Photometry

I think you can see some parallels with photometry. When you get your photometer you must become familiar with it and do some testing. Depending on the type of photometer, you must calibrate dead time, amplifier gains, and determine the maximum exposure when the data stays linear. You must then also determine the color transformation coefficients and zero points. Nightly you must determine the extinction coefficients. Once you have all that done you are ready to take serious data. You have a calibrated system that is capable of both precision and accuracy.
For single channel photometry (photon counting and analog, e.g., SSP-3, SSP-4 photometers), take three sets of each color and star + sky data, then sky data. Three sets of program star data all

bracketed by comparison star data is taken. Data is reduced to provide 4 comparison star magnitudes for each color , each bracketing program star magnitudes. Now differential magnitudes are calculated and normalized to the standard comparison star magnitude. The resulting three program star magnitude for each color are then averaged and a standard deviation calculated.

Photometric Precision

The reported standard deviation is an indication of the data's precision. The better the condition, your procedure and the behavior of your equipment will determine the precision. Just as with some rifles, some photometers will be more precise than others. Remember, the standard deviation is like a report on how good the bullet grouping are. It says nothing about accuracy or how close to the bullseye you are.

Note:

There has been discussion about whether to use standard deviation or standard error. It is customary with photometry to use standard deviation and not standard error. Standard error is just the standard deviation divided by the square root of the number of samples (or observations), The whole purpose is to give an idea of the data spread or precision of the data. With standard error you can have a poor standard deviation, but by using many observations the standard error goes down. This would then give the appearance of data better than what they really are. Please use standard deviation for your photometric data.

Photometry Accuracy

With the rifle you have a target with a bullseye so you can easily see how accurate you are. Where is the bullseye with photometry?

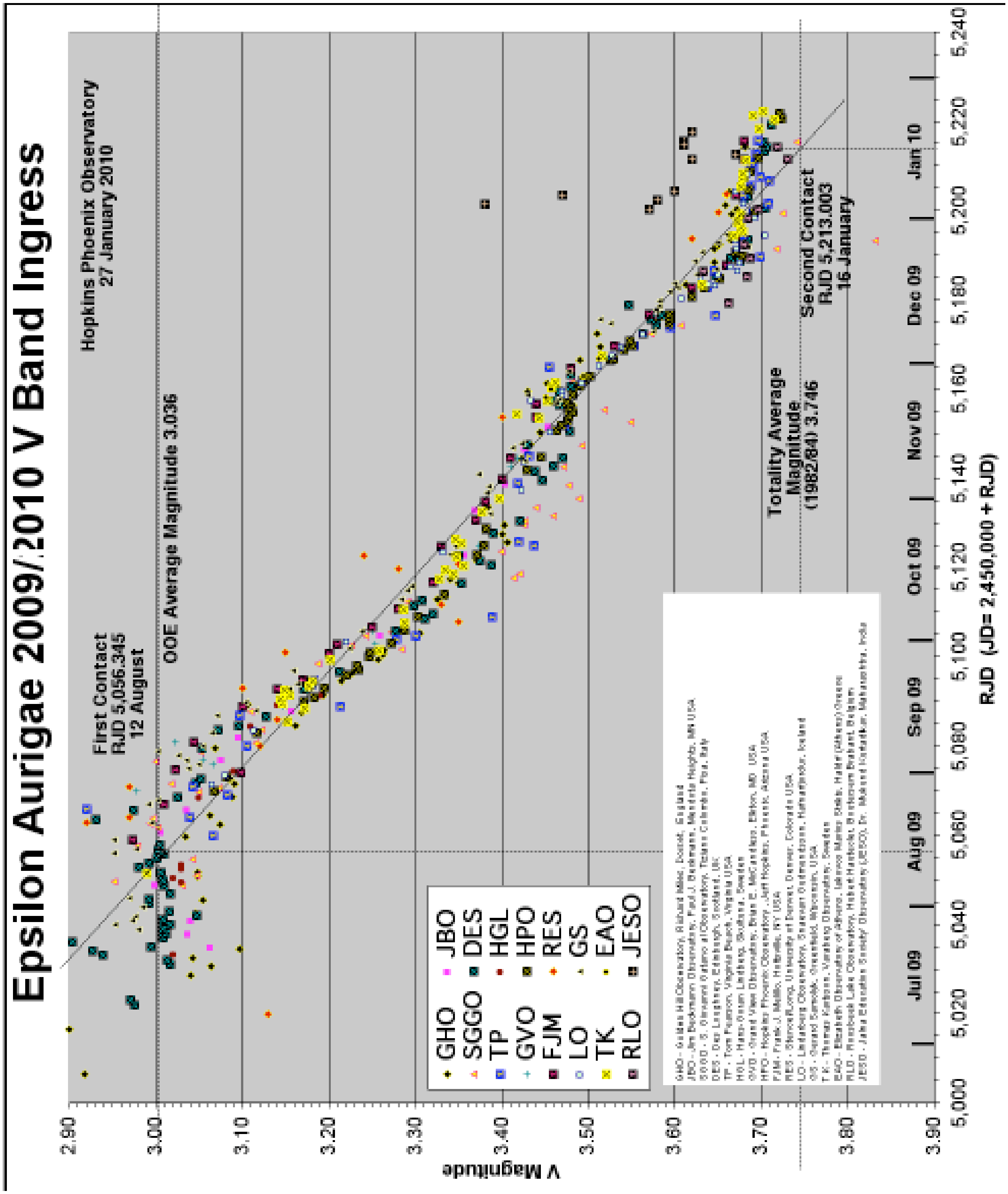
The Epsilon Aurigae Campaign presents and interesting and unique situation. Since many observers using different equipment at close to the same time are making observations, the combined data are a good indication for determining the bullseye. If your data are falling in close to the average of the other observer's data then you are achieving good accuracy and you have developed a good photometric skill. If your data are scattered and far from other data taken about the same time, your procedure or skills may need some improvement.

Conclusion

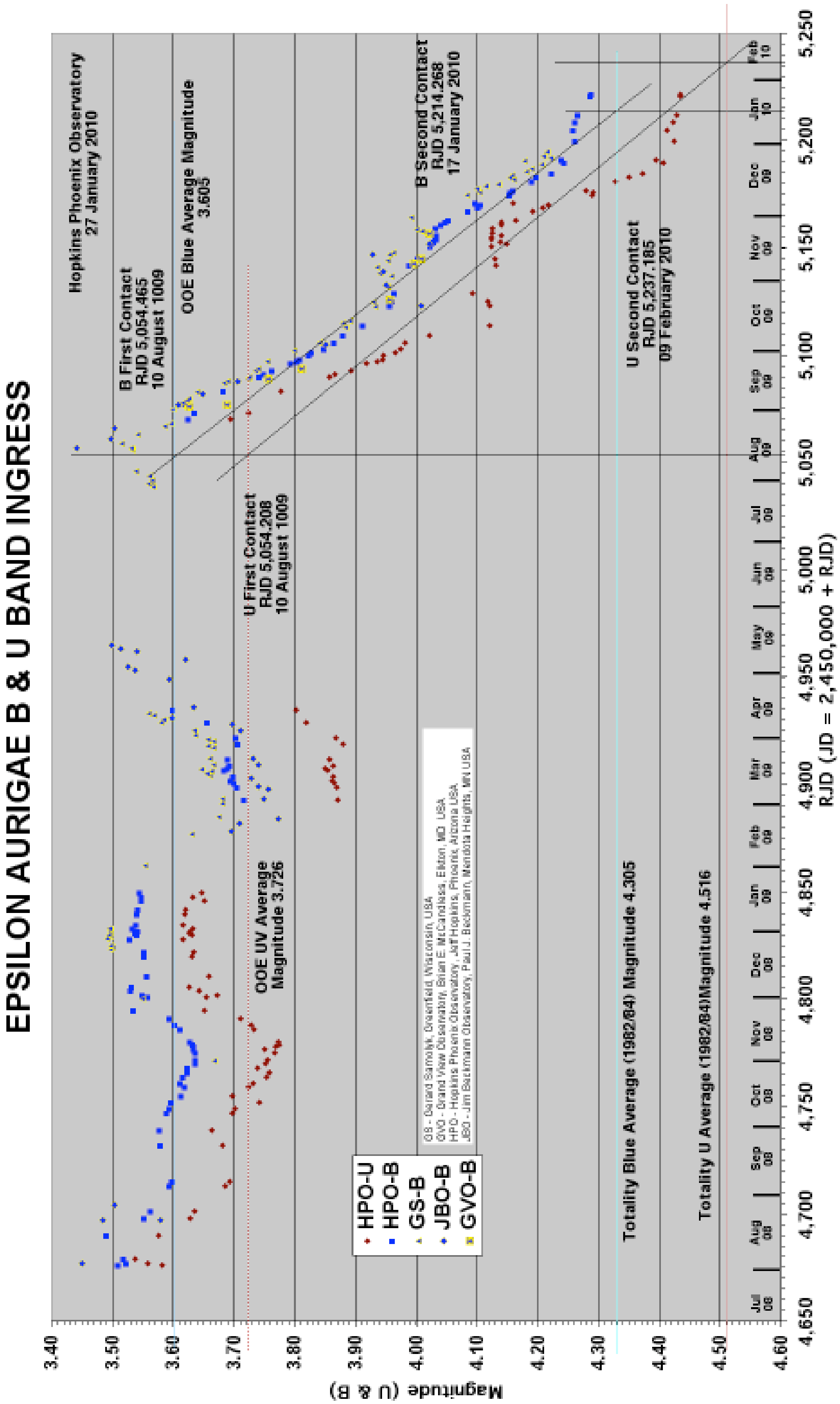
Remember precision is how close your data points are together (how close the bullet holes are) and accuracy is how close your data are to the actual magnitude (how close the bullet holes are to the center of the bullseye).

Just as with the rifle, if you wish to be accurate you must know your equipment, calibrate it, develop a good procedure and practice.

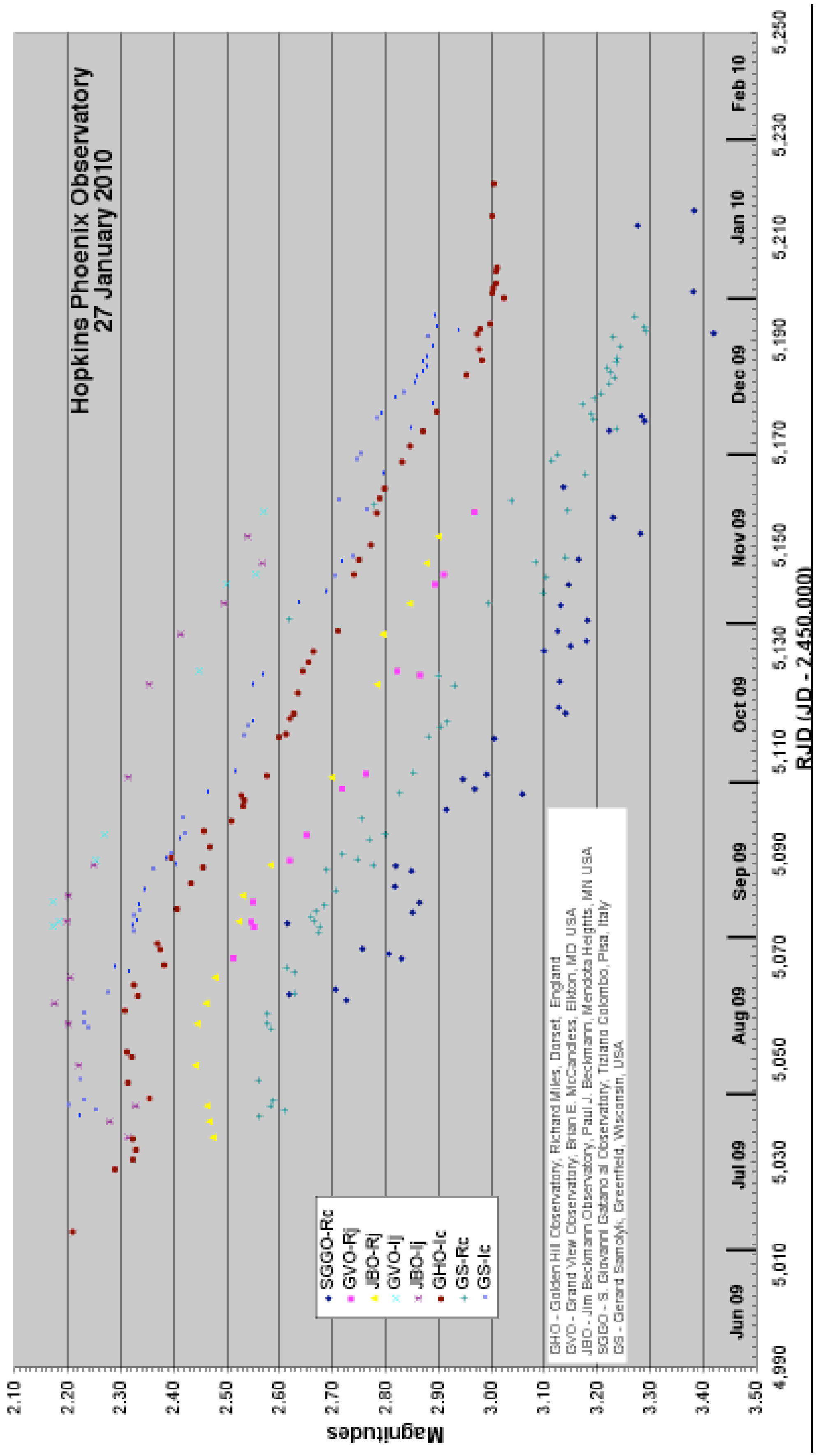
Season Photometry V Data Composite Plot



Season Photometry UB Data Composite Plot



Season Photometry RI Data Composite Plot



Plot Observer Key

GHO - Golden Hill Observatory, Richard Miles, Dorset, England
JBO - Jim Beckmann Observatory, Paul J. Beckmann, Mendota Heights, MN USA
SGGO - S. Giovanni Gatano al Observatory, Tiziano Colombo, Pisa, Italy
DES - Des Loughney, Edinburgh, Scotland, UK
TP - Tom Pearson, Virginia Beach, Virginia USA
HGL - Hans-Goran Lindberg, Skultuna, Sweden
GVO - Grand View Observatory, Brian E. McCandless, Elkton, MD USA
HPO - Hopkins Phoenix Observatory , Jeff Hopkins, Phoenix, Arizona USA
FJM - Frank J. Melillo, Holtsville, NY USA
RES - Stencel/Long, University of Denver, Denver, Colorado USA
LO - Lindarberg Observatory, Snaevarr Gudmundsson, Hafnarfjordur, Iceland
GS - Gerard Samolyk, Greenfield, Wisconsin, USA
TK - Thomas Karlsson, Varaberg Observatory, Sweden
EAO - Elizabeth Observatory of Athens, Iakovos Marios Strikis**,** Haldrf (Athens) Greece
RLO - Roosbeek Lake Observatory, Hubert Hautecler, Boutersem Brabant, Belgium
JESO - Jalna Education Society Observatory, Dr. Mukund Kurtadikar, Maharashtra, India

Note: RJD is Reduced Julian Date, 2,450,000 has been subtracted from the JD.

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

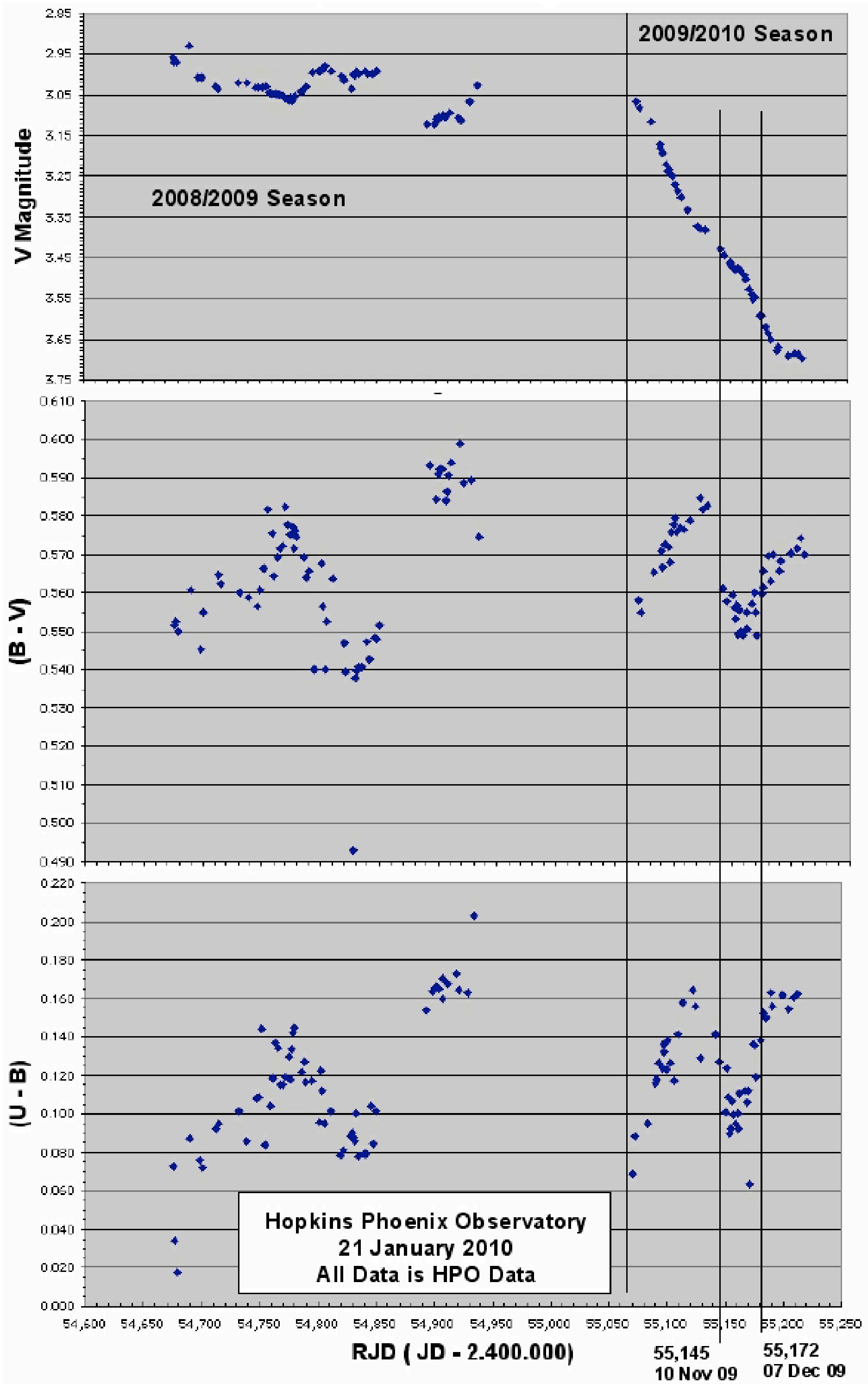
V Band Plot: **http://www.hposoft.com/Plots09/VFall09.jpg**

UB Band Plots: **http://www.hposoft.com/Plots09/UBFall09.jpg**

RI Band Plots: **http://www.hposoft.com/Plots09/RIFall09.jpg**

Note: The next Newsletter (NL #17) will list photometric data for the totality. Ingress and pre-ingress data will be archived on the web site.

Using (B-V) & (U-B) Values to See OOE Variations



One advantage of the (B-V) data is it shows when the OOE (Out-OF-Eclipse) Variations are affecting the V magnitude. This provides a means to separate the effect of the eclipsing body on the brightness. When the (B-V) increases, the V decreases (gets dimmer) when the (B-V) decreases(lower numerical value) the V magnitude increases (gets brighter). The ingress bump in November 2009 V data is most likely due to the OOE variations. One can see that (B-V) data for that period decreased significantly.

