Eruptive stars spectroscopy
Cataclysmics, Symbiotics, Novae

Eruptive Stars
Information Letter n° 42 #2019-02 06-10-2019
Observations of Apr. - Jun. 2019

Contents

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"We acknowledge with thanks the variable star observations from the AAVSO International Database contributed by observers worldwide and used in this letter."
Kafka, S., 2018, Observations from the AAVSO International Database, http://www.aavso.org

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Spectroscopic observations of symbiotic stars in 2019-Q2

Authors:
F. Teyssier, D. Boyd, F. Sims, A. Skopal, N. Shagatova, J. Guarro, T. Lester, F. Campos, J. Foster, U. Sollecchia, C. Boussin, S. Charbonnel, O. Garde, P. Somogyi, P. Berardi, C. Buil, V. Marik, G. Martineau, Y. Buchet, I. Diarrassouba, J. Michelet, M. Vrastak, P. Ledu, J. Coffin

Abstract:
178 spectra of 23 symbiotics stars were obtained during 2019-Q2. After a series of 4 outbursts (2015-2018), no outburst detected for AG Dra in 2019. AX Per was monitored during the decline of its outburst. V694 Mon (MWC 560) remains at high luminosity. The terminal velocities of Balmer and Fe II lines are low (~ 500 $km.s^{-1}$). The luminosity of CH Cyg oscillates by ~ 1 mag on ~ 80 day time scale, with significant changes of the relative intensity and profiles in all lines. The high cadence monitoring of this target allows to detect an abrupt change between 2019-05-12 and 14 in just 2 days during a rise. ARAS observing proposal by A. Skopal and N. Shagatova, "Probing the accretion process onto the white dwarf in the recurrent symbiotic nova RS Oph between its nova explosions" is presented.

Stars:
AG Dra, AXPer, BD Cam, BX Mon, CH Cyg, CQ Dra, EG And, GH Gem, NQ Gem, omi Cet, SS Lep, stHa 32, StHa 55, SU Lyn, T CrB, TX CVn, UV Aur, V1329 Cyg, V471 Per, V627 Cas, V694 Mon, Z And, ZZ CMi

Symbiotics: Observing program

Main targets for 2019, Quarter 4
AG Dra
CH Cyg
T CrB
R Aqr
V694 Mon in the morning sky
Other targets of interest: SU Lyn, V443 Her, YY Her, CI Cyg, BF Cyg, AG Peg, Z And, AX Per, EG And

Observing : collaboration with professional teams

Target	Request	Objective	Notes	Status
CH Cyg	Independently A. Skopal M. Karovska	Long term monitoring of a complex and highly variable object		Ongoing
AG Dra	R. Gàlis J. Merc L. Leedjarv	Study of orbital variability	He II / Hb Raman OVI	One spectrum a month
AX Per	R. Gàlis J. Merc	Ongoing outburst, declining		Ongoing
SU Lyn	K. Ilkiewitz	Study of the orbital variations of a newly discovered symbiotic		One spectrum a week
V694 Mon	A. Lucy J. Sokoloski M. Karovska	Detection of active phases	Balmer and Fe II lines	New season
R Aqr	M. Karovska	Studying ongoing eclipse	H alpha [O III]	Ongoing
RS Oph	N. Shagatova A. Skopal	see p. 52	H alpha H beta	Started
T CrB	B. Schaefer	Monitoring before expected nova outburst		Continuing until nova event (2023 ?)
Suspected	A. Lucy J. Sokoloski	Discovery of new symbiotics		Ongoing

SYMBIOTICS

Symbiotics in ARAS Data Base Update : 05-10-2019

64 stars
4705 spectra

#	Name	AD (2000)	DE (2000)	Nb.	First	Last
1	EG And	0 44 37.1	40 40 45.7	129	12/08/2010	28/09/2019
2	AX Per	1 36 22.7	54 15 2.5	293	04/10/2011	11/10/2019
3	V471 Per	1 58 49.7	52 53 48.4	30	06/08/2013	14/02/2019
4	Omi Cet	2 19 20.7	-2 58 39.5	33	28/11/2015	09/02/2019
5	BD Cam	03 42 9.3	63 13 0.5	49	08/11/2011	30/08/2019
6	StHa 32	04 37 45.6	-01 19 11.8	5	02/03/2018	25/01/2019
7	UV Aur	05 21 48.8	32 30 43.1	81	24/02/2011	28/03/2019
8	V1261 Ori	05 22 18.6	-8 39 58	17	22/10/2011	29/12/2018
9	StHA 55	05 46 42	6 43 48	10	17/01/2016	08/02/2019
10	SU Lyn	06 42 55.1	+55 28 27.2	164	02/05/2016	30/04/2019
11	ZZ CMi	07 24 13.9	8 53 51.7	61	29/09/2011	21/04/2019
12	BX Mon	07 25 24	-3 36 0	64	04/04/2011	25/03/2019
13	V694 Mon	07 25 51.2	-7 44 8	305	03/03/2011	15/09/2019
14	NQ Gem	07 31 54.5	24 30 12.5	76	01/04/2013	18/04/2019
15	GH Gem	07 4 4.9	12 2 12	9	10/03/2016	15/02/2019
16	CQ Dra	12 30 06	69 12 04	38	11/06/2015	26/06/2019
17	RT Cru	12 34 53.7	-64 33 56.0	1	28/07/2019	28/07/2019
18	TX CVn	12 44 42	36 45 50.6	68	10/04/2011	21/05/2019
19	RW Hya	13 34 18	- 25 22 48.9	19	28/06/2017	05/07/2019
20	IV Vir	14 16 34.3	-21 45 50	12	28/02/2015	06/07/2019
21	T CrB	15 59 30.1	25 55 12.6	319	01/04/2012	02/10/2019
22	AG Dra	16 01 40.5	66 48 9.5	628	03/04/2013	08/10/2019
23	AS 210	16 51 20.4	-26 00 26.7	4	14/06/2018	06/07/2019
24	V503 Her	17 36 46	23 18 18	8	05/06/2013	06/07/2019
25	RS Oph	17 50 13.2	-6 42 28.4	60	23/03/2011	01/10/2019
26	V934 Her	17 06 34.5	+23 58 18.5	31	09/08/2013	07/06/2019
27	Hen 3-1341	17 08 36.5	-17 26 30.4	2	04/07/2019	07/07/2019
28	Hen 3-1342	17 08 55.0	-23 23 26.5	1	07/07/2019	07/07/2019
29	RT Ser	17 39 52.0	-11 56 38.8	3	26/06/2012	03/07/2019
30	AS 245	17 51 00.9	-22 19 35.1	1	15/07/2018	15/07/2018
31	AS 270	18 05 33.7	-20 20 38	7	01/08/2013	13/07/2019
32	AS 289	18 12 22.1	-11 40 07	3	26/06/2012	15/06/2018
33	YY Her	18 14 34.3	20 59 20	30	25/05/2011	05/07/2019
34	FG Ser	18 15 06.2	0 18 57.6	10	26/06/2012	12/07/2019
35	StHa 149	18 18 55.9	27 26 12	8	05/08/2013	31/08/2019
36	V443 Her	18 22 08.4	23 27 20	63	18/05/2011	30/08/2019
38	AS 323	18 48 35.7	-06 41 10.4	2	02/07/2019	13/07/2019
39	FN Sgr	18 53 52.9	-18 59 42	9	10/08/2013	15/07/2018
40	V919 Sgr	19 03 46.0	-16 59 53.9	9	10/08/2013	11/07/2019
41	V1413 Aql	19 03 51.6	16 28 31.7	15	10/08/2013	06/07/2019
42	V335 Vul	19 23 14	+24 27 39.7	12	14/08/2016	25/07/2019
43	BF Cyg	19 23 53.4	29 40 25.1	166	01/05/2011	02/10/2019
44	CH Cyg	19 24 33	50 14 29.1	780	21/04/2011	09/10/2019
45	HM Sge	19 41 57.1	16 44 39.9	13	20/07/2013	23/09/2018
46	QW Sge	19 45 49.6	18 36 50	12	14/08/2016	25/07/2019
47	Hen 3-1768	19 49 48.4	-82 52 37.5	2	16/05/2018	27/05/2018
48	CI Cyg	19 50 11.8	35 41 3.2	225	25/08/2010	27/09/2019
49	StHa 169	19 51 28.9	46 23 6	7	12/05/2016	30/08/2019
50	EF Aql	19 51 51.7	-05 48 16.7	1	11/11/2018	11/11/2018
51	HbHa 1704-05	19 54 42.9	+17 22 12.7	61	09/08/2018	05/10/2019
52	V1016 Cyg	19 57 4.9	39 49 33.9	25	15/04/2015	15/09/2019
53	RR Tel	20 04 18.5	-55 43 33.2	4	08/09/2017	06/09/2019
54	PU Vul	20 21 12	21 34 41.9	25	20/07/2013	12/07/2019
55	LT Del	20 35 57.3	20 11 34	19	28/11/2015	05/07/2019
56	StHa 180	20 39 20.6	-05 17 16.3	2	03/07/2019	06/07/2019
57	Hen 2-468	20 41 19.0	34 44 52.3	2	01/07/2019	11/07/2019
58	ER Del	20 42 46.4	8 40 56.4	14	02/09/2011	30/08/2019
59	V1329 Cyg	20 51 1.1	35 34 51.2	25	08/08/2015	01/09/2019
60	V407 Cyg	21 2 13	45 46 30	12	14/03/2010	18/04/2010
61	StHa 190	21 41 44.8	2 43 54.4	24	31/08/2011	26/08/2019
62	AG Peg	21 51 1.9	12 37 29.4	265	06/12/2009	26/09/2019
63	V627 Cas	22 57 41.2	58 49 14.9	33	06/08/2013	08/01/2019
64	Z And	23 33 39.5	48 49 5.4	175	30/10/2010	05/10/2019
65	R Aqr	23 43 49.4	-15 17 4.2	199	20/11/2010	09/10/2019

ARAS Data Base Symbiotics : http://www.astrosurf.com/aras/Aras_DataBase/Symbiotics.htm