2009/2010 Season (Ingress) Photometry Data Summary

Snaevarr Gudmundsson (Hafnarfjordur, Iceland)
Lindarberg Observatory (LO)
Location (WGS 84) Latitude: +64d 03.740 Longitude: 21d 55.297
Optec SSP-3 on 12" Meade LX 200

Double Date	RJD	V	#	SD	X
10/11 April 2009	4927.4696	2.965	4	0.049	1.61
15/16 April 2009	4933.5003	2.975	4	0.021	1.87
27/28 August 2009	5071.5463	3.065	4	0.007	1.86
29/30 August 2009	5073.6379	3.080	4	0.014	1.36
08/09 September 2009	5083.6001	3.113	3	0.006	1.40
18/19 September 2009	5093.5748	3.183	3	0.006	1.57
28/29 September 2009	5103.4978	3.220	3	0.005	1.80
18/19 October 2009	5123.5143	3.332	3	0.052	1.32
01/02 November 2009	5137.4657	3.423	3	0.006	1.35
07/08 November 2009	5143.5305	3.426	3	0.006	1.15
14/19 November 2009	5150.5633	3.456	3	0.015	1.09
21/22 November 2009	5157.5641	3.433	3	0.032	1.08
22/23 November 2009	5158.5932	3.470	3	0.020	1.07
23/24 November 2009	5159.5215	3.470	3	0.010	1.11
25/26 November 2009	5161.4664	3.493	3	0.015	1.18
29/30 November 2009	5165.4386	3.512	3	0.004	1.22
01/02 December 2009	5167.5148	3.528	3	0.005	1.09
03/04 December 2009	5169.5317	3.538	3	0.004	1.08
06/07 December 2009	5172.4310	3.563	3	0.006	1.19
14/15 December 2009	5180.4242	3.608	3	0.012	1.60
17/18 December 2009	5183.4477	3.647	3	0.047	1.12
17/18 December 2009	5183.5820	3.640	3	0.000	1.08
18/19 December 2009	5184.5133	3.630	3	0.006	1.07
18/19 December 2009	5184.5762	3.630	3	0.006	1.80
19/20 December 2009	5185.5838	3.650	3	0.030	1.09
20/21 December 2009	5186.5185	3.673	3	0.043	1.07
21/22 December 2009	5187.5361	3.664	3	0.011	1.07
22/23 December 2009	5188.5052	3.675	3	0.017	1.07
25/26 December 2009	5191.4865	3.672	3	0.008	1.07
26/27 December 2009	5192.5244	3.677	3	0.006	1.07
27/28 December 2009	5193.3420	3.670	3	0.000	1.27
28/29 December 2009	5194.4718	3.705	3	0.049	1.07
29/30 December 2009	5195.5133	3.680	3	0.007	1.07
01/02 January 2010	5198.4427	3.685	3	0.006	1.08
02/03 January 2010	5199.3332	3.693	3	0.006	1.25
04/05 January 2010	5201.5401	3.680	3	0.000	1.09
07/08 January 2010	5204.4585	3.670	3	0.008	1.07
11/12 January 2010	5208.3418	3.685	3	0.005	1.17

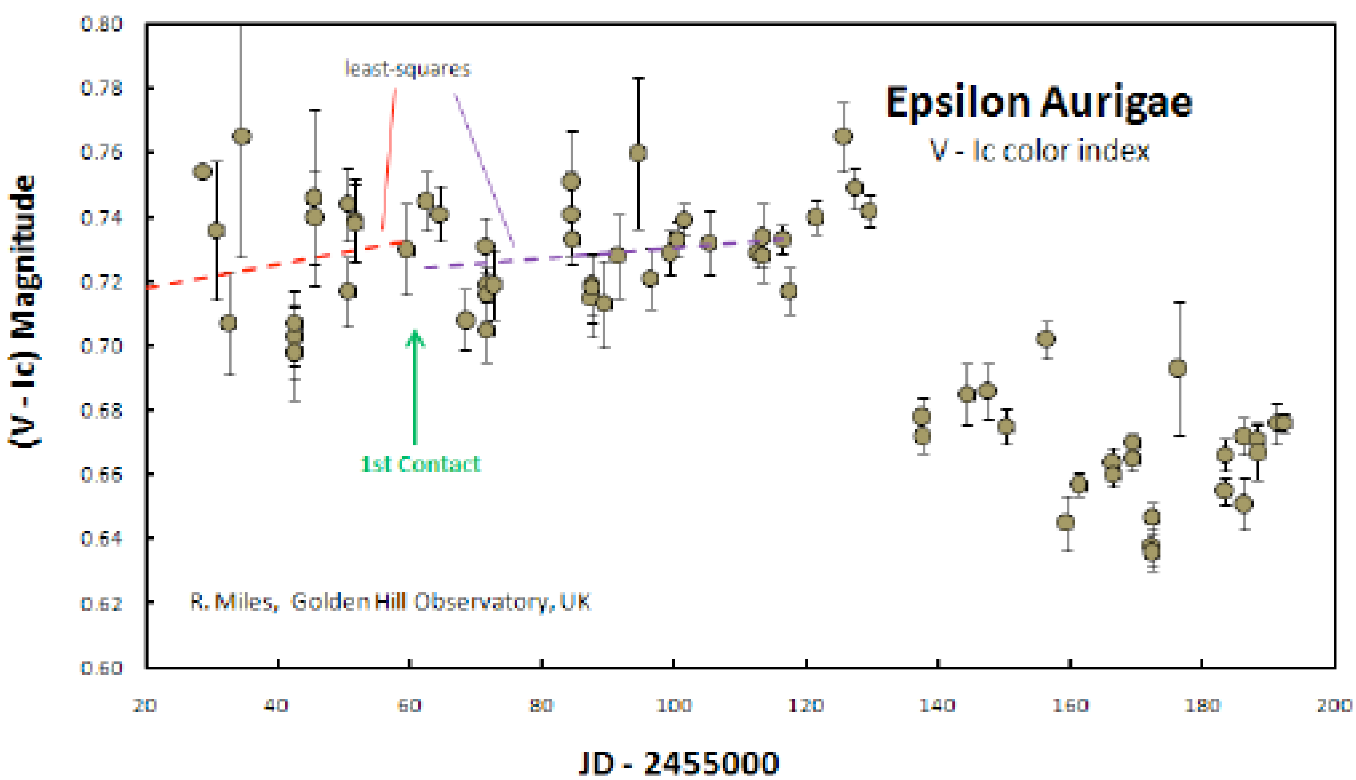
RJD = JD - 2,450,000

Richard Miles
Golden Hill Observatory (GHO)
Location: 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.

Observation Date	RJD	UT	V mag	SD	Ic	SD
11/12 May 2009	4963.389	21:20	2.927	.025	-	-
30/31 May 2009	4982.390	21:20	2.98	0.01	-	-
01/02 June 2009	4984.410	21:50	3.029	0.047	-	-
07/08 June 2009	4990.420	22:11	3.014	0.019	-	-
23/24 June 2009	5006.430	22:19	2.918	0.050	-	-
03/04 July 2009	5016.476	23:03	2.900	0.093	2.210	0.155
15/16 July 2009	5028.571	02.07	3.040	0.078	2.290	0.047
17/18 July 2009	5030.587	01.54	3.064	0.031	2.332	0.059
19/20 July 2009	5032.535	01.03	3.043	0.019	2.340	0.047
21/22 July 2009	5034.526	00.52	3.097	0.043	2.313	0.055
29/30 July 2009	5042.518	01:00	3.046	0.013	2.349	0.011
01/02 August 2009	5045.532	00:34	3.054	0.026	2.315	0.040
06/07 August 2009	5050.605	02:31	3.048	0.018	2.321	0.017
07/08 August 2009	5051.586	02:31	3.048	0.016	2.313	0.022
15/16 August 2009	5059.494	23:48	3.034	0.031	2.308	0.031
18/19 August 2009*	5062.445	22:40	3.074	0.019	2.333	0.022
20/21 August 2009*	5064.483	23:24	3.062	0.019	2.325	0.019
24/25 August 2009*	5068.435	22:51	3.088	0.025	2.384	0.016
27/28 August 2009*	5071.539	-	3.091	0.009	2.375	0.010
28/29 August 2009*	5072.648	-	3.085	0.031	2.370	0.012
04/05 September 2009	5079.438	-	3.068	0.031	2.407	0.034
09/10 September 2009	5084.400	-	3.162	0.011	2.433	0.019
12/13 September 2009	5087.426	-	3.169	0.010	2.456	0.017
14/15 September 2009	5089.397	-	3.106	0.019	2.397	0.037
16/17 September 2009	5091.418	-	3.193	0.016	2.469	0.037
19/20 September 2009	5094.456	-	3.214	0.056	2.458	0.047
21/22 September 2009	5096.418	-	3.227	0.016	2.510	0.025
24/25 September 2009	5099.424	-	3.257	0.016	2.532	0.016
25/26 September 2009	5100.427	-	3.263	0.012	2.534	0.012
26/27 September 2009	5101.432	-	3.264	0.012	2.529	0.009
31/01 Sept/Oct 2009	5105.336	-	3.305	0.031	2.577	0.009
07/08 October 2009	5112.702	-	3.325	0.012	2.600	0.009
08/09 October 2009	5113.401	-	3.335	0.011	2.608	0.018
11/12 October 2009	5116.434	-	3.350	0.009	2.621	0.009
12/13 October 2009	5117.4420	-	3.340	0.019	2.627	0.012
16/17 October 2009	5121.402	-	3.371	0.016	2.635	0.006
20/21 October 2009	2125.586	-	3.406	0.025	2.645	0.022
22/23 October 2009	5127.412	-	3.401	0.016	2.656	0.012
24/25 October 2009	5129.450	-	3.403	0.012	2.665	0.009
01/02 November 2009	5133.522	-	3.384	0.010	2.711	0.009
08/09 November 2009	5144.407	-	3.423	0.022	2.742	0.019

11/12 November 2009	5147.467	-	3.432	0.025	2.750	0.009
14/15 November 2009	5150.312	-	3.444	0.012	2.773	0.012
20/21 November 2009	5156.334	-	3.482	0.016	2.784	0.009
23/24 November 2009	5159.304	-	3.430	0.025	2.789	0.009
25/26 November 2009	5161.313	-	3.453	0.009	2.800	0.006
30/01 Nov/Dec 2009	5166.384	-	3.490	0.007	2.832	0.006
03/04 December 2009	5169.469	-	3.514	0.006	2.848	0.006
06/07 December 2009	5172.368	-	3.510	0.007	2.872	0.009
10/11 December 2009	5176.290	-	3.586	0.053	2.897	0.037
17/18 December 2009	5183.333	-	3.613	0.008	2.954	0.009
20/21 December 2009	5186.241	-	3.644	0.012	2.984	0.012
22/23 December 2009	5188.372	-	3.645	0.014	2.978	0.009
25/26 December 2009	5191.328	-	3.646	0.012	2.975	0.016
26/27 December 2009	5192.327	-	3.651	0.006	2.980	0.006
27/28 December 2009	5193.390	-	3.664	0.004	2.999	0.006
01/02 January 2010	5198.361	-	3.674	0.007	3.024	0.008
02/03 January 2010	5199.2320	-	3.666	0.006	3.003	0.005
03/04 January 2010	5200.2770	-	3.671	0.006	3.004	0.006
04/05 January 2010	5201.2850	-	3.659	0.004	3.009	0.006
06/07 January 2010	5203.4090	-	3.660	0.003	3.010	0.006
07/08 January 2010	5204.2550	-	3.663	0.006	3.011	0.005
17/18 January 2010	5214.2600	-	3.681	0.004	3.003	0.008
23/24 January 2010	5220.5460	-	3.725	0.007	3.006	0.008

RJD = JD - 2,450,000



Iakovos Marios Stkis, Haldrf (Athens) Greece
Elizabeth Observatory of Athens (EAO)
ATIC Monochrome CCD Camera with 55 mm lens at f 6.3, 30 images, 9 second exposures

RJD	V	SD
5158.2437	3.451	0.003
5160.0421	3.457	0.003
5163.0245	3.495	0.003
5167.0233	3.512	0.003

RJD = JD - 2,450,000

Hans-Goran Lindberg
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

Date	RJD	CV
19/20 July 2009	5033.4503	3.02
04/05 August 2009	5049.4653	3.03
05/06 August 2009	5050.4944	3.02
07/08 August 2009	5052.4958	3.03
08/09 August 2009	5053.4792	3.03
23/24 August 2009	5068.4799	3.05
29/30 August 2009	5074.4167	3.09
09/10 September 2009	5084.4472	3.11
14/15 September 2009	5089.3750	3.14
16/17 September 2009	5091.4028	3.19

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
13/14 December 2009	5179.3521	3.662	0.005
19/20 December 2009	5185.2347	3.683	0.028
21/22 December 2009	5186.2271	3.633	0.023
23/24 December 2009	5189.2486	3.687	0.028
26/27 December 2009	5192.2340	3.680	0.016
01/02 January 2010	5198.2493	3.684	0.020
03/04 January 2010	5200.2257	3.696	0.031
14/15 January 2010	5211.4257	3.730	0.022
17/18 January 2010	5214.2354	3.719	0.009

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	V Mag	SD	Rc Mag	SD
5048.6292	3.031	0.213	-	-
5049.6139	2.952	0.164	-	-
5050.9181	3.047	0.097	-	-
5054.6160	3.042	0.148	-	-
5055.6243	3.011	0.197	-	-
5056.6111	2.613	0.165	-	-
5057.6208	2.979	0.109	-	-
Note: The following data are corrected as of 20 November 2009				
5061.5736	3.002	-	2.726	-
5062.5681	2.993	-	2.619	-
5063.5979	2.997	-	2.706	-
5069.5625	3.049	-	2.831	-
5070.5625	3.073	-	2.807	-
5071.5590	3.018	0.014	2.756	0.066
5076.5472	3.000	0.013	2.615	0.090
5078.5208	3.052	0.196	2.852	0.103
5080.6042	3.115	0.011	2.865	0.001
5083.6146	3.123	0.006	2.818	0.053
5086.6111	3.126	0.029	2.849	0.032
5087.5833	3.110	0.005	2.820	0.063
5098.5000	3.187	0.045	2.914	0.056
5101.5556	3.284	0.022	3.058	0.021
5102.5521	3.226	0.036	2.968	0.036
5104.5000	3.243	0.011	2.946	0.014
5105.5076	3.272	0.018	2.991	0.048
5112.4479	3.291	0.026	3.006	0.033
5117.5000	3.414	0.021	3.141	0.048
5118.5000	3.421	0.017	3.128	0.089
5123.5000	3.399	0.010	3.129	0.054
5129.4375	3.425	0.010	3.099	0.053
5130.4063	3.427	0.011	3.150	0.014
5131.4479	3.459	0.013	3.180	0.109
5133.3958	3.439	0.049	3.126	0.092
5135.4444	3.489	0.024	3.182	0.091
5138.4382	3.477	0.100	3.130	0.100
5142.4583	3.471	0.018	3.146	0.021
5147.3750	3.492	0.010	3.164	0.014
5152.4583	3.549	0.039	3.282	0.081
5155.3750	3.518	0.040	3.229	0.114
5161.3333	3.481	0.038	3.136	0.019
5172.3333	3.572	0.035	3.223	0.058
5174.3229	3.607	0.004	3.290	0.028
5175.3229	3.579	0.026	3.283	0.066
5191.3007	3.717	0.005	3.419	0.104
5193.2882	3.832	0.017	3.765	0.039
5199.3856	3.724	0.020	3.380	0.032
5212.2708	3.672	0.006	3.277	0.026
5215.2326	3.741	0.012	3.382	0.105

RJD = JD - 2,450,000

Des Loughney
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.

> **Note:** SE is Standard Error which is the standard deviation divided by the square root of the number of samples. In the case of 5 samples the Standard Deviations (SDs) would be a bit more than double the SE value.

RJD	Date UT	V	Mag	SE	
4994	11 June 2009	23.50	2.56		(Very high air Mass)
5022	10 July 2009	02.20	2.975	0.002	
5023	11 July 2009	02:15	2.971	0.012	
5031	19 July 2009	04.75	3.017	0.005	
5032	20 July 2009	04.70	3.013	0.008	
5033	21 July 2009	04.70	2.939	0.005	
5034	22 July 2009	04.65	2.927	0.008	
5035	23 July 2009	04.65	2.994	0.012	
5036	24 July 2009	04.65	2.904	0.008	
5037	25 July 2009	04.60	3.008	0.015	
5038	26 July 2009	05.05	3.012	0.007	
5039	27 July 2009	05.10	3.008	0.005	
5040	28 July 2009	05.10	3.017	0.008	
5041	29 July 2009	05.10	3.008	0.007	
5042	30 July 2009	05.10	3.047	0.007	
5043	31 July 2009	05.10	3.015	0.011	
5044.713	01 August 2009	-	2.992	0.005	
5045.713	02 August 2009	-	2.992	0.007	
5046.715	03 August 2009	-	3.017	0.008	
5048.715	05 August 2009	-	3.009	0.008	
5049.715	06 August 2009	-	3.008	0.004	
5051.715	08 August 2009	-	3.006	0.005	
5052.715	09 August 2009	-	2.980	0.007	
5053.715	10 August 2009	-	2.992	0.004	
5054.715	11 August 2009	-	3.001	0.007	
5055.715	12 August 2009	-	3.009	0.005	
5056.717	13 August 2009	-	3.002	0.002	
5057.717	14 August 2009	-	3.005	0.003	
5063.485	20 August 2009	-	2.931	0.007	
5065.510	22 August 2009	-	2.974	0.004	
5068.521	25 August 2009	-	3.025	0.014	
5071.652	28 August 2009	-	3.046	0.005	
5072.656	29 August 2009	-	3.052	0.006	
5079.535	05 September 2009	-	3.053	0.004	
5083.502	09 September 2009	-	3.072	0.007	
5084.51	10 September 2009	-	3.096	0.004	
5086.633	12 September 2009	-	3.127	0.007	
5092.652	18 September 2009	-	3.171	0.003	
5094.502	20 September 2009	-	3.180	0.001	
5096.642	22 September 2009	-	3.212	0.005	
5105.619	01 October 2009	-	3.277	0.012	

5108.481	03 October 2009	-	3.311	0.024	
5108.529	04 October 2009	-	3.311	0.016	
5109.515	04/05 October 2009	-	3.321	0.008	
5111.471	06/07 October 2009	-	3.298	0.005	
5112.479	07/08 October 2009	-	3.307	0.004	
5116.475	11/12 October 2009	-	3.353	0.014	
5120.629	15/16 October 2009	-	3.388	0.016	
5121.502	16/17 October 2009	-	3.375	0.013	
5122.685	17/18 October 2009	-	3.350	0.016	
5127.708	22/23 October 2009	-	3.390	0.013	
5128.521	23/24 October 2009	-	3.382	0.006	
5130.492	25/26 October 2009	-	3.421	0.012	
5139.517	03/04 November 2009	-	3.446	0.001	
5141.496	05/06 November 2009	-	3.438	0.003	
5142.646	06/07 November 2009	-	3.459	0.020	
5144.494	08/09 November 2009	-	3.470	0.010	
5147.421	11/12 November 2009	-	3.429	0.026	
5150.556	14/15 November 2009	-	3.478	0.009	
5153.346	17/18 November 2009	-	3.442	0.008	
5156.446	20/21 November 2009	-	3.466	0.003	
5157.385	21/22 November 2009	-	3.457	0.003	
5159.413	23/24 November 2009	-	3.467	0.002	
5160.492	24/25 November 2009	-	3.479	0.003	
5163.371	27/28 November 2990	-	3.480	0.004	
5166.467	30/01/Nov/Dec 2009	-	3.526	0.002	
5172.398	06/07 December 2009	-	3.563	0.004	
5174.46	08/09 December 2009	-	3.579	0.02	
5175.717	09/10 December 2009	-	3.573	0.006	
5176.446	10/11 December 2009	-	3.584	0.004	
5178.771	12/13 December 2009	-	3.547	0.023	
5185.421	19/20 December 2009	-	3.647		0.008
5188.513	22/23 December 2009	-	3.675		0.005
5189.394	23/24 December 2009	-	3.664		0.009
5193.3917	27/28 December 2009	-	3.684		0.003
5200.383	03/04 January 2010	-	3.704		0.005
5202.513	05/06 January 2010	-	3.680		0.007
5203.2939	06/07 January 2010	-	3.685		0.010
5204.523	07/08 January 2010	-	3.679		0.004
5213.388	16/17 January 2010	-	3.703		0.003
5214.29	17/18 January 2010	-	3.707		0.005
5215.358	18/19 January 2010	-	3.702		0.005
5219.283	22/23 January 2010	-	3.711		0.007

RJD = JD - 2,450,000

Note: SE is Standard Error which is the standard deviation divided by the square root of the number of samples. In the case of 5 samples the Standard Deviations (SDs) would be a bit more than double the SE value.