Symbiotics observed in 2019-Q2 1/1

Id.	Observer	Date	Range		Res.
AX Per	D. Boyd	10/04/2019	3901	7380	1124
AX Per	C. Boussin	11/04/2019	3701	7571	507
AX Per	J. Guarro	13/04/2019	4053	7762	9000
AX Per	C. Boussin	20/04/2019	3701	7571	505
AX Per	C. Boussin	24/04/2019	3701	7571	504
AX Per	C. Boussin	12/05/2019	3701	7571	501
AX Per	C. Boussin	01/06/2019	3701	7571	500
AX Per	C. Boussin	13/06/2019	3701	7571	503
AX Per	C. Boussin	21/06/2019	3701	7571	507
BD Cam	V. Marik	29/04/2019	3726	7404	604
BF Cyg	T. Lester	22/04/2019	4031	7950	14000
BF Cyg	T. Lester	24/06/2019	4031	7950	14000
BF Cyg	J. Guarro	25/06/2019	3990	8023	9000
CH Cyg	F. Teyssier	11/04/2019	4034	7117	11000
CH Cyg	S. Charbonnel	20/04/2019	3917	7593	11000
CH Cyg	C. Boussin	21/04/2019	3701	7571	502
CH Cyg	F. Teyssier	29/04/2019	4034	7350	11000
CH Cyg	T. Lester	06/05/2019	4031	7950	14000
CH Cyg	F. Teyssier	11/05/2019	4034	7350	11000
CH Cyg	C. Boussin	12/05/2019	3701	7571	503
CH Cyg	F. Sims	15/05/2019	3726	7274	994
CH Cyg	F. Teyssier	15/05/2019	4200	7200	11000
CH Cyg	C. Buil	16/05/2019	3370	7402	760
CH Cyg	F. Sims	18/05/2019	3725	7274	1058
CH Cyg	U. Sollecchia	23/05/2019	6503	6892	8548
CH Cyg	F. Teyssier	25/05/2019	4035	7350	11000
CH Cyg	F. Teyssier	31/05/2019	4060	7250	11000
CH Cyg	C. Boussin	31/05/2019	3701	7571	509
CH Cyg	J. Guarro	04/06/2019	3980	7763	9000
CH Cyg	F. Sims	09/06/2019	3720	7307	950
CH Cyg	T. Lester	12/06/2019	4031	7950	14000
CH Cyg	J. Guarro	14/06/2019	3980	8041	9000
CH Cyg	C. Buil	15/06/2019	3492	4457	2512
CH Cyg	J. Guarro	21/06/2019	3994	8033	9000
CH Cyg	J. Guarro	25/06/2019	4053	7763	9000
CH Cyg	JMichelet	29/06/2019	3900	7580	1002
CI Cyg	C. Boussin	12/04/2019	3701	7400	506
CI Cyg	F. Teyssier	12/04/2019	4500	7100	11000
CI Cyg	C. Buil	16/05/2019	3324	7400	760
CI Cyg	C. Buil	16/06/2019	3492	4457	2392
CQ Dra	J. Guarro	12/04/2019	4053	7763	9000
CQ Dra	J. Guarro	26/04/2019	4053	7763	9000
CQ Dra	V. Marik	30/04/2019	3672	7410	600
CQ Dra	V. Lecocq	02/05/2019	3700	7300	525
CQ Dra	J. Guarro	11/05/2019	4053	7763	9000
CQ Dra	J. Guarro	20/05/2019	3996	7759	9000
CQ Dra	J. Guarro	02/06/2019	4053	7763	9000
CQ Dra	J. Guarro	21/06/2019	4053	7763	9000
CQ Dra	J. Guarro	26/06/2019	3980	7763	9000
NQ Gem	J. Guarro	01/04/2019	4053	7763	9000
NQ Gem	J. Guarro	04/04/2019	4053	7763	9000
NQ Gem	M.Verlinden	18/04/2019	3651	7399	568
PU Vul	D. Boyd	27/06/2019	3951	7371	981
RS Oph	T. Lester	07/06/2019	4031	7950	14000
RS Oph	J. Guarro	29/06/2019	5380	7674	9000