Tom Pearson
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
5059.8604	15/16 August 2009	08:42	3.066	0.011	1.4228
5063.8694	19/20 August 2009	08:52	3.039	0.050	1.2719
5065.8063	21/22 August 2009	07:21	2.92	0.092	1.6550
5068.8715	24/25 August 2009	08:55	3.083	0.057	1.2074
5070.8736	26/27 August 2009	08:58	3.043	0.030	1.1808
5073.8806	29/30 August 2009	08:58	3.098	0.022	1.1345
5079.8896	04/05 September 2009	09:21	3.105	0.014	1.0757
5086.8833	11/12 September 2009	09:12	3.097	0.050	1.0536
5088.8354	13/14 September 2009	08:03	3.213	0.049	1.1464
5094.8764	19/20 September 2009	09:02	3.183	0.032	1.0339
5103.8910	28/29 September 2009	09:23	3.278	0.052	1.0089
5104.6638	29/30 September 2009	08:07	3.300	0.066	1.0477
5108.9076	03/04 October 2009	09:47	3.389	0.031	1.0144
5124.8813	19/20 October 2009	09:09	3.437	0.001	1.0274
5125.8806	20/21 October 2009	09:08	3.419	0.011	1.0295
5138.8715	02/03 November 2009	09:55	3.418	0.019	1.1662
5144.9264	08/09 November 2009	10:14	3.431	0.023	1.5329
5151.9424	15/16 November 2009	10:37	3.472	0.024	1.8839
5164.9486	28/29 November 2009	10:46	3.455	0.011	2.6376
5169.7326	03/04 December 2009	05:35	3.553	0.021	1.0460
5173.6903	07/08 December 2009	04:34	3.595	0.010	1.0154
5176.5806	10/11 December 2009	01:56	3.647	0.009	1.0808
5182.6153	16/17 December 2009	02:46	3.637	0.007	1.0160
5186.6090	20/21 December 2009	02:37	3.646	0.006	1.0134
5189.6417	23/24 December 2009	03:24	3.698	0.015	1.0128
5193.6382	27/28 December 2009	03:19	3.672	0.004	1.0169
5194.6000	28/29 December 2009	02:24	3.678	0.005	1.0090
5199.6396	02/03 January 2010	03:21	3.690	0.024	1.0322
5201.6784	04/05 January 2010	04:14	3.708	0.003	1.1030
5203.5743	06/07 January 2010	01:47	3.679	0.007	1.0093
5205.6104	08/09 January 2010	02:39	3.688	0.006	1.0204
5206.6535	09/10 January 2010	03:41	3.709	0.015	1.0830
5207.6611	10/11 January 2010	03:52	3.699	0.003	1.0560
5209.5549	12/13 January 2010	01:19	3.690	0.010	1.0100
5210.5556	13/14 January 2010	01:20	3.689	0.005	1.0092
5212.5500	15/16 January 2010	01:12	3.694	0.011	1.0092
5215.5410	18/19 January 2010	00:59	3.696	0.004	1.0094

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
07 August 2009	5051.4160	2.990	0.010
10 September 2009	5085.4236	3.152	0.031
13 September 2009	5088.4028	3.172	0.042
14 September 2009	5089.4194	3.146	0.044
15 September 2009	5090.4229	3.144	0.024
16 September 2009	5091.4028	3.155	0.060
17 September 2009	5092.4271	3.149	0.049
18 September 2009	5093.4201	3.177	0.008
29/30 September 2009	5101.4118	3.258	0.021
02/03 October 2009	5107.4410	3.288	0.013
05/06 October 2009	5110.4271	3.286	0.023
12/13 October 2009	5117.4042	3.328	0.011
13/14 October 2009	5118.4083	3.344	0.008
14/15 October 2009	5119.3896	3.335	0.021
15/16 October 2009	5120.3868	3.356	0.023
17/18 October 2009	5122.3938	3.348	0.015
20/21 October 2009	5125.4036	3.353	0.005
21/22 October 2009	5126.3931	3.346	0.031
27/28 October 2009	5132.4410	3.377	0.007
30/31 October 2009	5135.3368	3.397	0.015
17/18 November 2009	5153.4514	3.443	0.015
18/19 November 2009	5154.4514	3.417	0.004
21/22 November 2009	5157.2397	3.432	0.009
24/25 November 2009	5160.2653	3.457	0.014
25/26 November 2009	5161.3799	3.462	0.005
01/02 December 2009	5167.2944	3.516	0.019
17/18 December 2009	5183.3028	3.631	0.016
28/29 December 2009	5194.2215	3.668	0.010
29/30 December 2009	5165.2771	3.679	0.019
30/31 December 2009	5196.2028	3.676	0.010
31/01 Dec/Jan 09/10	5197.2278	3.675	0.009
02/03 January 2010	5199.2069	3.676	0.010
08/09 January 2010	5205.2237	3.676	0.008
10/11 January 2010	5207.3646	3.679	0.023
11/12 January 2010	5208.2389	3.679	0.008
14/15 January 2010	5211.3410	3.682	0.002
21/22 January 2010	5218.3340	3.697	0.019
23/24 January 2010	5220.2569	3.715	0.025
24/25 January 2010	5221.2257	3.690	0.012
25/26 January 2010	5222.2417	3.702	0.015

RJD = JD - 2,450,000

Brian E. McCandless, Grand View Observatory (GVO)
Elkton, MD USA
Telescope: CGE1400 Detector *(BVRI): SSP-3 Detector (JH): SSP-4 @ T= - 40C

Photometric Monitoring of Epsilon Aurigae

Summary
Photometric observations of epsilon Aurigae are presented for the observing period JD2455156 (Nov 2009) to present. Cumulative photometric results in Johnson BVRI, Wing ABC and near-infrared JH bands are plotted for the longer interval, from JD2454460 (Jan 2008) to the present. Photometry shows progress of the eclipse ingress, with intensity bumps in BVRI and J bands. The V band transition to eclipse shows a soft entry, a smooth inflection from JD2455187 to JD2455207. Photometry on the narrow-band Wing system shows that the effective photosphere temperature remains constant through the ingress, within the margin of error. The TiO index fluctuated around zero but spectra in the 712 nm band reveals variable absorption.

Introduction
This report contains results of photometric and spectrographic monitoring of the long period eclipsing system epsilon Aurigae. The observations are part of an on-going program to elucidate the underlying mechanisms responsible for the photometric and spectroscopic behavior of this system, during the period preceding and during the 2009-2011 occurrence of the 27.1 year eclipse cycle.

Observation and Reduction
The observation period for this report is from JD2455156 to the present. The observing site is somewhat poorly located, with respect to seeing conditions, in the mid-Atlantic coastal region of the United States, at: Lon N39¡ 36.390'; Lat W75¡ 50.223'; Elev 7 m. The portable observatory consists of a Celestron CGE1400 (35cm f/10) telescope with Optec solid state photometers: SSP3 using Optec filters for BVRI on the Johnson system and Wing ABC narrow-band pass system; and Optec SSP4 for JH photometry. The photometer detectors subtend an angle of approximately 55 arcsec, with the target star placed within a central 15 arcsec diameter region.

The GVO facility is also equipped with an SBIG SGS spectrograph with ST7XME CCD camera operating at f/6.3, optimized for 600-760 nm spectral range, grating 600 l/mm, dispersion = 0.107 nm/pixel, R = 0.22 nm at 650 nm, yielding a spectral resolution R ~ 3000 at Hα. Wavelength calibration was performed for each spectrum using SBIG Spectra software and contiguous spectra of the output of Ar/Ne and Hg/Ne emission lamps. An observing run consists of setting the grating, centering the star on the slit, acquiring a 30 sec image with the calibration lamps and star, then acquiring a spectrum of the target star without making any instrument adjustments.

Comparison Stars:

- BVRI comparison star: λ Aur (HD34411)
- BVRI check star: HD32655
- Wing comparison star: λ Aur calibrated using δ Aur, ρ Gem, π2 Ori
- JH comparison star: λ Aur
- JH check stars: HD32655 and δ Aur

Brian E. McCandless (continued)

Photometry Observations and Reduction:
Variable star measurements (3x10 sec) made between comparison star readings (3x10 sec); magnitudes calculated using HPO-cited values for λ Aurigae and corrected for first-order extinction. Statistical errors calculated by transforming deflection standard-deviations to magnitude. Table I

lists standard magnitudes used for reduction, compiled from HPO, Simbad, UKIRT sources. Single channel photometry results from January 2008 to current date are plotted in Figure 1. BVRI and JH data from Aug 09 to present are listed in Tables II and III. Note that early B filter data in Figure 1 may have been tainted by poor filter properties, and a new B filter was installed after JD 2455000 after delamination spots were found in the original filter.

Table I. Filter properties, comparison star and check star magnitudes.

Filter	Central l (nm)	Band Pass (nm)	λ Aur Mag	HD32655 Mag	δ Aur Mag
B	440	100	5.34	6.63	4.94
V	540	95	4.71	6.26	3.72
Rj	650	180	4.19	5.77	-
WA	712	11	3.01	-	1.79
WB	754	11	3.11	-	1.82
Ij	880	280	3.88	5.47	-
WC	1025	42	4.04	-	2.42
J	1250	200	3.62	5.17	2.04
H	1650	300	3.33	5.02	1.52

Photometric Data

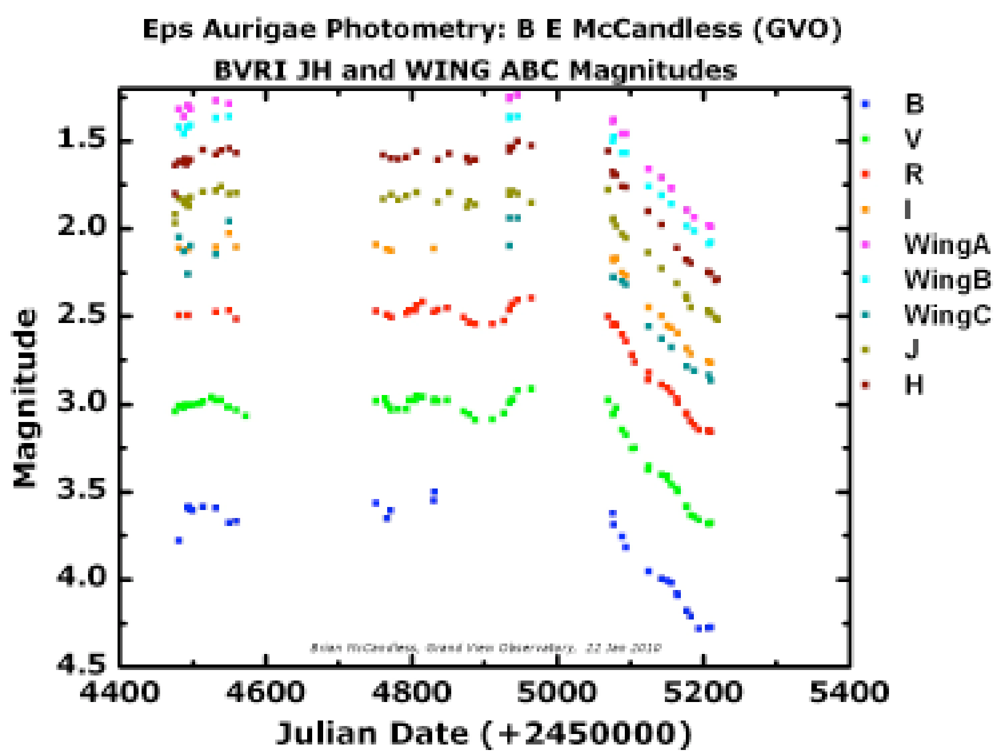


Figure 1. Cumulative plot of McCandless' photometry (Jan 08 to present):

Brian E. McCandless (continued)

Photometric magnitudes are presented in Tables I to III for BVRI, Wing and JH observations, respectively. The following abbreviations are used to represent nominal observing conditions for data presented in the photometry tables: T = Temperature, RH = Relative Humidity, Q= Seeing Quality; Exc = no visible haze, good stability, no breeze; Good = low haze, good stability, no breeze; Poor = high haze and/or excessive scintillation, possible breeze.

Table II. BVRI magnitudes

RJD	B	SD	V	SD	Rj	SD	Ij	SD
5210.57153	4.272	0.003	3.676	0.002	3.159	0.001	2.767	0.003
5207.56806			3.682	0.003	3.151	0.002		
5206.60000	4.279	0.006	3.679	0.002	3.154	0.003	2.757	0.002
5193.58333	4.282	0.004	3.663	0.004	3.146	0.003		
5187.55917			3.641	0.005	3.122	0.003		
5182.60000	4.208	0.012	3.635	0.003	3.097	0.007	2.715	0.003
5177.60208	4.177	0.006	3.583	0.003	3.060	0.002	2.686	0.003
5176.55833			3.579	0.004	3.048	0.003		
5164.59792	4.092	0.005	3.499	0.005	2.990	0.006	2.598	0.007
5163.67292	4.080	0.007	3.483	0.006	2.970	0.005		
5156.61111	4.021	0.005	3.458	0.004	2.938	0.004	2.569	0.003

RJD = JD - 2,450,000

Table III. Wing A, B, C avg magnitudes : statistical errors are nominally ±0.01 M

RJD	WA	WB	WC	Teff (±20K)	TiO Index
5210.57	1.99	2.08	2.87	5900	0.016
5207.57	1.98	2.09	2.82	5720	-0.011
5187.56	1.93	2.02	2.81	5920	0.026
5177.60	1.89	1.98	2.79	5900	0.011
5156.63	1.77	1.86	2.55	5900	-0.011
5142.66	1.71	1.81	2.63	6020	0.007

RJD = JD - 2,450,000

The collected photometry in Wing A, B and C bands (band passes at 712, 754 and 1025 nm) is shown in Table III. Motivation for this is: 1) detection of possible TiO, VO and C content in companion cloud system 2) continuum values in the far-red and NIR. The penultimate column in Table III lists values of computed effective photospheric temperature, based on a blackbody approximation using Wing B and C magnitudes:

$$T_{eff} = 3402 - 2302.5(B - C) + 977.5(B - C)^2 - 142.4(B - C)^3 \quad (1)$$

For Wing A filter magnitudes, spanning TiO and C transitions, deviation from blackbody flux can be quantified by the TiO index (last column):

$$TiO = (WA - WB) - 0.13(WB - WC) \quad (2)$$

The effective temperature equation is based on calibration by McCandless using standard stars, and the TiO index equation is from literature by Dr. Robert Wing.

Brian E. McCandless (continued)

Table IV. JH magnitudes

RJD	J	SD	H	SD
5210.59028	2.481	0.005	2.256	0.002
5207.55139	2.473	0.003	2.258	0.004
5207.51667	2.484	0.005	2.253	0.003
5206.57222	2.470	0.004	2.249	0.003
5182.60972	2.449	0.009	2.199	0.007
5177.55347	2.400	0.012	2.179	0.007
5176.57639	2.384	0.007	2.179	0.007
5163.59861	2.313	0.011	2.111	0.013
5142.63056	2.224	0.010	2.013	0.007
5142.61944	2.228	0.011	1.979	0.007

RJD = JD - 2,450,000

Other Activities:

1. Collected data on low-amplitude variable PU Aurigae on most dates in VR and JH.
2. Finalized design of NIR polarimeter and obtained necessary filters and waveplates. Plan to obtain measurements during mid-eclipse, egress, and post-eclipse.

Dr. Mukund Kurtadikar, Jalna Education Society Observatory (JESO) Maharashtra, India

Team:

1. Dr.M.L. Kurtadikar, J.E.S.College, Jalna 431 203, India.
2. A.N. Ardad, Shiv Chatrapati College, Aurangabad 431 003, India.
3. Dr.P.M. Kokne, Barwale College , Jalna 431 203.
4. A.D. Dashrath, High Tech Polytechnic and Engg. College, Aurangabad.
5. S.K. Pandit, Barwale College , Jalna 431 203.

Postgraduate Department of Physics
Jalna Education Society's
R.G.B.Arts , S.B.Lakhotia Commerce & R.Bezonji Science College
Optec SSP-3

Date	RJD	V	SD
03/04 January 2010	5200.3377	3.57	0.01
04/05 January 2010	5201.3911	3.38	
05/06 January 2010	5202.3442	3.58	0.03
06/07 January 2010	5203.3844	3.47	
07/08 January 2010	5204.3313	3.60	0.03
14/15 January 2010	5211.3616	3.62	0.02
15/16 January 2010	5212.5871	3.67	0.02
17/18 January 2010	5214.6358	3.61	0.01
18/19 January 2010	5215.5664	3.61	0.02
20/21 January 2010	5217.6194	3.62	0.01

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
25/26 August 2009	5069.9433	3.6940	0.0156	3.6251	0.0069	3.0669	0.0030
28/29 August 2009	5072.9732	3.7242	0.0112	3.6359	0.0205	3.0811	0.0087
07/08 September 2009	5082.9565	3.7768	0.0135	3.6819	0.0021	3.1163	0.0074
14/15 September 2009	5089.9704	3.8572	0.0013	3.7416	0.0030	3.1707	0.0024
15/16 September 2009	5090.9774	3.8667	0.0011	3.7489	0.0008	3.1821	0.0022
17/18 September 2009	5092.9662	3.8933	0.0030	3.7622	0.0044	3.1944	0.0074
20/21 September 2009	5095.9753	3.9174	0.0072	3.7940	0.0030	3.2220	0.0019
21/22 September 2009	5096.9669	3.9356	0.0119	3.8033	0.0072	3.2351	0.0014
22/23 September 2009	5097.9655	3.9445	0.0086	3.8086	0.0018	3.2326	0.0036
24/25 September 2009	5099.9225	3.9466	0.0019	3.8238	0.0044	3.2460	0.0045
25/26 September 2009	5100.9774	3.9655	0.0150	3.8271	0.0080	3.2476	0.0030
27/28 September 2009	5102.9308	3.9741	0.0032	3.8478	0.0049	3.2718	0.0042
30/01 Sept/Oct 2009	5105.9322	3.9817	0.0170	3.8646	0.0028	3.2876	0.0033
03/04 October 2009	5108.9225	4.0211	0.0094	3.8793	0.0035	3.3028	0.0007
08/09 October 2009	5113.9392	4.0701	0.0061	3.9126	0.0034	3.3337	0.0044
17/18 October 2009	5122.8697	4.1207	0.0153	3.9561	0.0041	3.3715	0.0038
19/20 October 2009	5124.8496	4.1172	0.0069	3.9612	0.0052	3.3793	0.0054
23/24 October 2009	5128.8405	4.0931	0.0284	3.9642	0.0045	3.3815	0.0042
05/06 November 2009	5141.8051	4.1306	0.0258	3.9894	0.0030	3.4285	0.0067
08/09 November 2009	5144.8100	4.1299	0.0081	4.0029	0.0029	3.4449	0.0025
14/15 November 2009	5150.8030	4.1233	0.0122	4.0224	0.0058	3.4631	0.0049
15/16 November 2009	5151.8072	4.1485	0.0038	4.0248	0.0066	3.4686	0.0020
16/17 November 2009	5152.8086	4.1379	0.0149	4.0290	0.0007	3.4756	0.0012
17/18 November 2009	5153.8121	4.1236	0.0155	4.0340	0.0088	3.4769	0.0003
18/19 November 2009	5154.8024	4.1240	0.0155	4.0313	0.0020	3.4820	0.0019
19/20 November 2009	5155.8017	4.1396	0.0213	4.0326	0.0087	3.4770	0.0040
20/21 November 2009	5156.8072	4.1243	0.0328	4.0249	0.0156	3.4748	0.0132
22/23 November 2009	5158.8072	4.1257	0.0209	4.0311	0.0044	3.4822	0.0021
24/25 November 2009	5160.8058	4.1404	0.0014	4.0400	0.0027	3.4897	0.0007
25/26 November 2009	5161.8037	4.1401	0.0127	4.0481	0.0008	3.4931	0.0031
26/27 November 2009	5162.8030	4.1631	0.0024	4.0522	0.0031	3.5014	0.0028
30/01 Nov/Dec 2009	5166.7803	4.1919	0.0193	4.0858	0.0058	3.5286	0.0027
02/03 December 2009	5168.7878	4.2072	0.0043	4.1014	0.0017	3.5411	0.0045
03/04 December 2009	5169.7676	4.2174	0.0065	4.1057	0.0035	3.5509	0.0080
04/05 December 2009	5170.7669	4.1594	-	4.0962	-	3.5473	-
08/09 December 2009	5174.7301	4.2896	0.0056	4.1531	0.0033	3.5932	0.0008
09/10 December 2009	5175.7260	4.2905	0.0004	4.1547	0.0024	3.5933	0.0026
10/11 December 2009	5176.7301	4.2786	0.0026	4.1594	0.0034	3.5937	0.0043
14/15 December 2009	5180.7329	4.3274	0.0039	4.1895	0.0068	3.6197	0.0057
16/17 December 2009	5182.7232	4.3501	0.0064	4.1973	0.0064	3.6343	0.0058
18/19 December 2009	5184.7232	4.3720	0.0029	4.2220	0.0035	3.6520	0.0056
23/24 December 2009	5189.7253	4.4068	0.0094	4.2436	0.0011	3.6781	0.0023
24/25/December 2009	5190.7183	4.3941	0.0110	4.2384	0.0032	3.6701	0.0091
02/03 January 2010	5199.6753	4.4235	0.0097	4.2616	0.0040	3.6912	0.0026
07/08 January 2010	5204.6815	4.4122	0.0077	4.2577	0.0061	3.6859	0.0017
11/12 January 2010	5208.6774	4.4221	0.0082	4.2615	0.0026	3.6871	0.0045

14/15 January	2010	5211.6739	4.4283	0.0049	4.2659	0.0037	3.6959	0.0009
23/24 January	2010	5220.6836	4.4342	0.0013	4.2867	0.0017	3.7236	0.0016
24/25 January	2010	5221.6468	4.4343	0.0022	4.2883	0.0003	3.7209	0.0020

RJD = JD - 2,450,000

Frank J. Melillo
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	
5058.8090	14/15 August 2009	07:25	2.973	12	0.017
5066.7951	22/23 August 2009	07:05	3.010	12	0.019
5073.8806	29/30 August 2009	08:58	3.098	12	0.022
5074.7639	30/31 August 2009	06:20	3.023	12	-
5080.7514	05/06 September 2009	06:28	3.044	12	0.012
5088.7361	13/14 September 2009	-	3.10	3-	
5092.7361	17/18 September 2009	05:40	3.14	12	0.02
5094.7500	19/20 September 2009	06:00	3.17	12	0.01
5100.7263	25/26 September 2009	05:30	3.20	12	0.01
5102.7263	27/28 September 2009	05:15	3.21	12	0.02
5106.7114	01/02 October 2009	04:40	3.25	12	0.019
5110.6982	05/06 October 2009	04:45	3.28	12	0.020
5116.7115	11/12 October 2009	05:05	3.32	12	0.019
5124.6699	19/20 October 2009	04:51	3.33	12	0.017
5130.6951	25/26 October 2009	03:40	3.37	16	0.019
5134.6559	29/30 October 2009	03:50	3.38	16	0.020
5139.7088	03/04 November 2009	08:00	3.40	16	0.022
5144.6515	08/09 November 2009	03:30	3.41	16	0.016
5153.7132	17/18 November 2009	05:05	3.44	16	0.026
5156.7090	20/21 November 2009	05:20	3.44	16	0.024
5164.7535	28/29 November 2009	05:55	3.48	12	0.031
5169.7142	03/04 December 2009	05:05	3.53	12	0.020
5176.7124	10/11 December 2009	05:00	3.57	11	0.020
5182.6315	16/17 December 2009	03:15	3.62	12	0.017
5187.7218	21/22 December 2009	05:10	3.66	12	0.012
5193.6325	27/28 December 2009	03:10	3.67	12	0.012
5203.5209	06/07 January 2010	00:30	3.67	12	0.017
5207.6319	10/11 January 2010	03:10	3.68	12	0.016
5211.5226	14/15 January 2010	00:40	3.68	12	0.028
5215.5294	18/19 January 2010	00:40	3.68	12	0.036

RJD = JD - 2,450,000

Gerard Samolyk
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
5038.8770	2.980	0.009	3.567	0.011	2.563	0.013	2.223	0.009
5039.8840	2.955	0.013	3.560	0.015	2.609	0.016	2.255	0.023
5040.8178	2.973	0.018	3.566	0.014	2.583	0.028	2.202	0.025
5041.8184	2.976	0.009	3.566	0.013	2.588	0.017	2.232	0.016
5043.8183	2.985	0.015	3.562	0.010				
5045.8605	2.970	0.008	3.539	0.017	2.560	0.015	2.225	0.010
5055.8670	2.952	0.012	3.533	0.009	2.584	0.007	2.240	0.008
5056.8689	2.978	0.005	3.532	0.017	2.578	0.010	2.233	0.004
5058.8482	2.952	0.012	3.515	0.015	2.577	0.028	2.232	0.019
5062.8575	2.995	0.019	3.542	0.015	2.628	0.010	2.278	0.014
5066.8375	2.992	0.017	3.587	0.017	2.627	0.020	2.316	0.015
5067.8512	3.003	0.005	3.597	0.016	2.613	0.015	2.290	0.015
5074.8333	3.038	0.011	3.600	0.007	2.675	0.013	2.325	0.008
5075.8293	3.049	0.013	3.619	0.013	2.676	0.012	2.323	0.011
5076.8159	3.036	0.020	3.615	0.014	2.664	0.016	2.331	0.006
5077.8389	3.026	0.017	3.616	0.020	2.659	0.006	2.325	0.016
5078.8500	3.002	0.019	3.623	0.014	2.669	0.015	2.337	0.010
5079.8741	3.054	0.008	3.627	0.019	2.686	0.017	2.335	0.005
5082.8339	3.065	0.012	3.640	0.010	2.705	0.015	2.346	0.009
5086.8186	3.071	0.012	3.684	0.018	2.689	0.009	2.362	0.017
5087.8501	3.116	0.013	3.690	0.024	2.777	0.013	2.406	0.021
5088.9027	3.149	0.013	3.724	0.014	2.747	0.015	2.388	0.008
5089.8505	3.104	0.019	3.726	0.028	2.719	0.035	2.396	0.013
5092.7804	3.154	0.010	3.736	0.018	2.770	0.013	2.413	0.018
5093.8139	3.164	0.015	3.740	0.019	2.799	0.014	2.422	0.013
5096.7917	3.159	0.017	3.755	0.021	2.754	0.023	2.419	0.022
5101.8129	3.224	0.015	3.799	0.018	2.827	0.006	2.465	0.018
5105.7878	3.238	0.012	3.841	0.012	2.853	0.014	2.518	0.008
5112.7545	3.284	0.008	3.884	0.018	2.882	0.018	2.535	0.013
5114.7949	3.291	0.016	3.880	0.014	2.903	0.010	2.542	0.010
5115.7735	3.296	0.011	3.891	0.012	2.917	0.011	2.551	0.006
5122.7456	3.340	0.011	3.933	0.012	2.929	0.018	2.552	0.015
5124.6330	3.346	0.022	3.930	0.036	2.900	0.016	2.569	0.017
5131.9432	3.387	0.007	3.954	0.013				
5135.70242					2.619	0.010		
5136.6984	3.383	0.004	3.960	0.013				
5138.1650	3.385	0.024	3.940	0.017	2.995	0.007	2.637	0.012
5140.9099	3.373	0.022	3.935	0.023	3.097	0.008	2.690	0.017
5143.9008	3.427	0.007	3.954	0.019	3.103	0.008	2.706	0.007
5146.8591	3.412	0.009	3.956	0.012	3.083	0.009	2.718	0.010
5147.8454	3.423	0.003	3.962	0.012	3.141	0.009	2.740	0.014
5156.8431	3.463	0.015	4.013	0.030	3.144	0.029	2.765	0.067
5157.8508	3.466	0.011	4.009	0.019	2.779	0.011		
5158.6526	3.430	0.017	4.000	0.019	3.037	0.013	2.713	0.015
5163.8541	3.477	0.007	3.992	0.021	3.178	0.003	2.797	0.013
5166.61795					3.115	0.014	2.747	0.019
5167.72619					3.125	0.011	2.754	0.006

5172.8084	3.575	0.011			3.236	0.003	2.850	0.005
5174.6075	3.526	0.020	4.084	0.032	3.193	0.016	2.785	0.016
5175.6061	3.514	0.046	4.104	0.067	3.189	0.036	2.794	0.035
5177.6313	3.579	0.021	4.100	0.015	3.171	0.014	2.890	0.007
5178.6223	3.582	0.011	4.115	0.014	3.195	0.005	2.820	0.007
5179.6616	3.582	0.009	4.135	0.014	3.208	0.006	2.837	0.015
5181.6654	3.594	0.015	4.160	0.026	3.222	0.014	2.857	0.017
5182.6946	3.603	0.017	4.154	0.011	3.232	0.012	2.860	0.011
5183.6410	3.600	0.011	4.157	0.009	3.224	0.011	2.872	0.012
5184.63937					3.219	0.017	2.880	0.008
5185.6091	3.626	0.016	4.181	0.013	3.235	0.018	2.872	0.010
5186.6826	3.648	0.008	4.190	0.005	3.238	0.005	2.880	0.006
5188.6217	3.623	0.012	4.206	0.015	3.243	0.007	2.890	0.010
5190.6191	3.631	0.015	4.178	0.023	3.230	0.015	2.881	0.012
5191.7336	3.685	0.019	4.221	0.011	3.291	0.018	2.939	0.006
5192.6316	3.650	0.014	4.209	0.012	3.289	0.012	2.898	0.011
5194.6619	3.660	0.015	4.215	0.024	3.271	0.010	2.894	0.011

RJD = JD - 2,450,000

Robert E. Stencel, University of Denver, Denver, Colorado USA
DSLR V Band Data, Comparison Star eta Aurigae assumed to be V-3.17

RJD	V	SD
5153.65	3.40	0.17
5122.71	3.24	0.02
5120.69	3.35	0.16
5119.69	3.28	0.04
5111.70	3.33	0.02
5107.69	3.35	0.14
5100.91	3.15	0.04
5092.89	3.10	0.02
5085.89	3.14	--
5079.86	3.12	0.05
5070.88	2.97	0.02
5063.88	2.97	0.04
5062.89	2.92	0.06
5019.92	3.13	0.15
5193.61	3.62	0.07
5199.56	3.65	0.14
5203.59	3.66	0.03

RJD = JD - 2,450,000

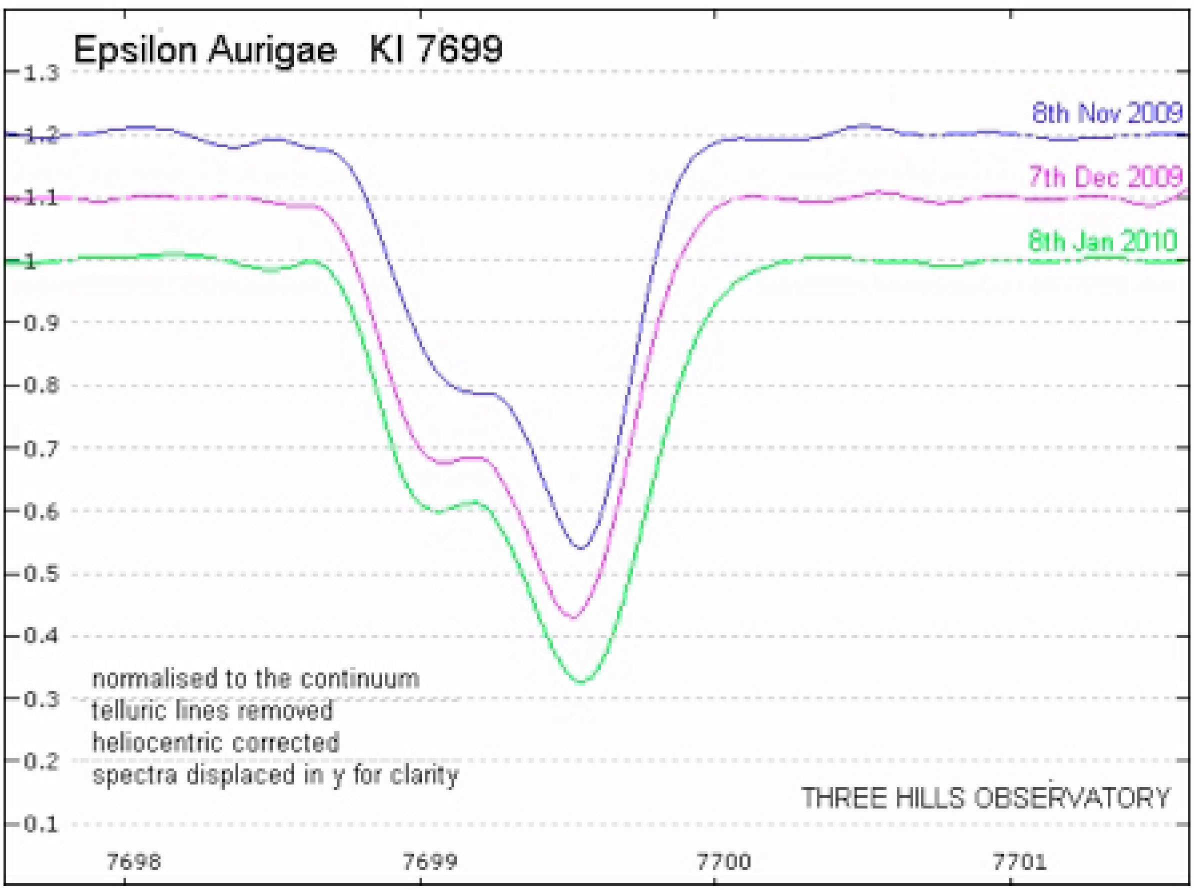
Spectroscopy Report

Robin Leadbeater, Three Hills Observatory
Location: Cubria, England
Equipment:

Telescope
Vixen VC200L Cassegrain, 200mm f 6.4/f9
Spectrographs
Star Analyser, Lhires III

Potassium 7699Å line

Photometrically the light curve has flattened off, indicating that the densest part of the eclipsing object now stretches across the F star and the second contact point of the eclipse has been reached. The more tenuous outer regions of the eclipsing object however (as tracked for example by the additional absorption in the K I 7699 line) have been spread across the width of the eclipsed star for some months now. As a result, the changes in the K I 7699 line have become more subtle since November 2009. Although the Equivalent Width has continued to increase overall, the changes have been more at the edges of the line profile with little increase in the maximum absorption.



This may be explained if the eclipsing object is a rotating disc in Keplerian motion.

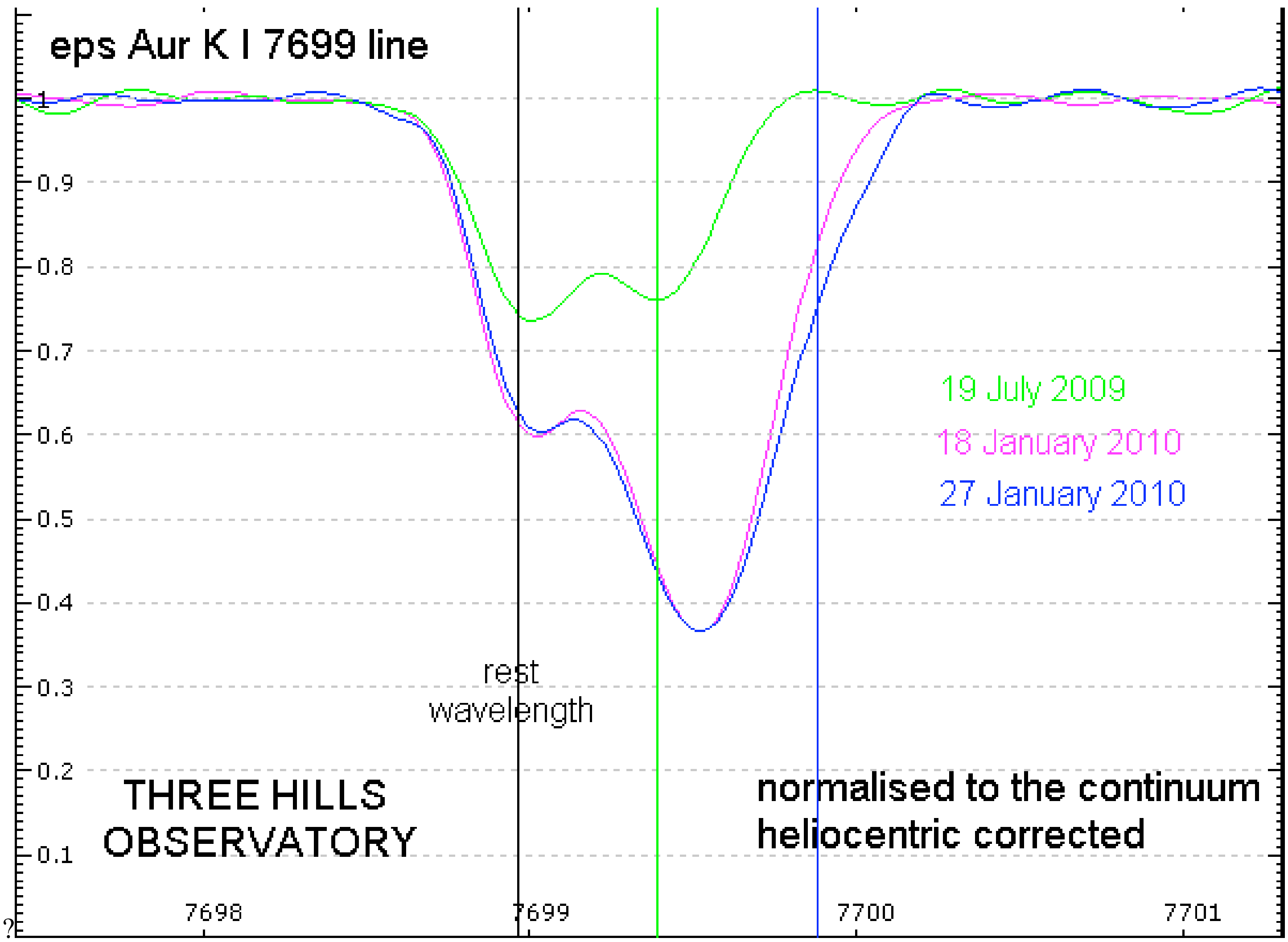
a) As the eclipse progresses, an increasing proportion of the rotating disc in front of the star is moving almost transversely relative to our line of sight and so shows little Doppler shift due to the rotation. This produces an increase in absorption around the KI rest wavelength, currently at the blue edge of the absorption line profile.

Robin Leadbeater, Three Hills Observatory (continued)

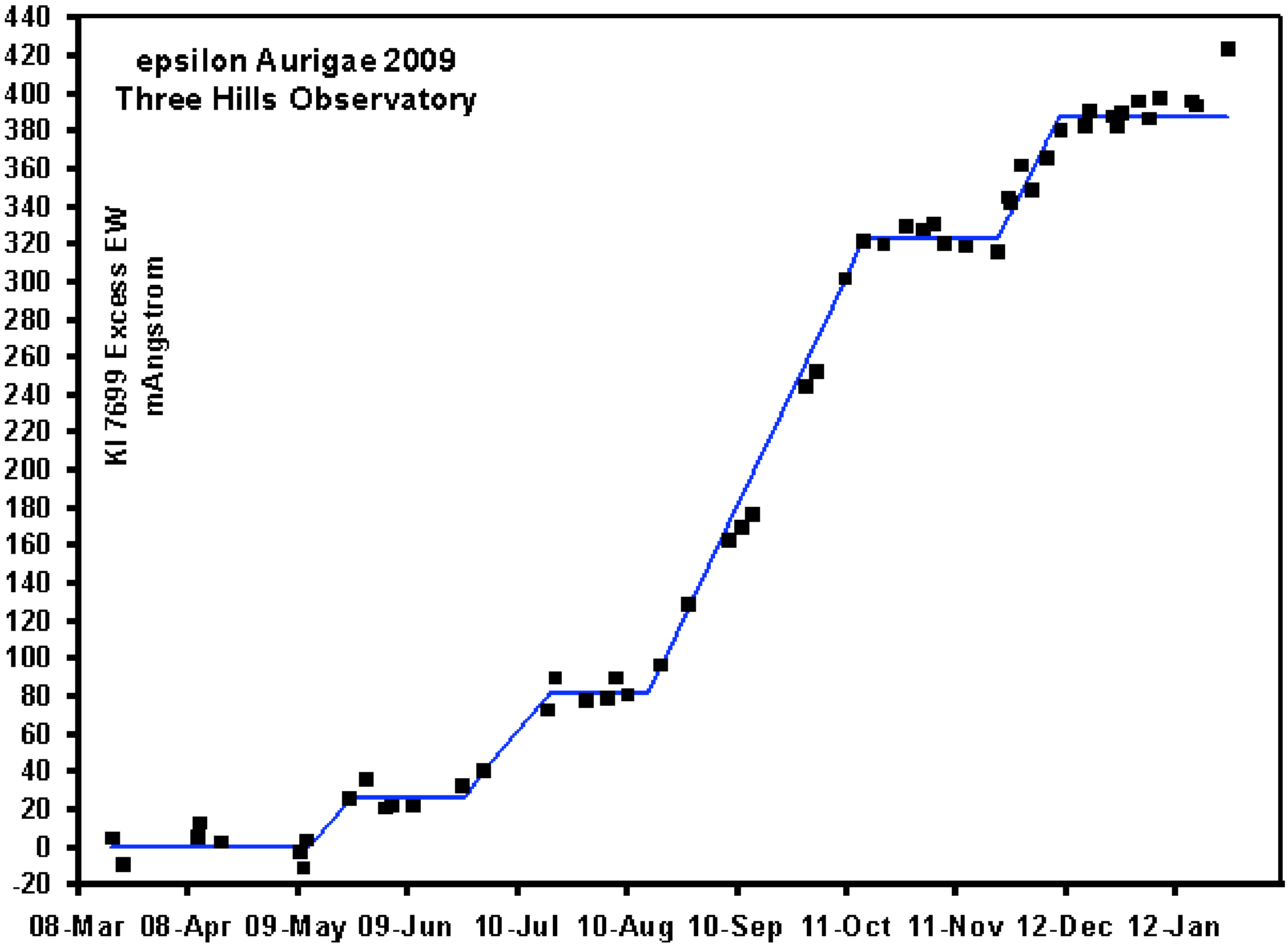
b) The inner regions of the leading half of the disc are now moving in front of the star. These are rotating faster than the outer regions now moving off the far edge of the star and the net result is an increased radial velocity red shift.

The intensity of the additional absorption in the KI 7699 line has now reached 400 mÅ equivalent width, similar to the value seen at this stage by Lambert and Sawyer during the previous eclipse.

Finally on 27 January 2919 a chance to get another spectrum after a gap of 9 days. A surprise was waiting for me. After almost no change in EW since 10 December 09, it has started increasing again. Nearly all the additional absorption over the past 9 days is on the red (high RV) edge of the line. The RV of the absorption now being added to the line is roughly twice that first seen back in July last year. Faster orbiting inner material now eclipsing the F star.



Robin Leadbeater, Three Hills Observatory (continued)



KI 7699 EW data and line profiles from Three Hills Observatory were included in this poster paper presented at the 110th AAS meeting Washington DC January 2010.

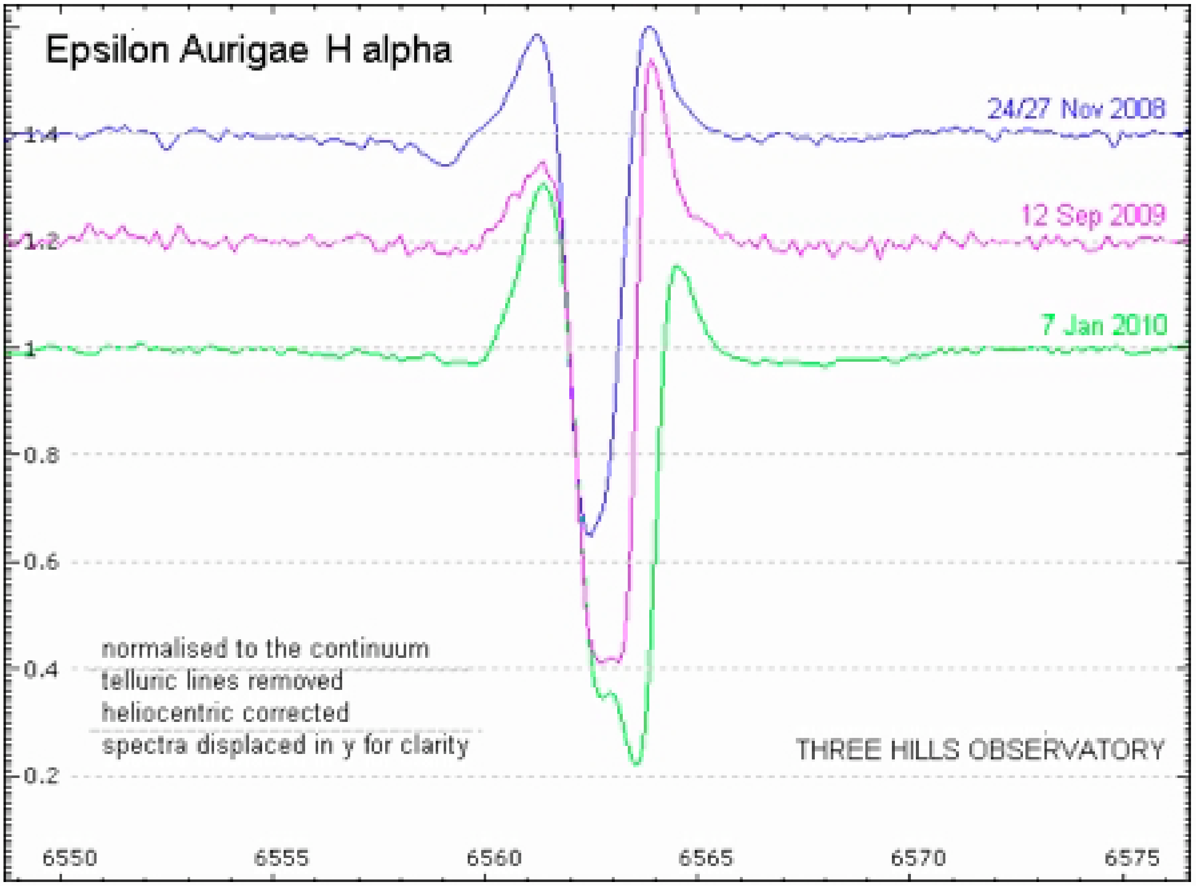
"Epsilon Aurigae - Two Year Totality Transpiring" Brian Kloppenborg, Robert Stencel, Jeffrey Hopkins

The EW results were also included in this poster paper presented at the 25th New Mexico Symposium January 2010 as part of a collaboration with Apache Point Observatory.