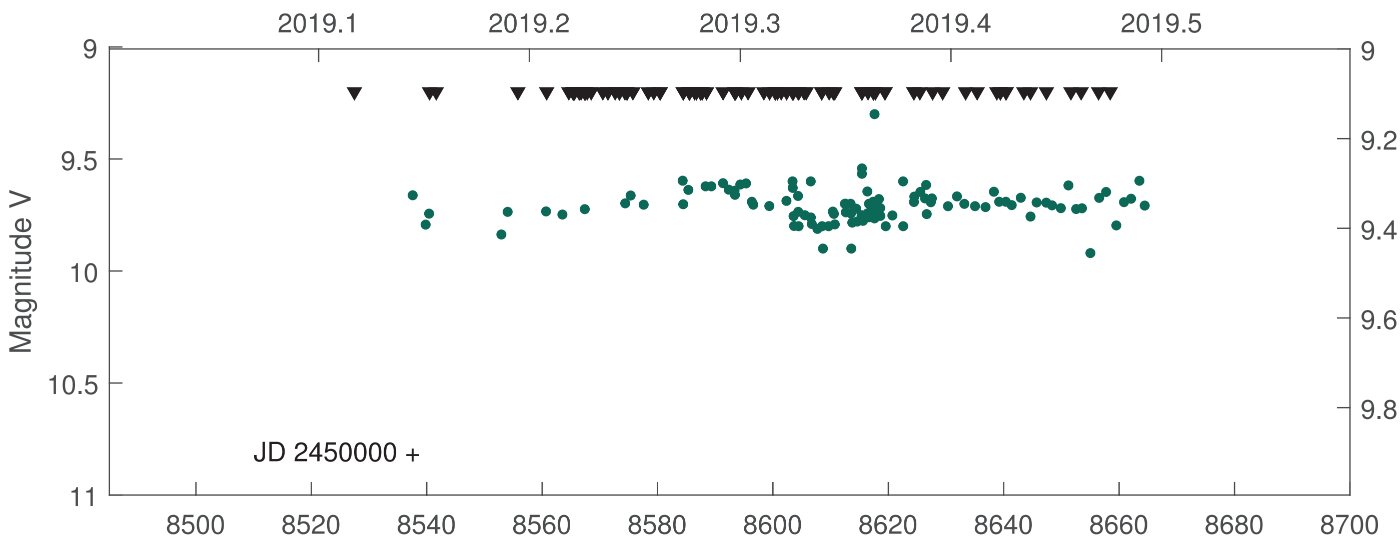
Id.	Observer	Date	Range		Res.
SU Lyn	S. Charbonnel	31/03/2019	3917	7593	11000
SU Lyn	M.Verlinden	10/04/2019	3516	8001	576
SU Lyn	S. Charbonnel	11/04/2019	3917	7593	11000
SU Lyn	C. Boussin	11/04/2019	3701	7571	501
SU Lyn	J. Guarro	13/04/2019	4053	7762	9000
SU Lyn	S. Charbonnel	20/04/2019	3917	7593	11000
SU Lyn	C. Boussin	20/04/2019	3701	7571	503
SU Lyn	T. Lester	22/04/2019	4031	7950	14000
SU Lyn	F. Teyssier	29/04/2019	4060	7300	11000
SU Lyn	C. Boussin	30/04/2019	3701	7571	505
SU Lyn	J.Coffin	30/04/2019	3801	7401	559
T CrB	J. Guarro	04/04/2019	3980	7762	9000
T CrB	M.Verlinden	12/04/2019	3751	7791	586
T CrB	C. Boussin	12/04/2019	3701	7571	505
T CrB	F. Sims	13/04/2019	3726	7275	985
T CrB	J.Coffin	13/04/2019	3801	7401	519
T CrB	D. Boyd	19/04/2019	3901	7379	1082
T CrB	F. Teyssier	28/04/2019	4300	7300	11000
T CrB	F. Sims	02/05/2019	3727	7276	1032
T CrB	T. Lester	06/05/2019	4031	7950	14000
T CrB	F. Sims	07/05/2019	3725	7274	987
T CrB	F. Teyssier	11/05/2019	4060	7200	11000
T CrB	J. Guarro	12/05/2019	4053	7763	9000
T CrB	J. Guarro	21/05/2019	4053	7763	9000
T CrB	F. Sims	24/05/2019	3725	7275	1048
T CrB	K. Graham	27/05/2019	3977	7396	566
T CrB	J. Guarro	30/05/2019	3980	7763	9000
T CrB	F. Teyssier	01/06/2019	4035	7353	11000
T CrB	F. Sims	06/06/2019	3721	7305	907
T CrB	J. Guarro	06/06/2019	3980	7763	9000
T CrB	C. Boussin	15/06/2019	3701	7571	507
T CrB	D. Boyd	15/06/2019	3901	7380	1031
T CrB	J. Guarro	17/06/2019	4763	6986	9000
T CrB	S. Charbonnel	21/06/2019	4524	7593	11000
T CrB	T. Lester	24/06/2019	4031	7950	14000
T CrB	K. Graham	26/06/2019	3603	7404	509
T CrB	J. Guarro	27/06/2019	4053	8041	9000
TX CVn	D. Boyd	20/04/2019	3901	7380	1020
TX CVn	J. Guarro	28/04/2019	4053	7763	9000
TX CVn	J. Guarro	21/05/2019	4059	7672	9000
V443 Her	F. Sims	18/05/2019	3727	7276	1048
V443 Her	F. Teyssier	01/06/2019	4035	7353	11000
V503 Her	D. Boyd	14/05/2019	4101	7350	1080
V694 Mon	F. Sims	01/04/2019	3727	7276	919
V694 Mon	F. Campos	04/04/2019	3754	7297	972
V694 Mon	J. Guarro	12/04/2019	4053	7763	9000
V934 Her	T. Lester	07/06/2019	4031	7950	14000
YY Her	F. Sims	18/05/2019	3727	7275	1066
ZZ CMi	T. Lester	02/04/2019	4031	7950	14000
ZZ CMi	D. Boyd	21/04/2019	3901	7380	996