"Early results of a high-resolution spectroscopic monitoring program of the mysterious eclipsing binary, Epsilon Aurigae, at Apache Point Observatory" William Ketzeback, John Barentine, Russet McMillan, Jack Dembicky, Gabrelle Saurage, Jeffrey Coughlin, Joe Huehnerhoff, Sarah Schmidt, George Wallerstein, Suzanne Hawley, Robin Leadbeater

The THO results are in good agreement with those obtained using the 3.5m ARC telescope and ARCES spectrograph at APO as shown in fig 7 of the paper.

Hydrogen alpha 6563Å line: Identifying changes in the Hydrogen alpha line due to the eclipse is complicated by variations seen in this line outside eclipse (both in the absorption core and in the red and blue emission wings).

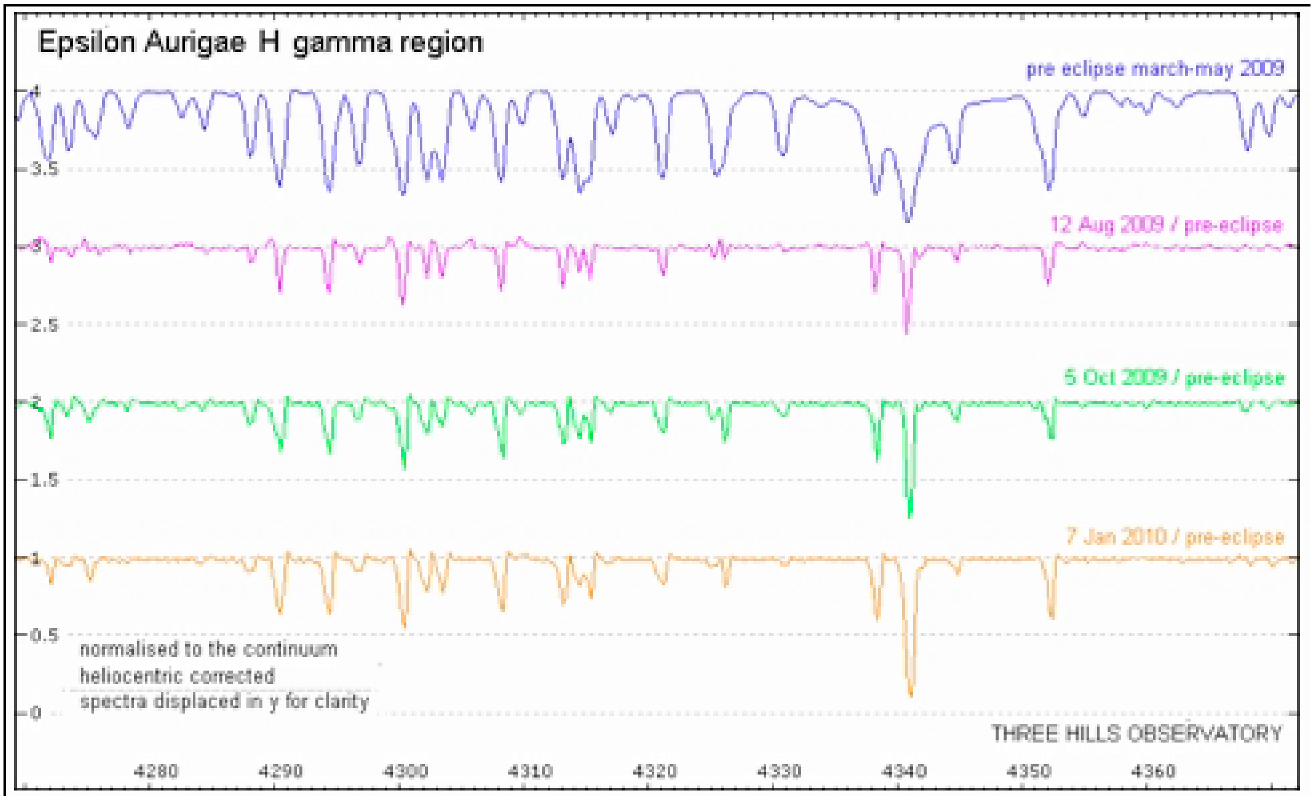


The emergence of an additional absorption component during ingress to the red of the out of eclipse absorption core is clear however.

Robin Leadbeater, Three Hills Observatory (continued)

Hydrogen gamma and metal lines 4270-4370Å

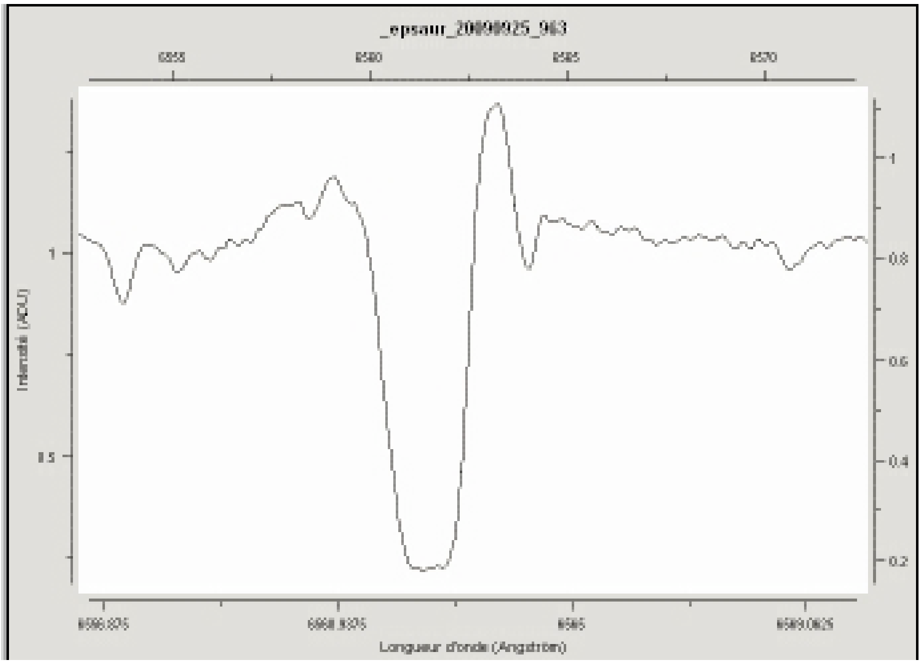
The "shell spectrum" of narrow metal lines, extracted by dividing the in eclipse spectra by the mean pre eclipse, was identified by Ferluga during the last eclipse and was first seen in THO spectra during this eclipse in August 2009



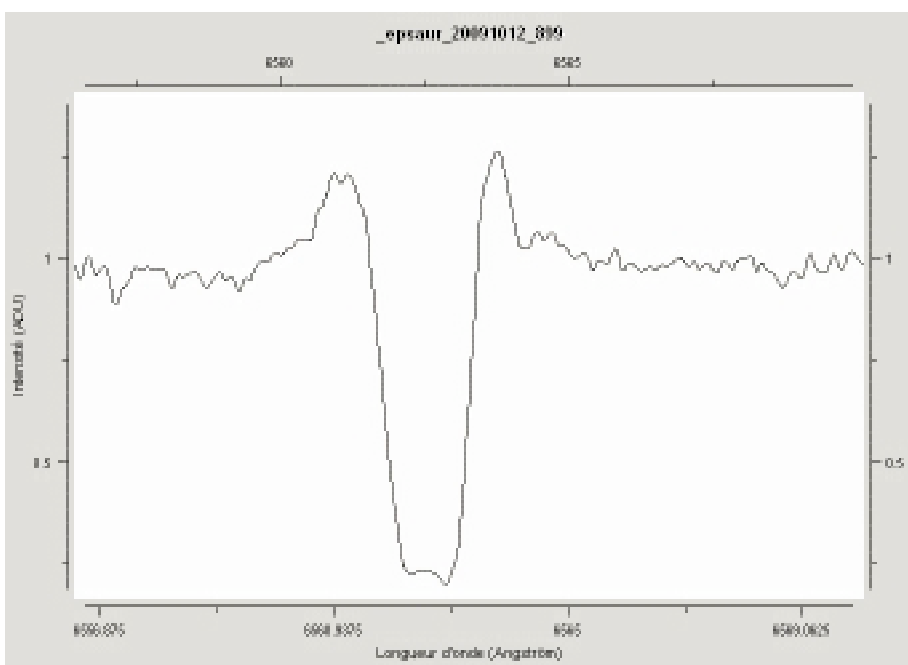
During ingress the H gamma line in the shell spectrum has increased significantly in intensity, the other features less so. Note also the absence in the shell spectrum of some lines present in the pre-eclipse spectrum. The Ti II line at 4331Å is a good example.

Thierry Garrel, Observatoire de Foncaude
Juvignac, France
Telescope Type: CN212 Takshashi, 212 mm, 12,4/3,99
Cassegrain/Newtonian
Instrument/Detector: Spectrometer
Lhires III 2400 l/mm, Star Analyser100
Atik 314L+, cooled camera based on sony285 CCD

Hydrogen Alpha Spectrum Profile 25 September 2009

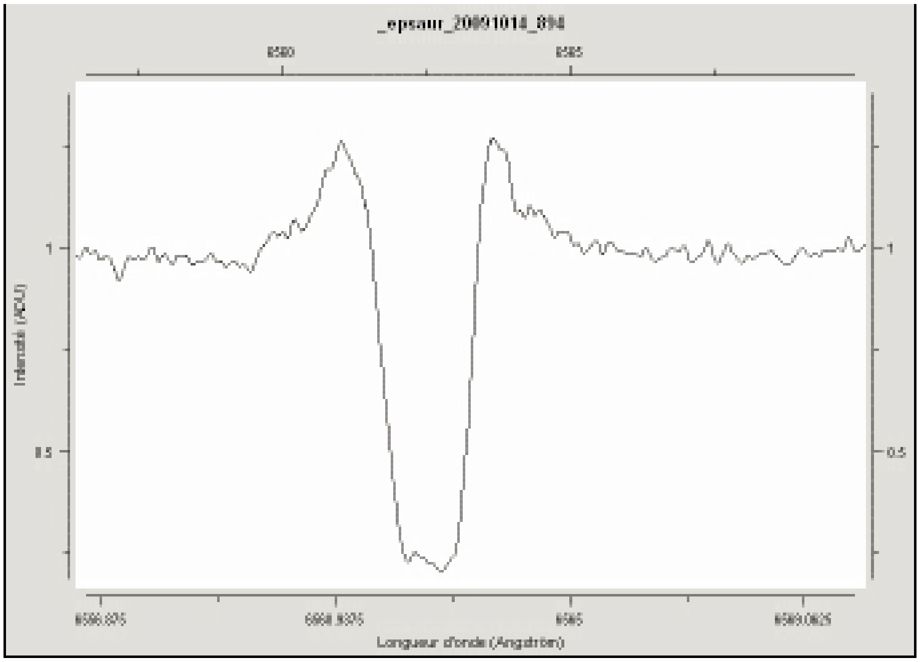


Hydrogen Alpha Spectrum Profile 12 October 2009

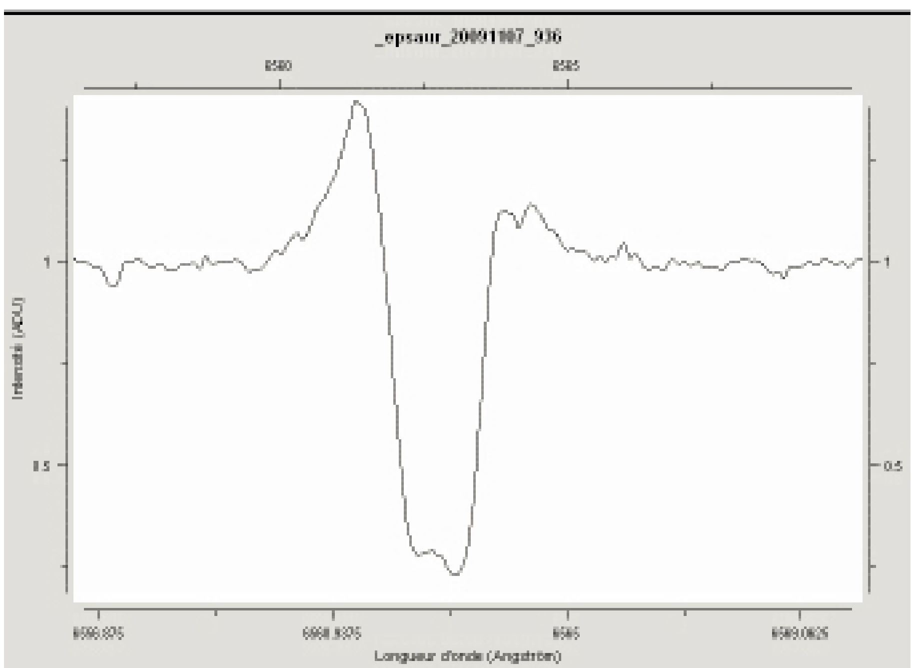


Thierry Garrel, Observatoire de Foncaude (continued)

Hydrogen Alpha Spectrum Profile 14 October 2009

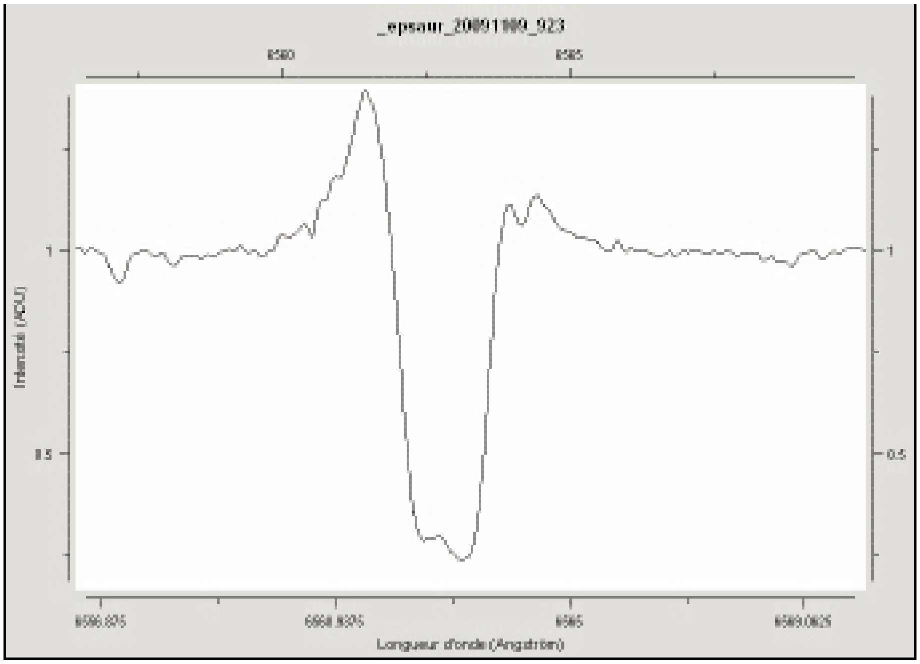


Hydrogen Alpha Spectrum Profile 07 November 2009

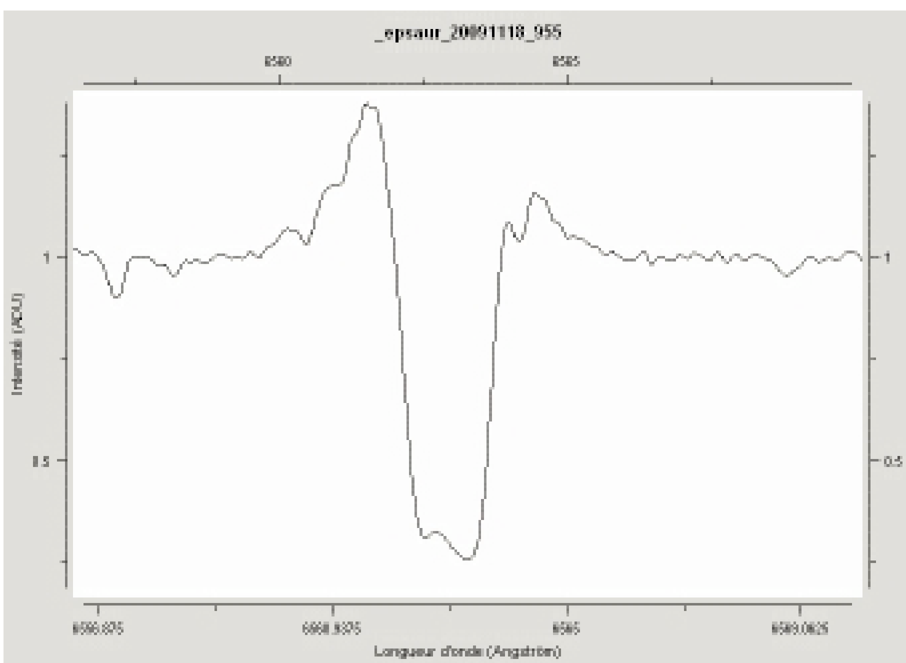


Thierry Garrel, Observatoire de Foncaude (continued)

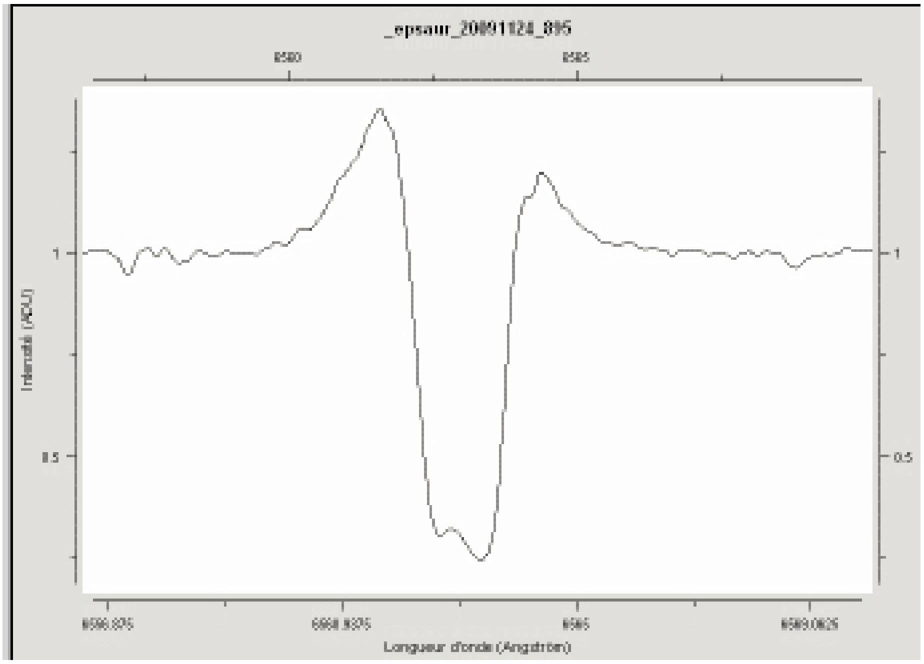
Hydrogen Alpha Spectrum Profile 09 November 2009



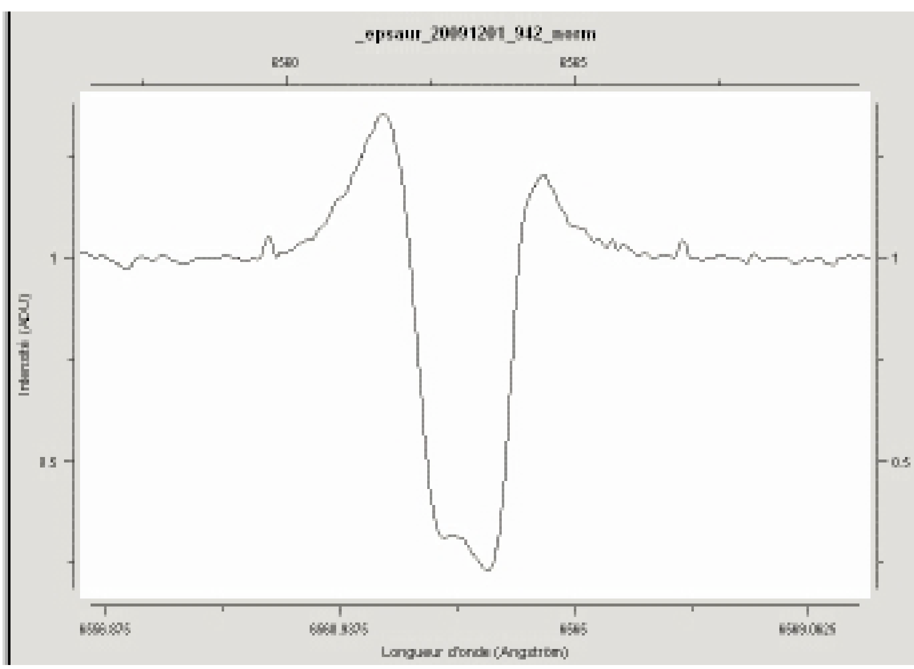
Hydrogen Alpha Spectrum Profile 18 November 2009