SYMBIOTICS

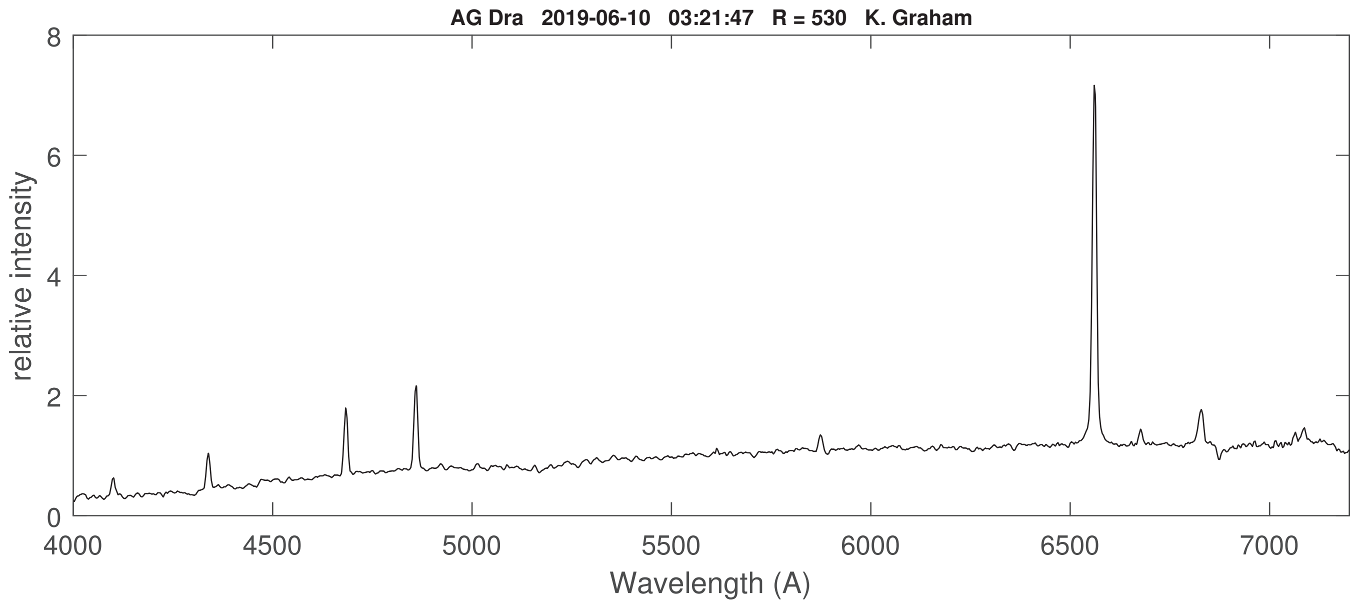
AG Dra

Coordinates (2000.0)	
R.A.	16 01 41.0
Dec	+66 48 10.1
Mag V	9.8

Continuous observations of AG Dra upon the request of J. Merc and R. Gàlis.
After a series of 4 outburts (Gàlis & al., 2019) in May 2015, April 2016, May 2017 and April 2018 (Gàlis & al., 2019), no outburst was detected this year. Monitoring continues in order to acquire reference spectra according to the orbital phase in low activity.



AAVSO lightcurve (1 day mean) and ARAS spectra



Low resolution spectrum obtained by Keith Graham (ALPY600, R = 600)

AG Dra

Id.	Observer	Date	Range		Res.
AG Dra	S. Charbonnel	01/04/2019	3917	7593	11000
AG Dra	F. Sims	01/04/2019	3727	7275	985
AG Dra	T. Lester	02/04/2019	4031	7950	14000
AG Dra	F. Campos	04/04/2019	3765	7283	878
AG Dra	U. Sollecchia	05/04/2019	6506	6895	8962
AG Dra	P. Somogyi	06/04/2019	6464	7170	2778
AG Dra	P. Somogyi	06/04/2019	4535	5251	1896
AG Dra	M.Verlinden	10/04/2019	3631	7801	571
AG Dra	D. Boyd	10/04/2019	3900	7380	1132
AG Dra	C. Boussin	11/04/2019	3701	7571	502
AG Dra	Ibrahima	11/04/2019	4100	7390	537
AG Dra	S. Charbonnel	12/04/2019	3917	7593	11000
AG Dra	F. Teyssier	12/04/2019	4300	7100	11000
AG Dra	G. Martineau	12/04/2019	3704	7400	923
AG Dra	F. Sims	13/04/2019	3727	7276	990
AG Dra	F. Campos	13/04/2019	4318	5041	6110
AG Dra	F. Campos	13/04/2019	6458	7226	4792
AG Dra	T. Lester	14/04/2019	4031	7950	14000
AG Dra	F. Sims	14/04/2019	3726	7275	990
AG Dra	C. Buil	14/04/2019	3346	6374	489
AG Dra	O. Garde	17/04/2019	4080	7586	11000
AG Dra	U. Sollecchia	19/04/2019	6506	6891	8721
AG Dra	P. Berardi	19/04/2019	4609	5073	3884
AG Dra	D. Boyd	19/04/2019	3902	7379	999
AG Dra	Ibrahima	19/04/2019	4131	7400	549
AG Dra	C. Boussin	21/04/2019	3701	7571	503
AG Dra	T. Lester	22/04/2019	4031	7950	14000
AG Dra	U. Sollecchia	24/04/2019	6509	6893	7815
AG Dra	D. Boyd	25/04/2019	3901	7381	1087
AG Dra	F. Campos	26/04/2019	6458	7225	6683
AG Dra	U. Sollecchia	26/04/2019	6509	6893	8538
AG Dra	F. Campos	26/04/2019	4333	5054	5268
AG Dra	F. Sims	27/04/2019	3727	7276	874
AG Dra	J. Guarro	27/04/2019	4053	7763	9000
AG Dra	F. Teyssier	28/04/2019	4300	7300	11000
AG Dra	S. Charbonnel	29/04/2019	3917	7593	11000
AG Dra	V. Marik	30/04/2019	3699	7404	0
AG Dra	F. Teyssier	30/04/2019	4060	7300	11000
AG Dra	Ibrahima	30/04/2019	4132	7392	559
AG Dra	J. Guarro	01/05/2019	4053	7763	9000
AG Dra	F. Sims	02/05/2019	3726	7275	1033
AG Dra	J. Guarro	04/05/2019	4053	7763	9000
AG Dra	C. Boussin	04/05/2019	3701	7571	506
AG Dra	T. Lester	06/05/2019	4031	7950	14000
AG Dra	C. Buil	06/05/2019	6477	6643	14126
AG Dra	F. Sims	07/05/2019	3726	7275	963
AG Dra	F. Teyssier	11/05/2019	4060	7200	11000
AG Dra	J. Guarro	11/05/2019	4053	7763	9000
AG Dra	C. Boussin	11/05/2019	3701	7571	506
AG Dra	J.Coffin	12/05/2019	3801	7401	559
AG Dra	J. Guarro	13/05/2019	3999	7759	9000
AG Dra	Ibrahima	13/05/2019	4101	7400	554
AG Dra	D. Boyd	13/05/2019	3901	7380	1112
AG Dra	F. Sims	14/05/2019	3727	7290	951
AG Dra	F. Sims	15/05/2019	3726	7276	962
AG Dra	C. Buil	15/05/2019	3350	7357	760
AG Dra	F. Teyssier	15/05/2019	4060	7200	11000
AG Dra	J. Guarro	20/05/2019	3993	7592	9000
AG Dra	D. Boyd	20/05/2019	3901	7380	995
AG Dra	Ibrahima	21/05/2019	3883	8266	558
AG Dra	F. Sims	24/05/2019	3726	7275	1039
AG Dra	F. Teyssier	25/05/2019	4060	7250	11000
AG Dra	J. Guarro	29/05/2019	4053	7763	9000
AG Dra	F. Teyssier	31/05/2019	4060	7250	11000
AG Dra	F. Sims	04/06/2019	3782	7275	900
AG Dra	J. Guarro	04/06/2019	3980	7763	9000
AG Dra	U. Sollecchia	04/06/2019	6504	6894	6052
AG Dra	P. Berardi	05/06/2019	6463	6925	5230
AG Dra	P. Berardi	05/06/2019	4594	5082	3885
AG Dra	D. Boyd	08/06/2019	3901	7380	1090
AG Dra	K. Graham	10/06/2019	3900	7370	530
AG Dra	J. Guarro	12/06/2019	4036	7752	9000
AG Dra	T. Lester	17/06/2019	4031	7950	14000
AG Dra	J. Guarro	18/06/2019	4269	7127	9000
AG Dra	D. Boyd	21/06/2019	3901	7380	1014
AG Dra	U. Sollecchia	23/06/2019	6500	6898	7786