Hydrogen Alpha Spectrum Profile 24 November 2009

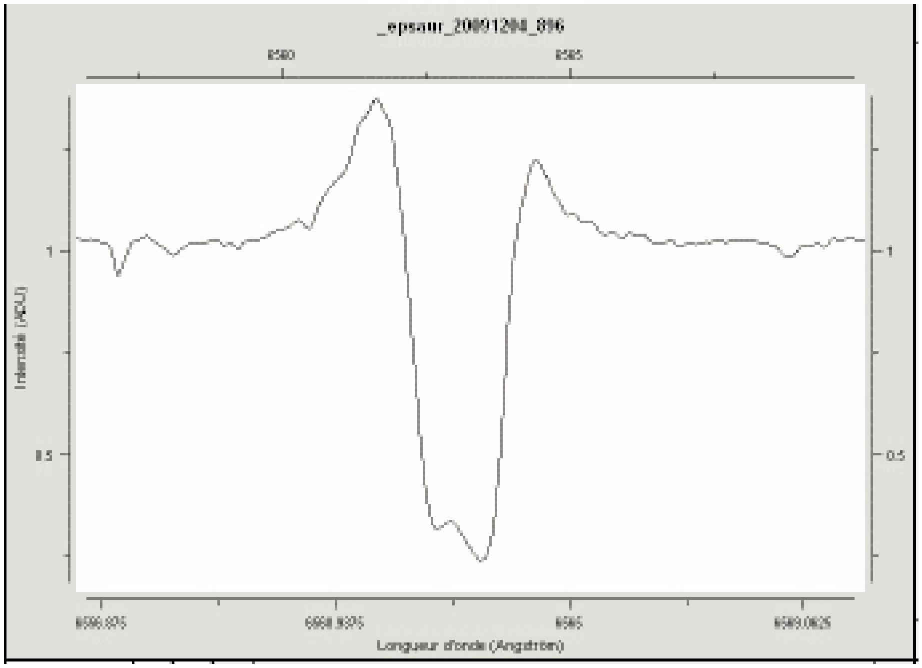


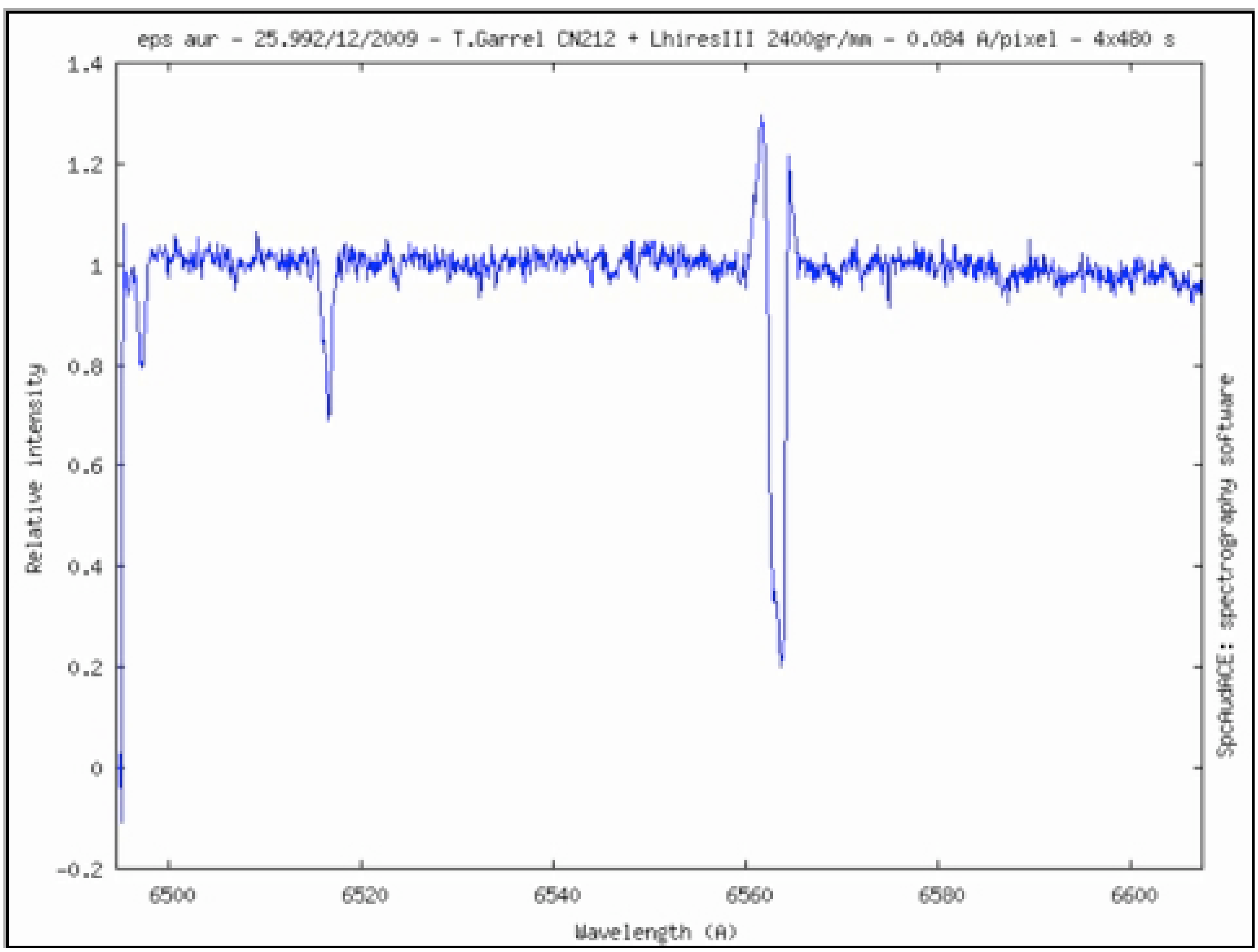
Hydrogen Alpha Spectrum Profile 01 December 2009

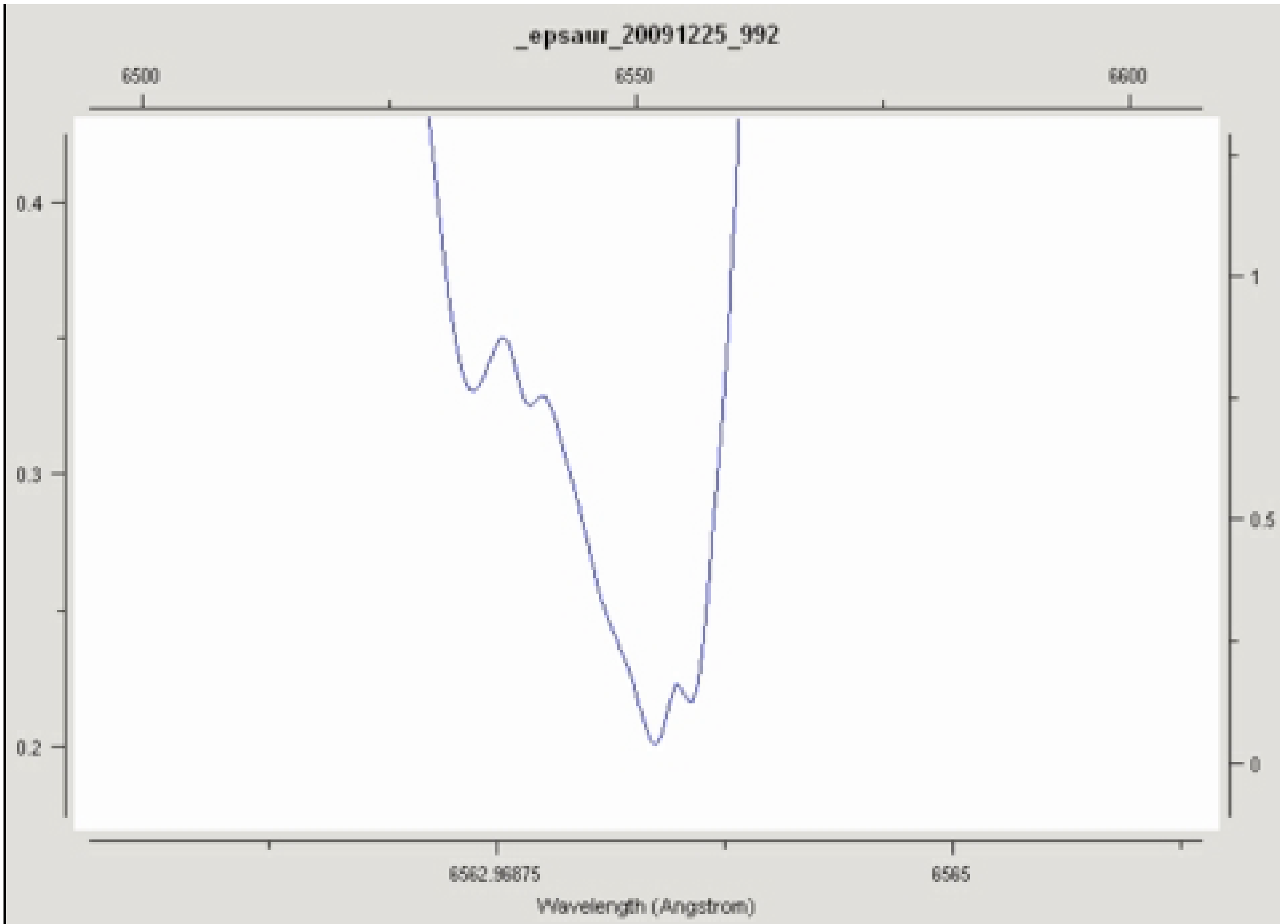


Thierry Garrel, Observatoire de Foncaude (continued)

Hydrogen Alpha Spectrum Profile 04 December 2009



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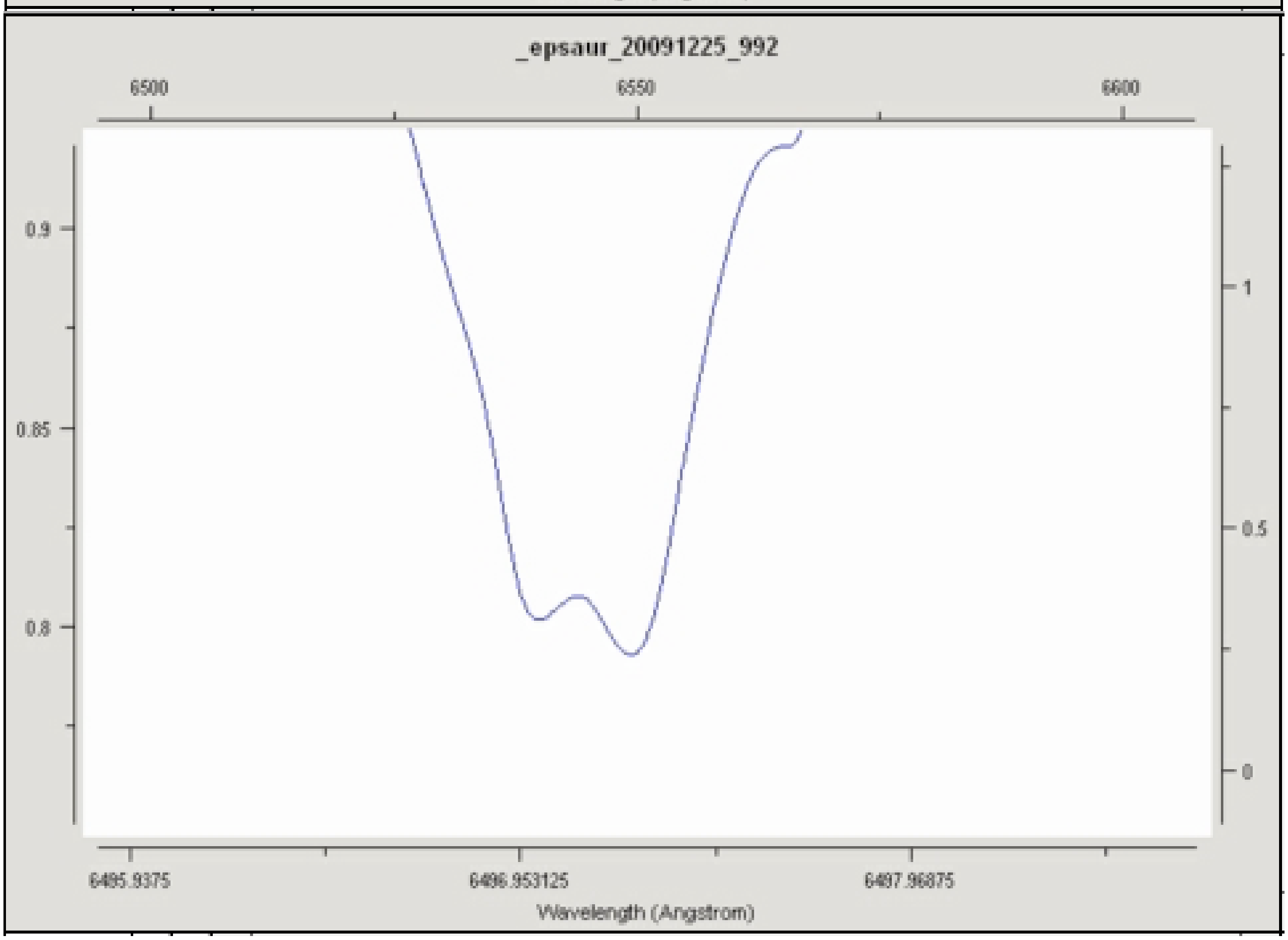
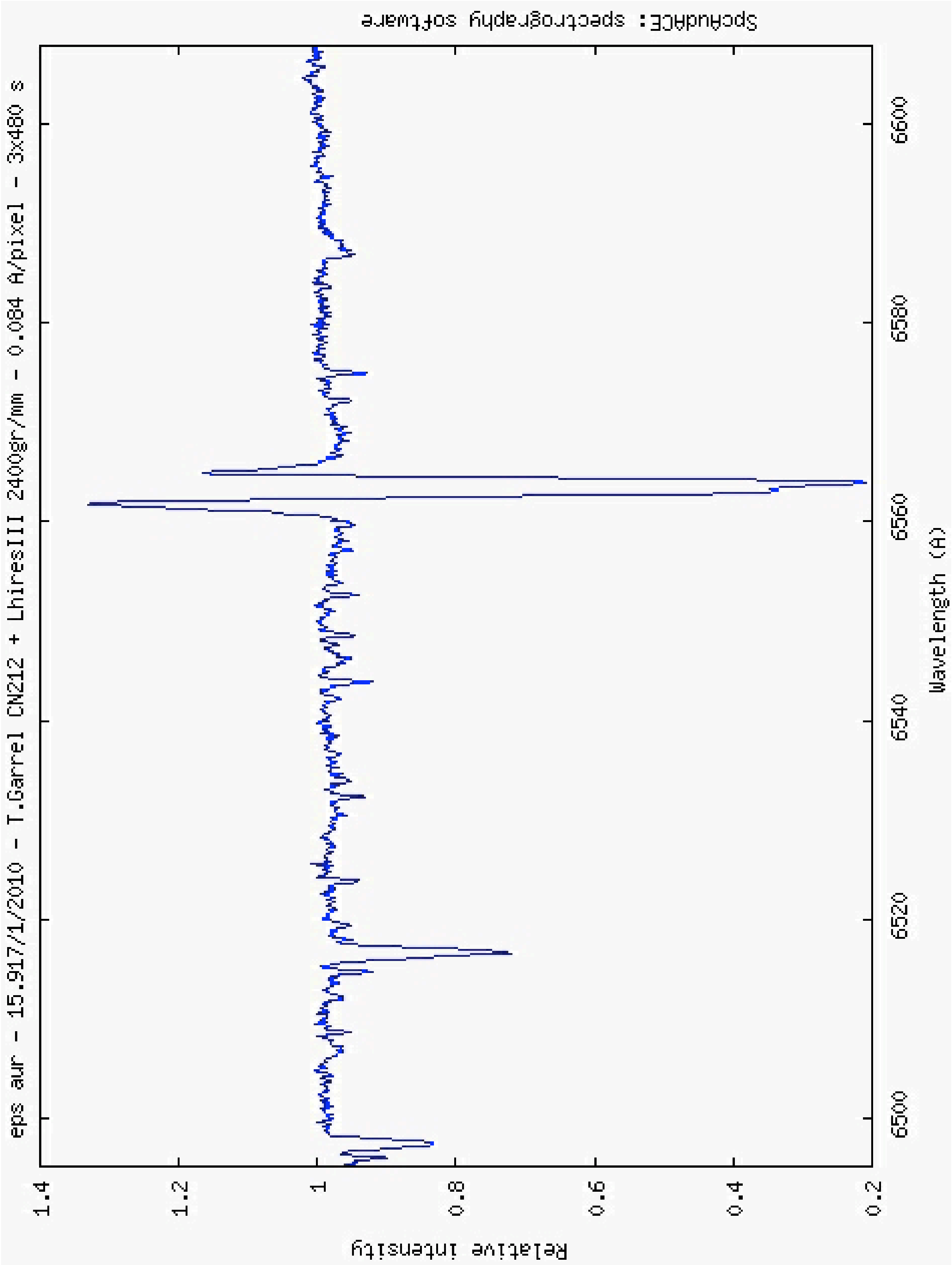
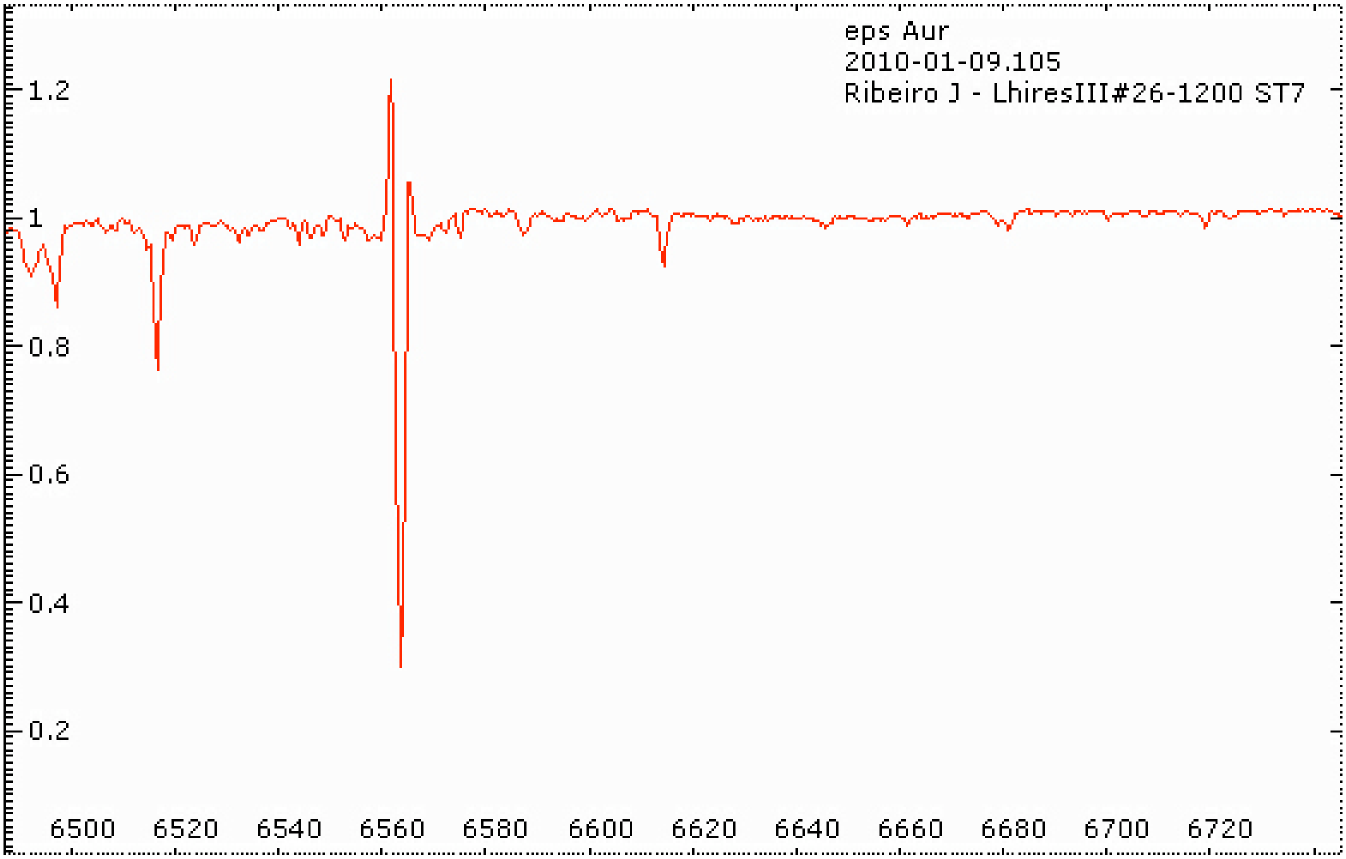
6550
6600
0.4
0.3
0.2
1
0.5
0
6562.96875
6565
Wavelength (Angstrom)


_epsaur_20091225_992
6500
6550
6600
0.9
0.85
0.8
1
0.5
0
6485.9375
6486.953125
6487.96875
Wavelength (Angstrom)


eps aur - 15.917/1/2010 - T.Garrel CN212 + LhiresIII 2400gr/mm - 0.084 A/pixel - 3x480 s
SpcAudACE: spectrography software
Wavelength (A)
Relative intensity
6500
6520
6540
6560
6580
6600
0.2
0.4
0.6
0.8
1
1.2
1.4

Jose Ribeiro, Lisboa, Portugal
Observatorio de Instituto Geografico de Exercito (IGEOE - Portugal)
C14 with Lhires III and SBIG ST7

Epsilon Aurigae Hydrogen Alpha Region
09 January 2010

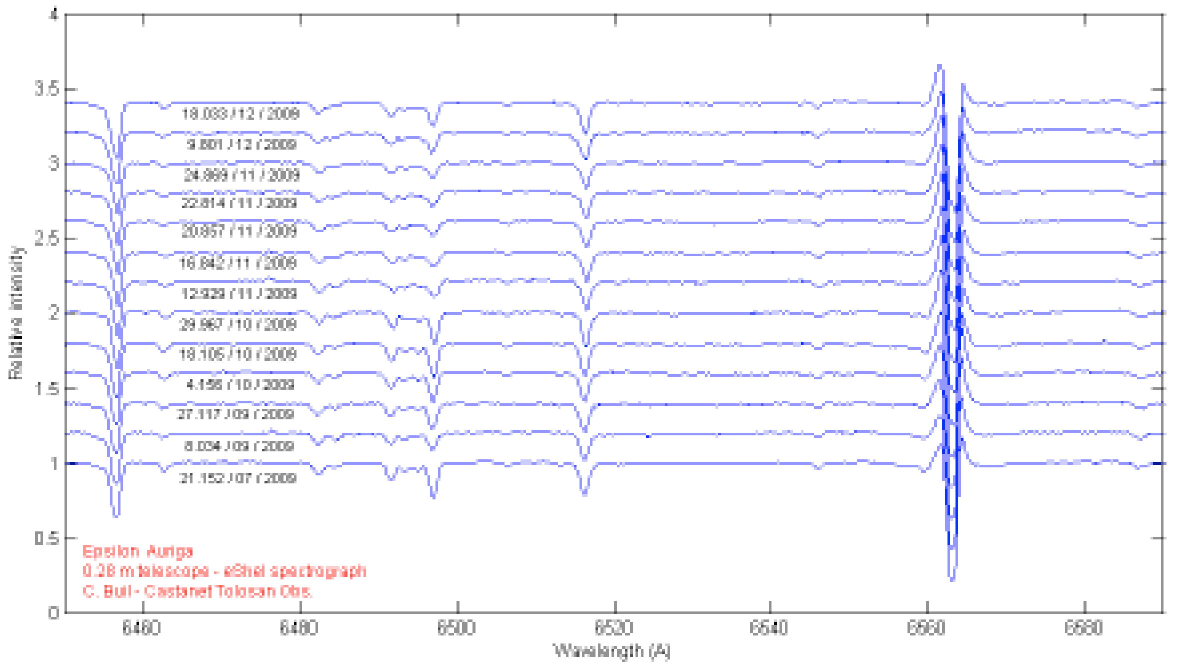


Christian Buil, Castanet-Tolosan, France

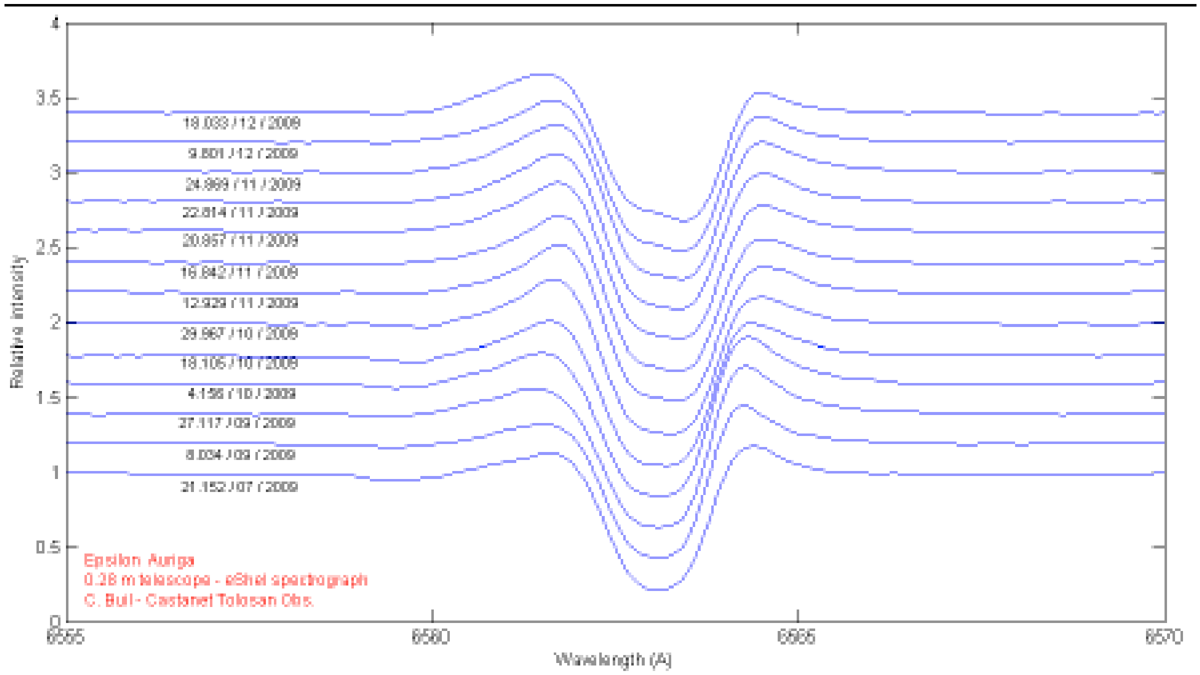
Instrument: 0.28 m telescope (Celestron 11) + eShel spectrograph (R=11000) + QSI532 CCD camera (CCD KAF3200ME)

Processing: standard échelle pipeline (Reshel software V1.11). H2O telluric lines are removed (division by a synthetic H2O spectrum by using Vspec software - the telluric lines list is from GEISA database (LMD/CNRS)).

The diurnal and annual earth velocity are corrected (the spectra wavelength are given in an heliocentric reference for a standard atmosphere). For the plots, the continuum is normalized and vertically shifted between each spectrum for clarity. Date are given in UT.

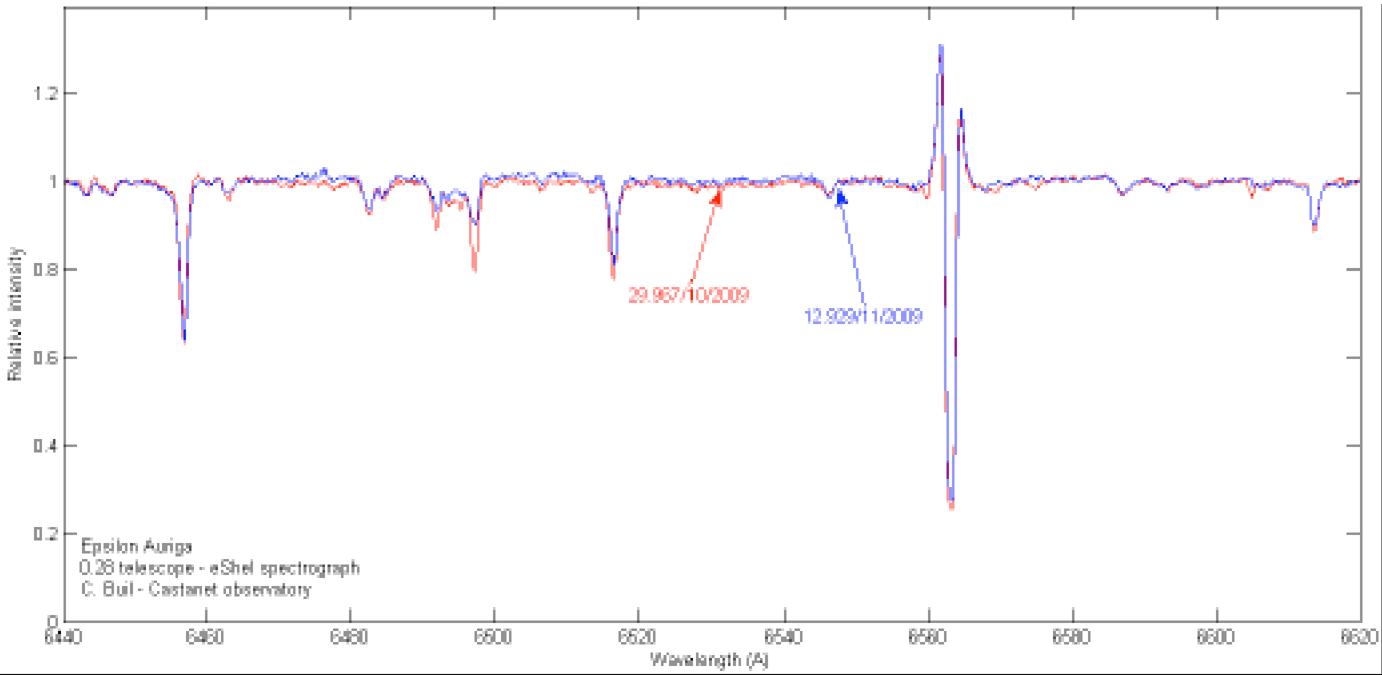


Hα Region

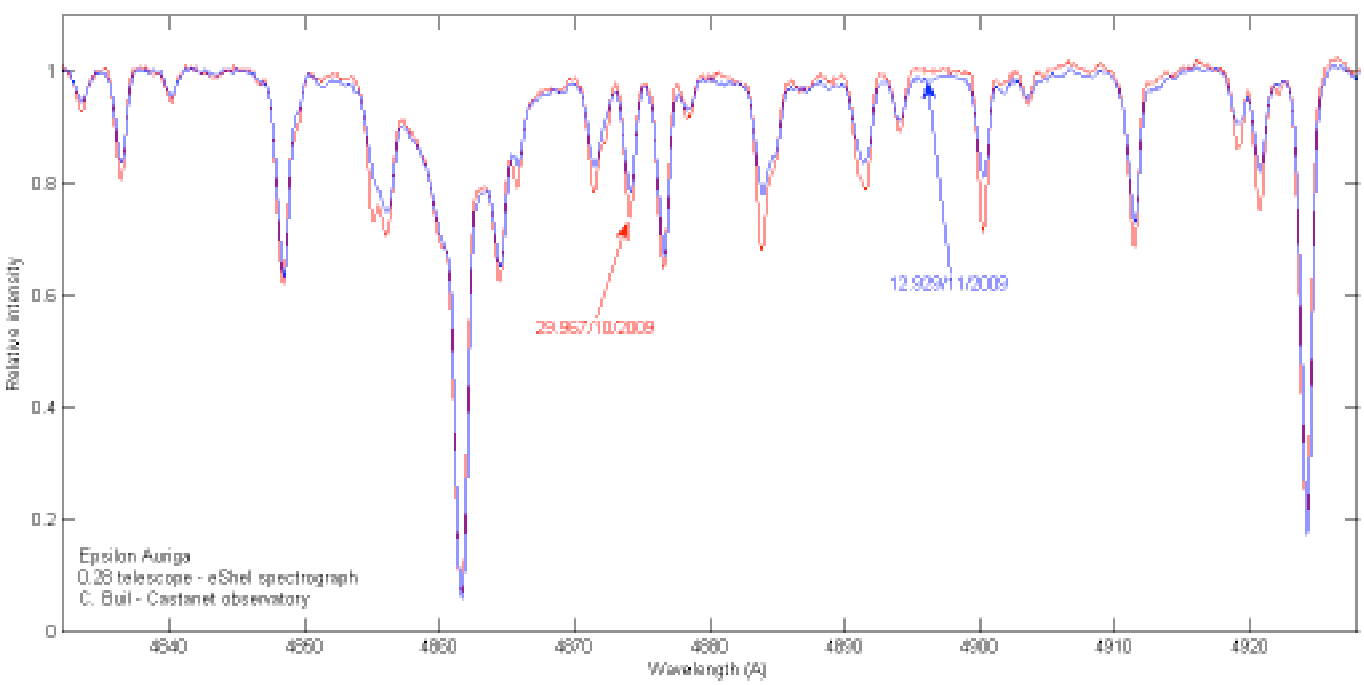


Activity of Hα Line

Christian Buil (continued)



Fast Evolution Near Hα Line, Note Features near 6491.9 Å and 6497.1 Å



Fast Evolution Near Hβ Line

Brian E. McCandless, Grand View Observatory
Elkton, MD USA

Equipment:

Celestron CGE1400 (35cm f/10)

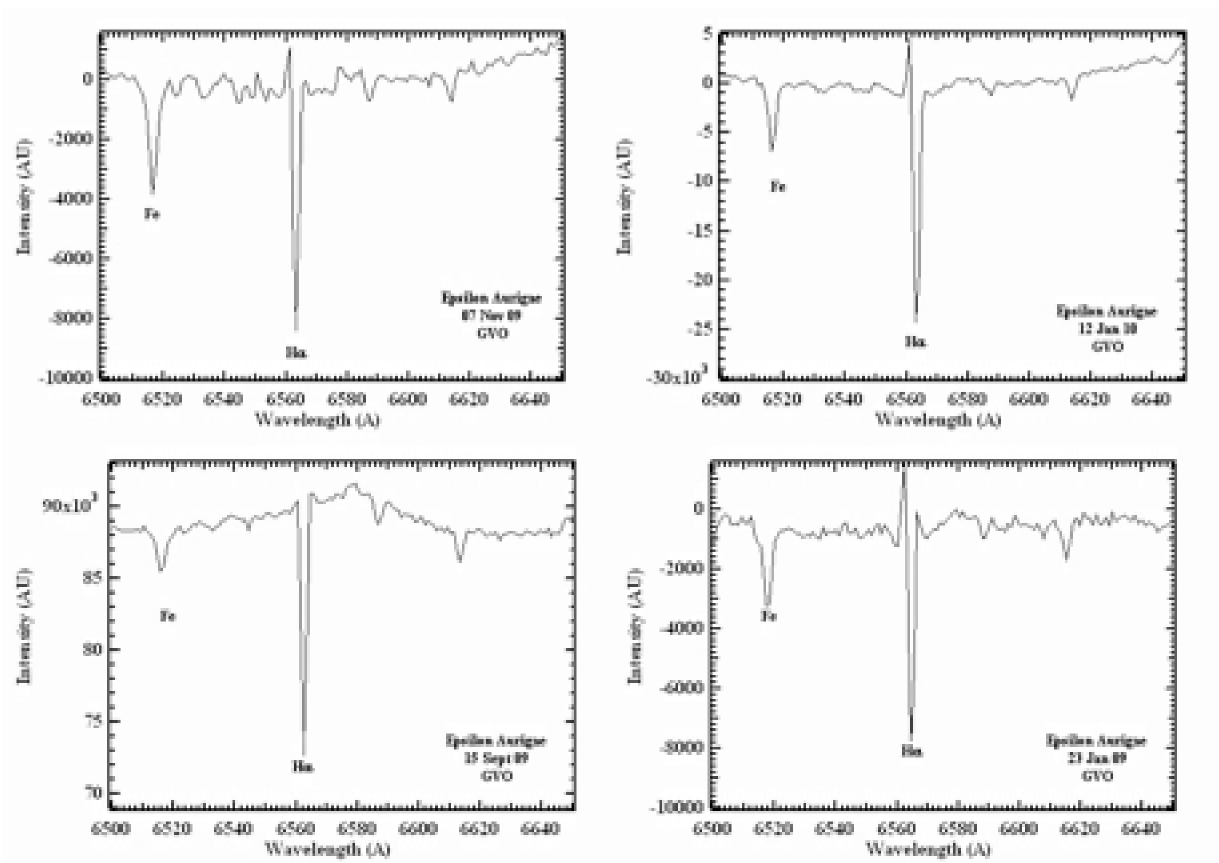
SBIG SGS spectrograph with ST7XME CCD camera

(Operates at f/6.3, 400-800 nm spectral range, grating 600 l/mm, dispersion = 0.107 nm/pixel, R = 0.22 nm at 650 nm, R ~ 3000)

Spectrographic Monitoring of Epsilon Aurigae: 14 Jan 2010

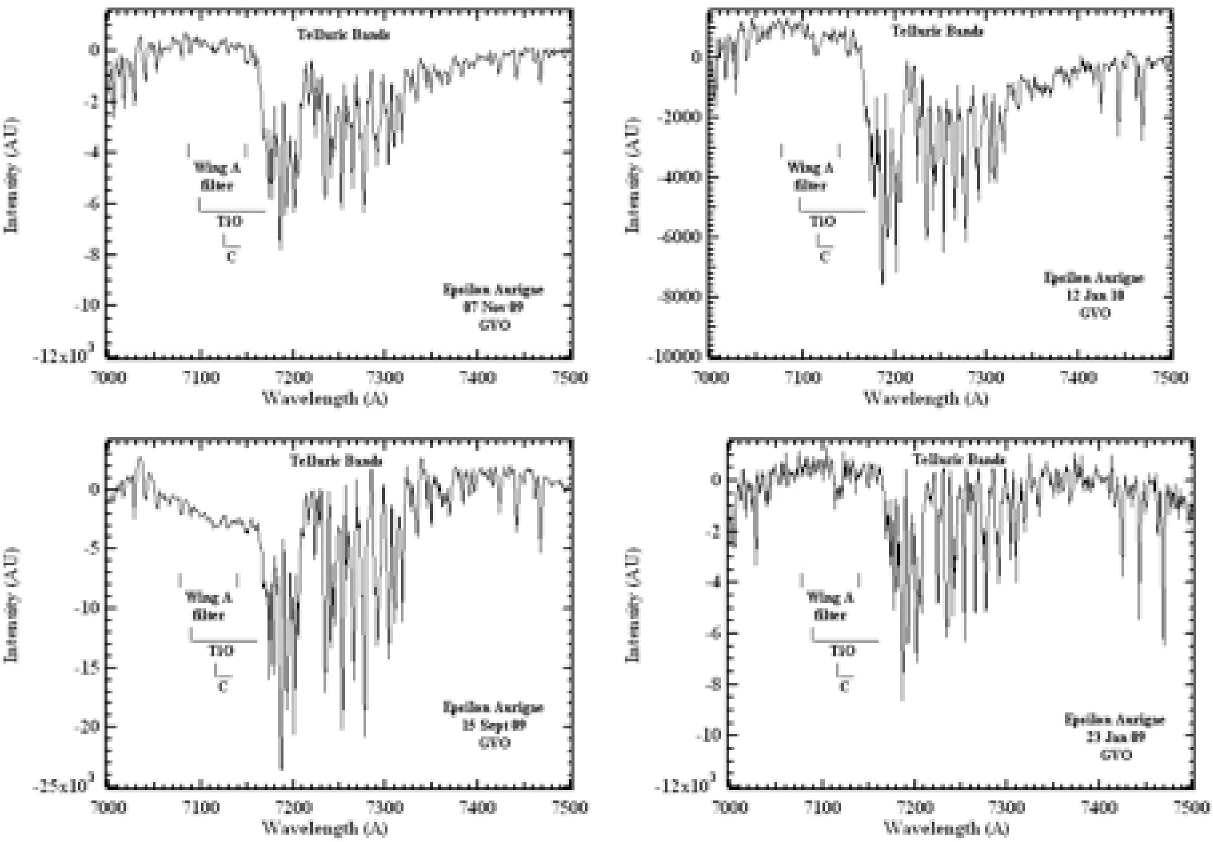
Summary

Spectrographic observations of epsilon Aurigae are presented for the observing period JD 2,455,156 (Nov 2009) to present. Spectroscopic measurements reveal that the relative depth of Fe (652 nm) to Hα absorption varies, and approaching emission horn on Hα remains prevalent throughout the eclipse ingress.



Hα region of ε Aur spectrum: Time progression clockwise from lower-right.