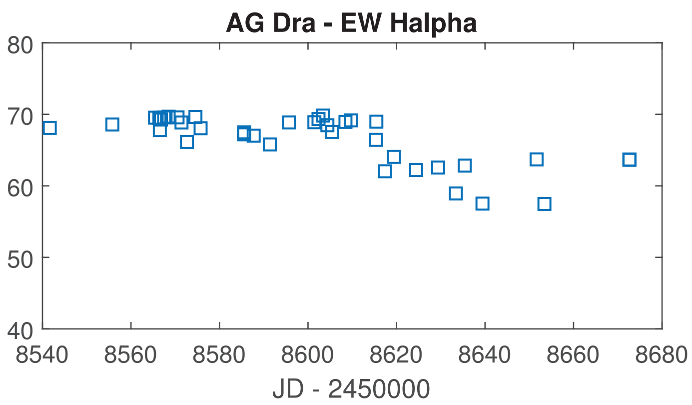
Log of observations

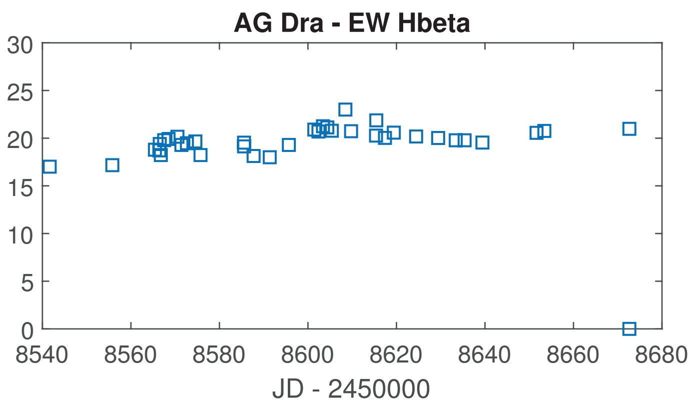
AG Dra

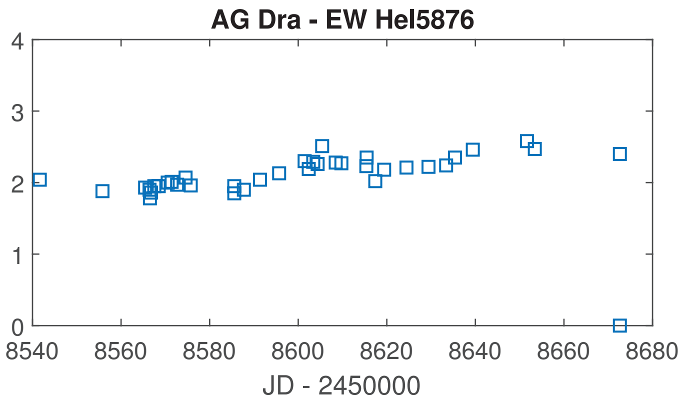
Equivalent widths of selected lines from Echelle spectra