Brian McCandless, Grand View Observatory (continued)



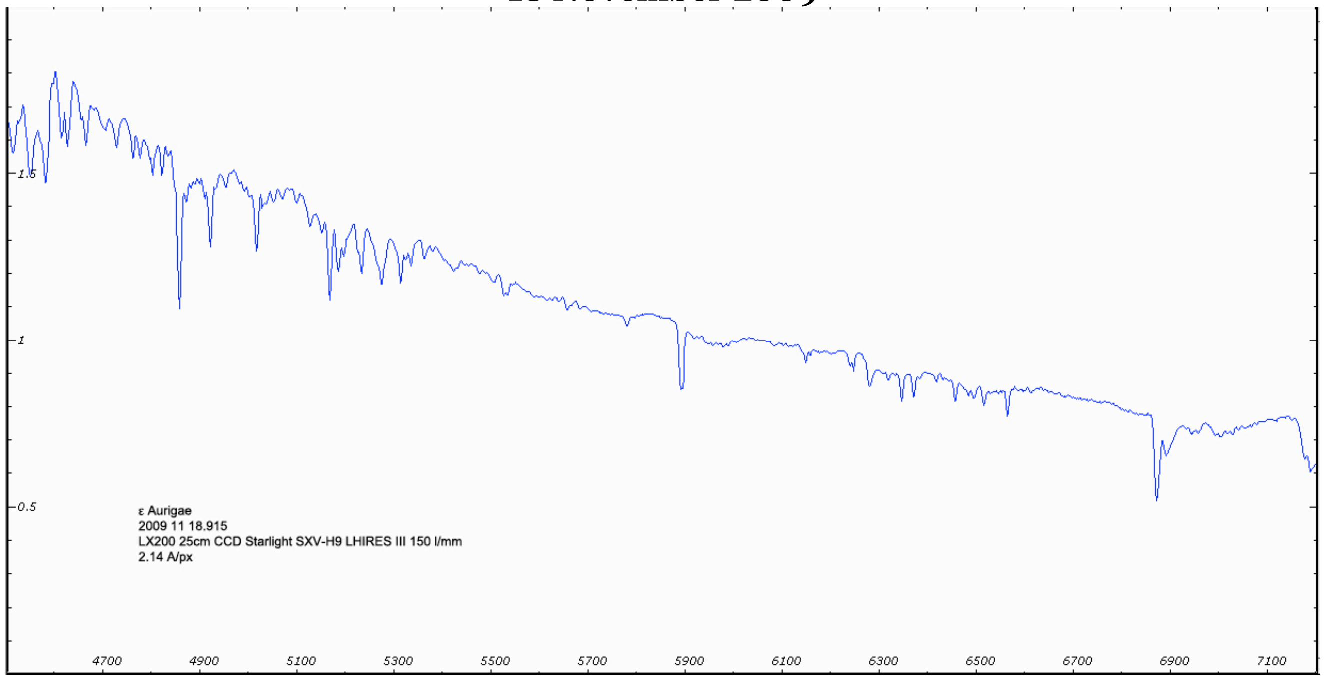
TiO (γ system) region of ε Aur spectrum: Time progression clockwise from lower-right.

François Teyssier, Yogurt pot observatory, Rouen, France
Equipment: Lhires III Low Resolution, 150 line/mm, CCD Starlight SXV-H9

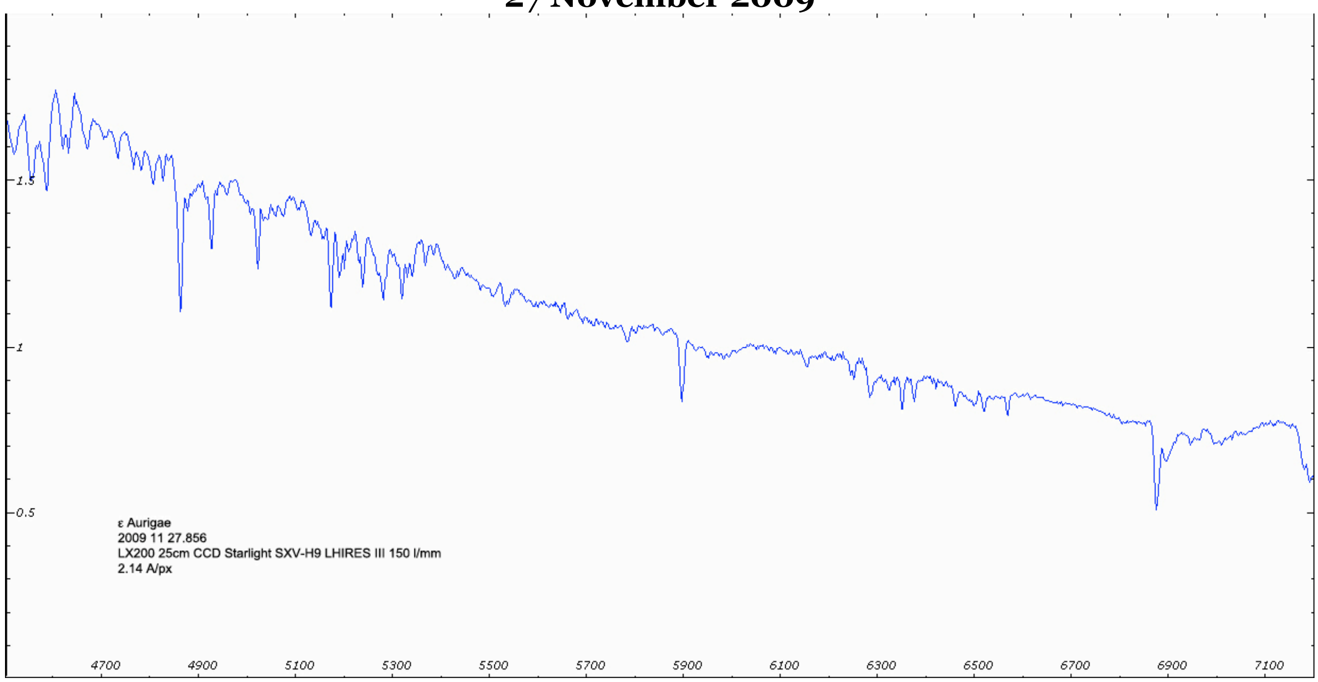
Spectra line profiles range 4,700Å to 7,100Å.

Epsilon Aurigae

18 November 2009

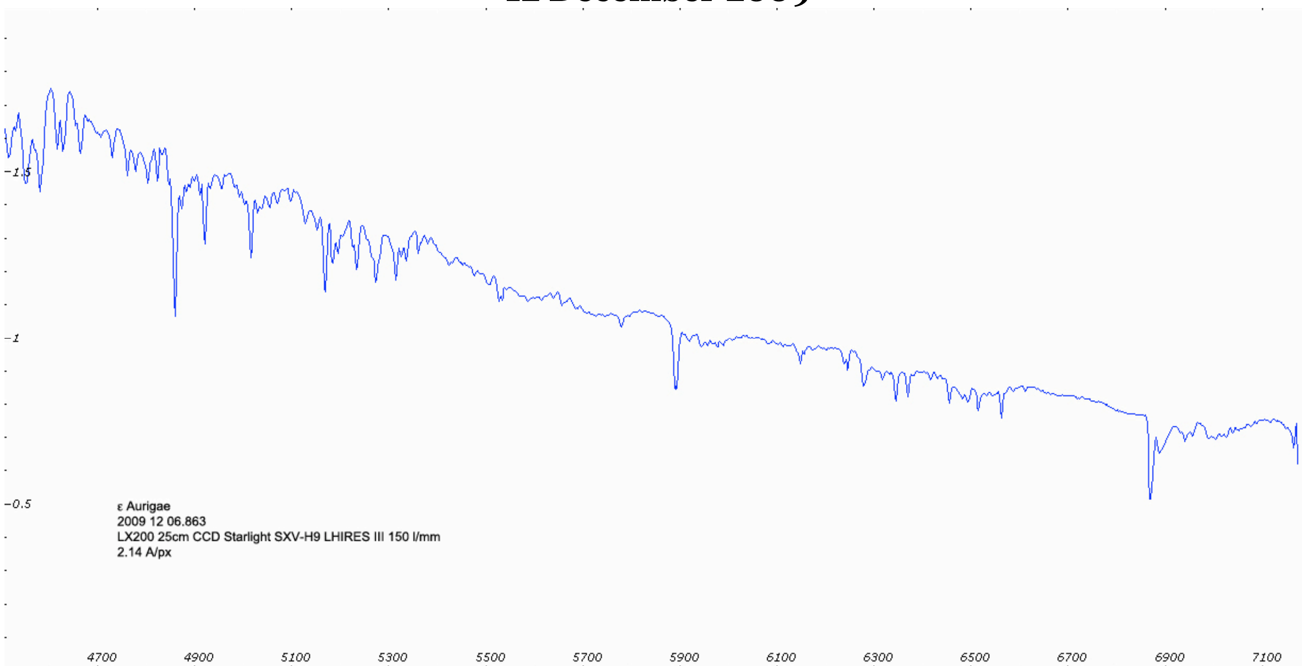


27 November 2009

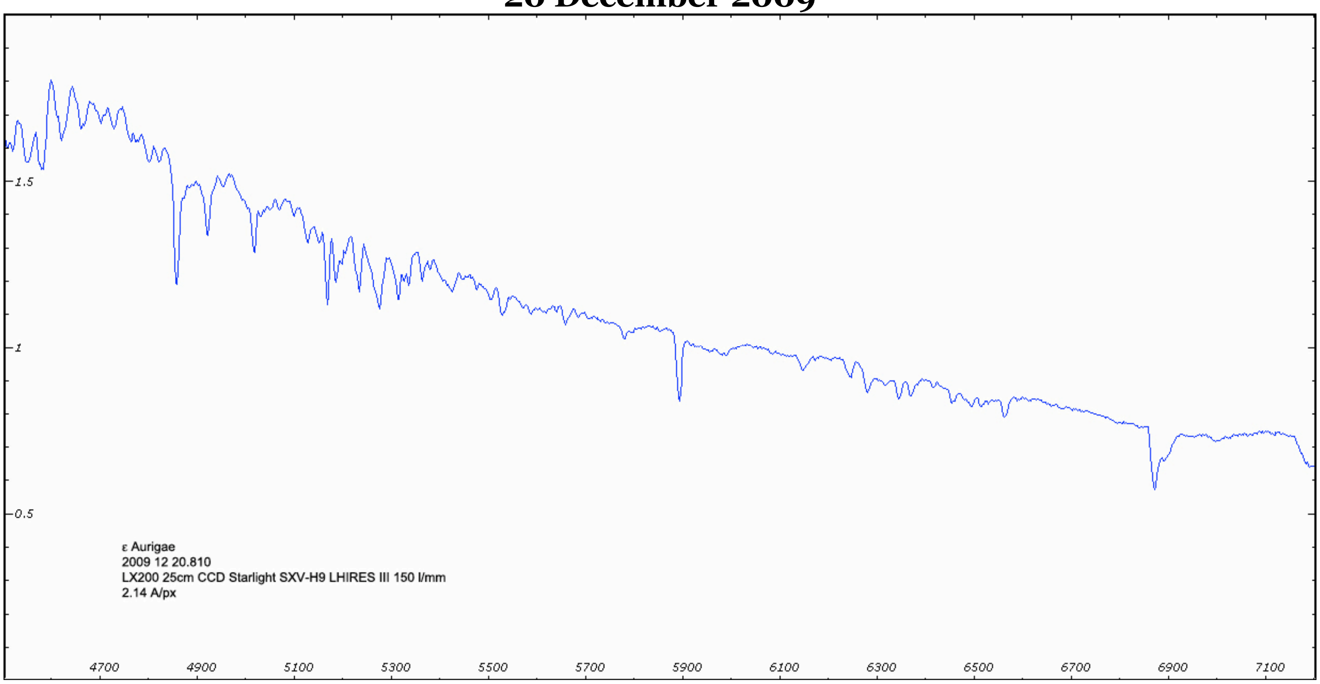


François Teyssier (continued)

12 December 2009



20 December 2009



INTERFEROMETRY REPORT
Dr. Robert Stencel, University of Denver Astronomy

Since Newsletter 15, we have been fortunate to obtain a pair of near-infrared imaging data sets at the Mt. Wilson CHARA array with milli-arcsecond resolution, that clearly show the disk ingress across the F star. While these results are presently under review for journal publication, the details cannot be shared now, but will be provided hopefully in the next newsletter. Similarly, optical region spectral-interferometric data were obtained by colleagues during November that hold exciting potential as well, but their data reduction process is not completed. That said, there is every reason to obtain additional interferometric observations during this eclipse. Unfortunately, Mt.Wilson has endured heavy rains that caused road-damaging mudslides at the end of 2009, compromising observatory programs for the foreseeable. We remain hopeful that at least one more imaging session will be possible this season before mid-eclipse in August. Meanwhile, Brian Kloppenborg and I are reprocessing all the epsilon Aurigae pre-eclipse data available from the Palomar Testbed Interferometer in hopes of adding better definition of the F star itself.

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POLARIMETRY REPORT

Polarimetry Paper

Characteristics of an Imaging Polarimeter for the Powell Observatory

Author Block Shannon Hall[1], G. Henson[2]
1-Whitman College, 2-East Tennessee State University

http://adsabs.harvard.edu/abs/2010AAS...21544121H

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 TEC 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.

This project was funded by a partnership between the National Science Foundation (NSF AST-0552798), Research Experience for Undergraduates (REU), and the Department of Defense (DoD) ASSURE (Awards to Stimulate and Support Undergraduate Research Experiences) programs.

From Dr. Bob

Dr. Robert E. Stencel, Co- Editor
University of Denver Astronomy Program
rstencel@du.edu
Headlines at: **www.twitter.com/epsilon_Aurigae**

Totality has arrived, give or take the early uncertainty of the exact time for second contact. A glance at the night sky shows epsilon looking pale even in comparison to zeta!

Because of the exceptional coverage of ingress by you, our observers, it will be possible for the first time to precisely estimate the relative contribution of those out of eclipse (OOE) light variations, at a much wider set of wavelengths than ever before.

Jeff's UBV work demonstrates how dominant OOE variations are at U-B and B-V colors, and Brian's McCandless clearly shows that these are less pronounced at the longer wavelengths (JH).

Because of recent work by Don Hoard, Steve Howell and myself (Astrophysical Journal, submitted), we can now put these wavelength differences in a firmer context, as illustrated here. This shows the relative contributions to light from the F star, indications of a B star companion in the UV and the signature of the cold disk in the infrared. Note that much of the non-optical data come from spacecraft (FUSE, HST and IUE in the UV; Spitzer in the IR) and are pre-eclipse.

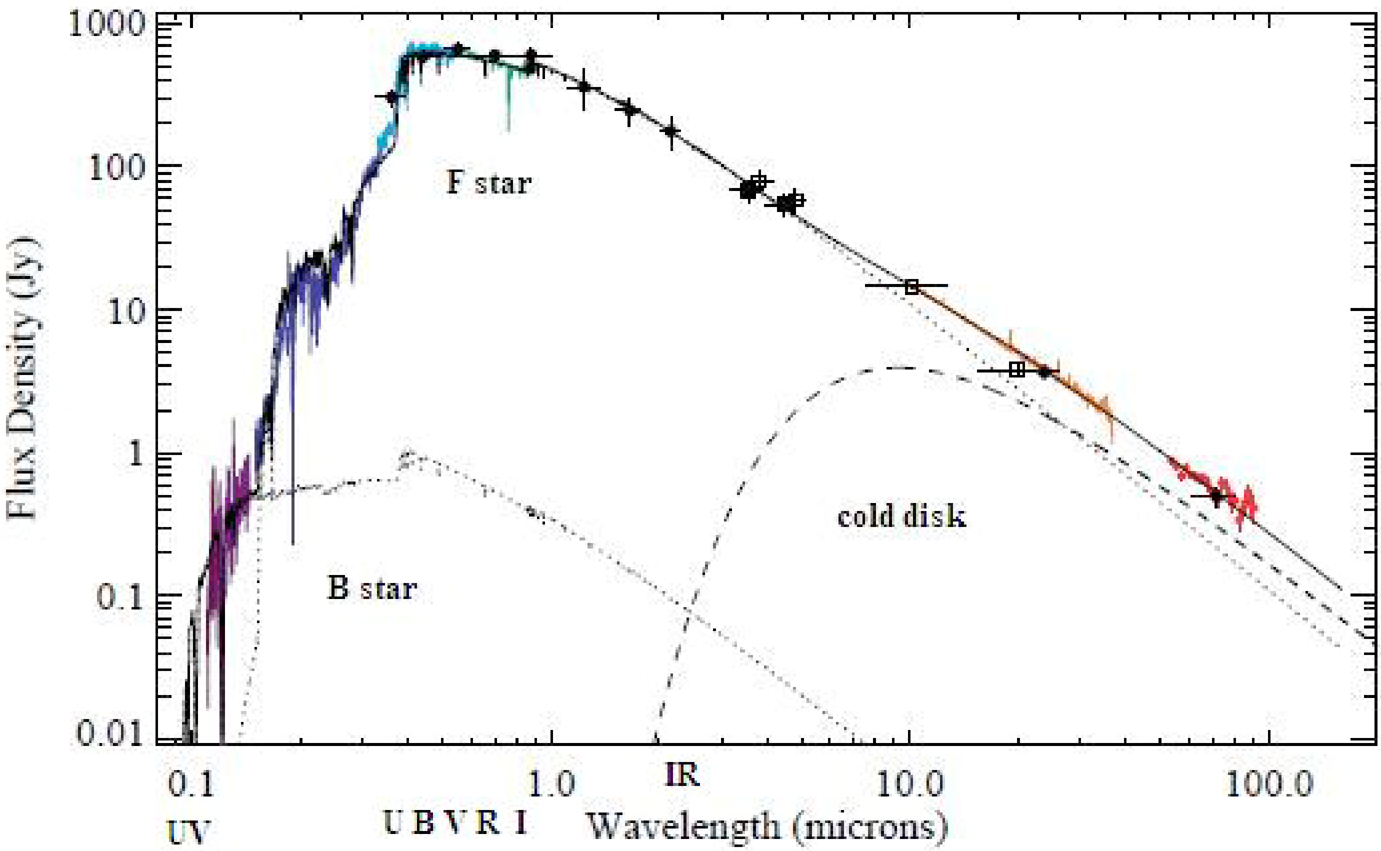
Thus, OOE are likely associated with the B star and/or interaction of the B star with the F star. Spectroscopic variations reported by Robin Leadbeater and others are defining disk characteristics in new ways.

The spectral coverage, including Hα, by all the observers reporting in this newsletter is unprecedented, and will be key in terms of making sense of new observations being generated by the photometry and with interferometers (see Interferometry report). As we approach mid-eclipse, a change from redshifted to blueshifted components is anticipated.

The polarimetry effort by Gary Henson and his students is unique so far, and we hope will provide important evidence about the eclipse geometry. The multi-spectral ensemble illustrated here will provide an important template for comparison with eclipse data now being generated.

ϵ Aurigae from the Far-UV to the Mid-IR

Hoard, Howell and Stencel, 2010 Astrophysical Journal - submitted.



Interesting Papers

Epsilon Aurigae -Two Year Totality Transpiring (Poster Paper)
by Brian Kloppenborg, Robert Stencel, Jeffrey Hopkins

Abstract

The 27 year period eclipsing binary, epsilon Aurigae, exhibits the hallmarks of a classical Algol system, except that the companion to the F supergiant primary star is surprisingly under-luminous for its mass. Eclipse ingress appears to have begun shortly after the predicted time in August 2009, near JD 2,455,065. At the University of Denver, we have focused on near-infrared interferometry, spectroscopy, and photometry with the superior instrumentation available today, compared to that of the 1983 eclipse. Previously obtained interferometry indicates that the source is asymmetric (Stencel, et. al. 2009 APLJ)and initial CHARA+MIRC closure-phase imaging shows hints of resolved structures. In parallel, we have pursued SPEX near-IR spectra at NASA IRTF in order to confirm whether CO molecules only seen during the second half of the 1983 eclipse will reappear on schedule. Additionally, we have obtained J and H band photometry using an Optec SSP-4 photometer with a newly written control and analysis suite. Our goal is to refine daytime photometric methods in order to provide coverage of the anticipated mid-eclipse brightening during summer 2010, from our high-altitude observatory atop Mt. Evans, Colorado. Also, many parallel observations are ongoing as part of the epsilon Aurigae international campaign. In this report, we describe the progress of the eclipse and ongoing observations. We invite interested parties to get involved with the campaign for coverage of the 2009-2011 eclipse via the campaign web sites.

See: **http://www.hposot.com/EAur09/EAUR%20pdfs/EAURAASJan10.pdf**

Epsilon Aurigae: An improved spectroscopic orbital solution
Stefanik et al.
http://lanl.arxiv.org/abs/1001.5011
(Submitted on 27 Jan 2010)

Abstract

A rare eclipse of the mysterious object Epsilon Aurigae will occur in 2009-2011. We report an updated single-lined spectroscopic solution for the orbit of the primary star based on 20 years of monitoring at the CfA, combined with historical velocity observations dating back to 1897. There are 518 new CfA observations obtained between 1989 and 2009. Two solutions are presented. One uses the velocities outside the eclipse phases together with mid-times of previous eclipses, from photometry dating back to 1842, which provide the strongest constraint on the ephemeris. This yields a period of 9896.0 +/- 1.6 days (27.0938 +/- 0.0044 years) with a velocity semi-amplitude of 13.84 +/- 0.23 km/s and an eccentricity of 0.227 +/- 0.011. The middle of the current on-going eclipse predicted by this combined fit is JD 2,455,413.8 +/- 4.8, corresponding to 2010 August 5. If we use only the radial velocities, we find that the predicted middle of the current eclipse is nine months earlier. This would imply that the gravitating companion is not the same as the eclipsing object. Alternatively, the purely spectroscopic solution may be biased by perturbations in the velocities due to the short-period oscillations of the supergiant.

BOOK
Epsilon Aurigae A Mysterious Star System

by

Hopkins and Stencel

This is a 287 page soft cover book covering the history of epsilon Aurigae and the observations both in and out-of-eclipse as well as the different techniques used.

Note: We only have a handful of copies left. While we plan to provide a second addition after the eclipse, there will be no second printing of the first edition. This is a last chance to get a first edition copy of the book.

For more information
http://www.hposoft.com/EAur09/Book.html
$29.95 + S&H

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

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

Clear Skies!
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(Counting Photons)
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Phoenix, Arizona 85033 USA
phxjeff@hposoft.com