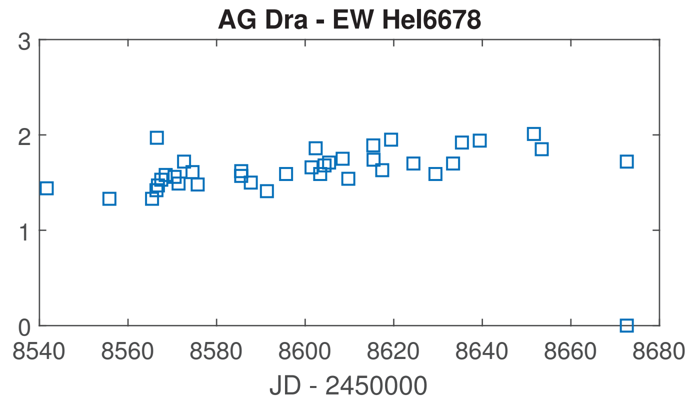
JD -2450000	Hα	Hβ	He II 4686	He I 5876	He I 6678	OVI 6830
8574.564	69.6	19.7	17.1	2.1	1.6	7.2
8575.732	68.1	18.2	16.1	2.0	1.5	7.0
8585.563	67.2	19.1	16.1	1.9	1.6	6.8
8587.724	67.0	18.1	15.4	1.9	1.5	6.7
8591.362	65.8	18.0	14.5	2.0	1.4	6.4
8595.689	68.9	19.3	16.0	2.1	1.6	6.8
8601.439	68.9	20.9	17.0	2.3	1.7	7.1
8602.373	69.3	20.7	16.4	2.2	1.9	7.4
8603.393	69.8	21.3	16.5	2.3	1.6	7.1
8604.381	68.5	21.1	16.5	2.3	1.7	7.5
8609.744	69.2	20.7	16.4	2.3	1.5	7.1
8615.380	66.4	20.3	15.5	2.2	1.9	7.0
8617.400	62.0	20.0	14.7	2.0	1.6	6.4
8619.404	64.1	20.6	16.3	2.2	2.0	7.5
8624.440	62.2	20.2	15.3	2.2	1.7	6.6
8633.394	58.9	19.8	15.2	2.2	1.7	6.7
8635.396	62.8	19.8	16.1	2.4	1.9	7.4
8639.420	57.5	19.5	16.0	2.5	1.9	7.2
8651.647	63.7	20.6	16.2	2.6	2.0	7.9
8672.627	63.7	21.0	16.2	2.4	1.7	7.2

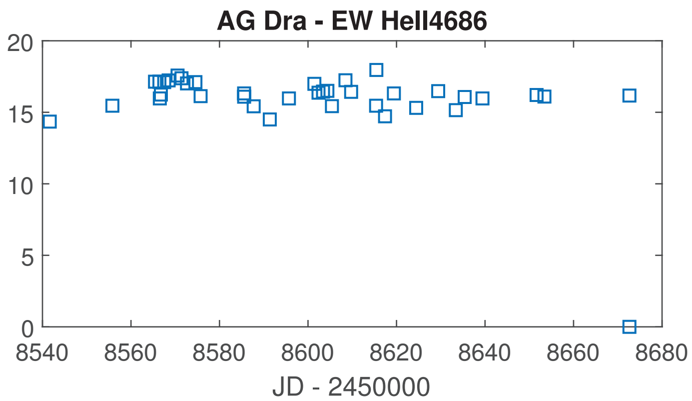
AG Dra

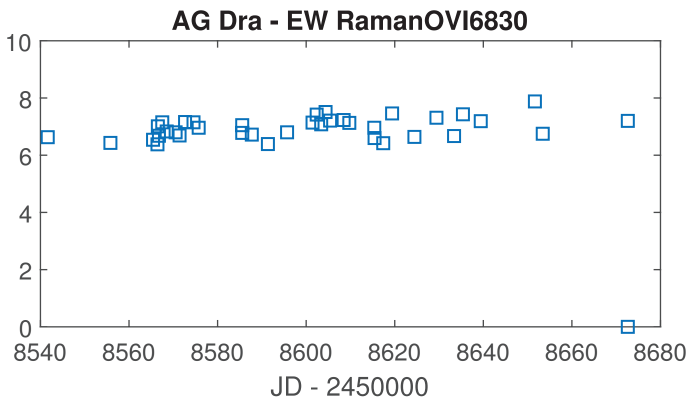

AG Dra - EW Halpha
JD - 2450000


AG Dra - EW Hbeta
JD - 2450000


AG Dra - EW HeI5876
JD - 2450000

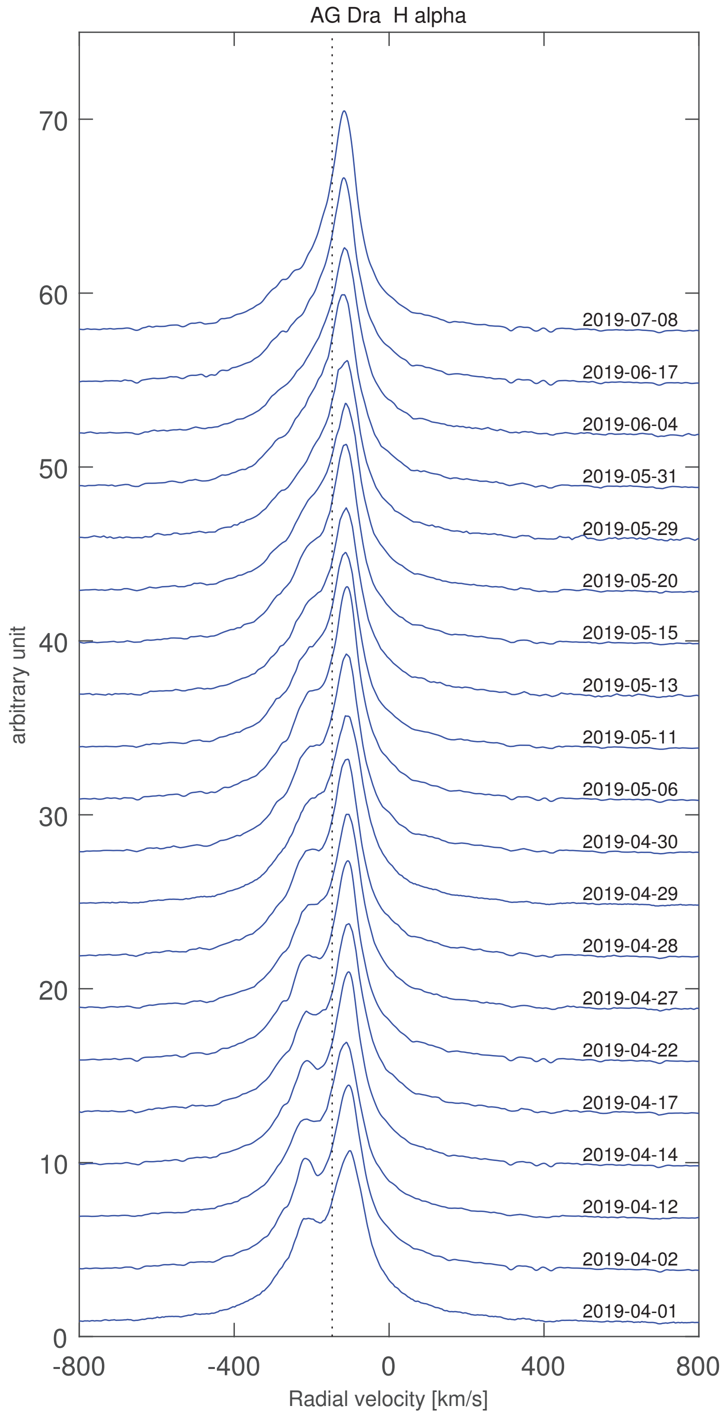

AG Dra - EW HeI6678
JD - 2450000

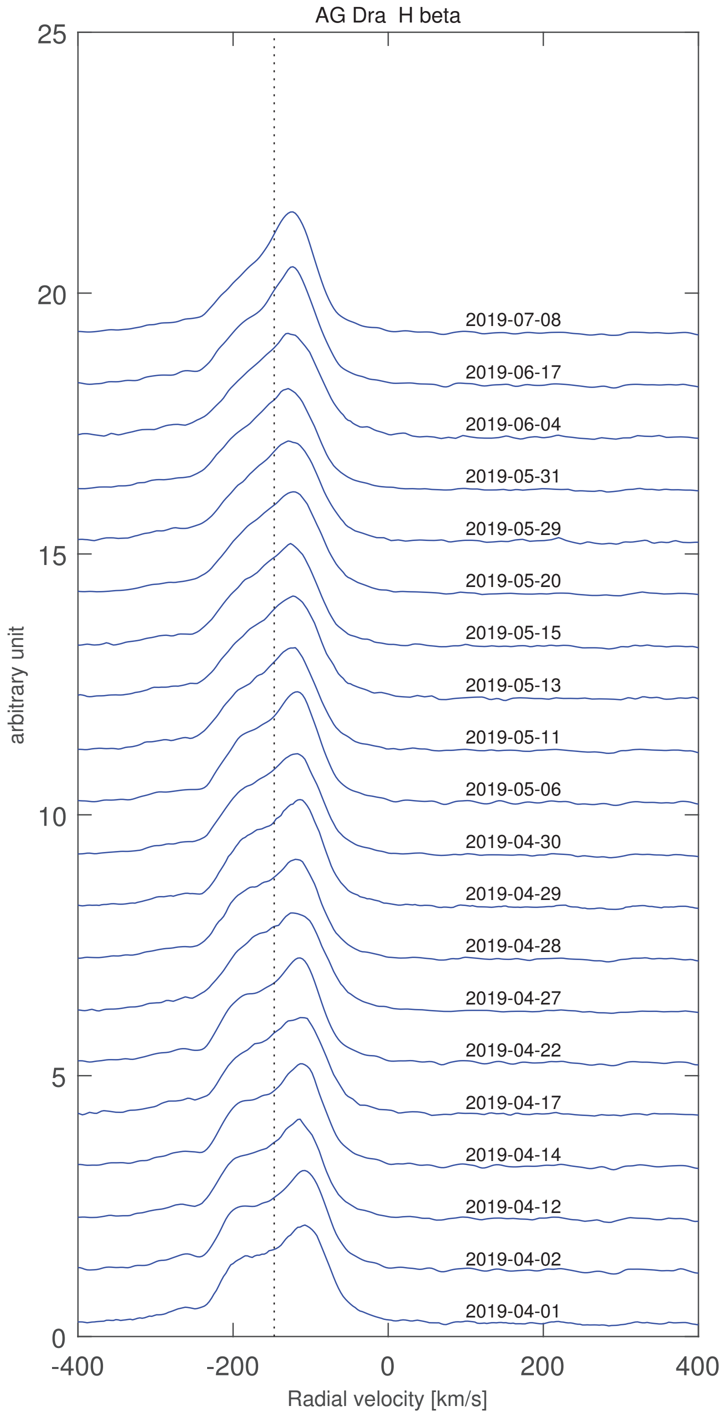

AG Dra - EW HeII4686
JD - 2450000


AG Dra - EW RamanOVI6830
JD - 2450000

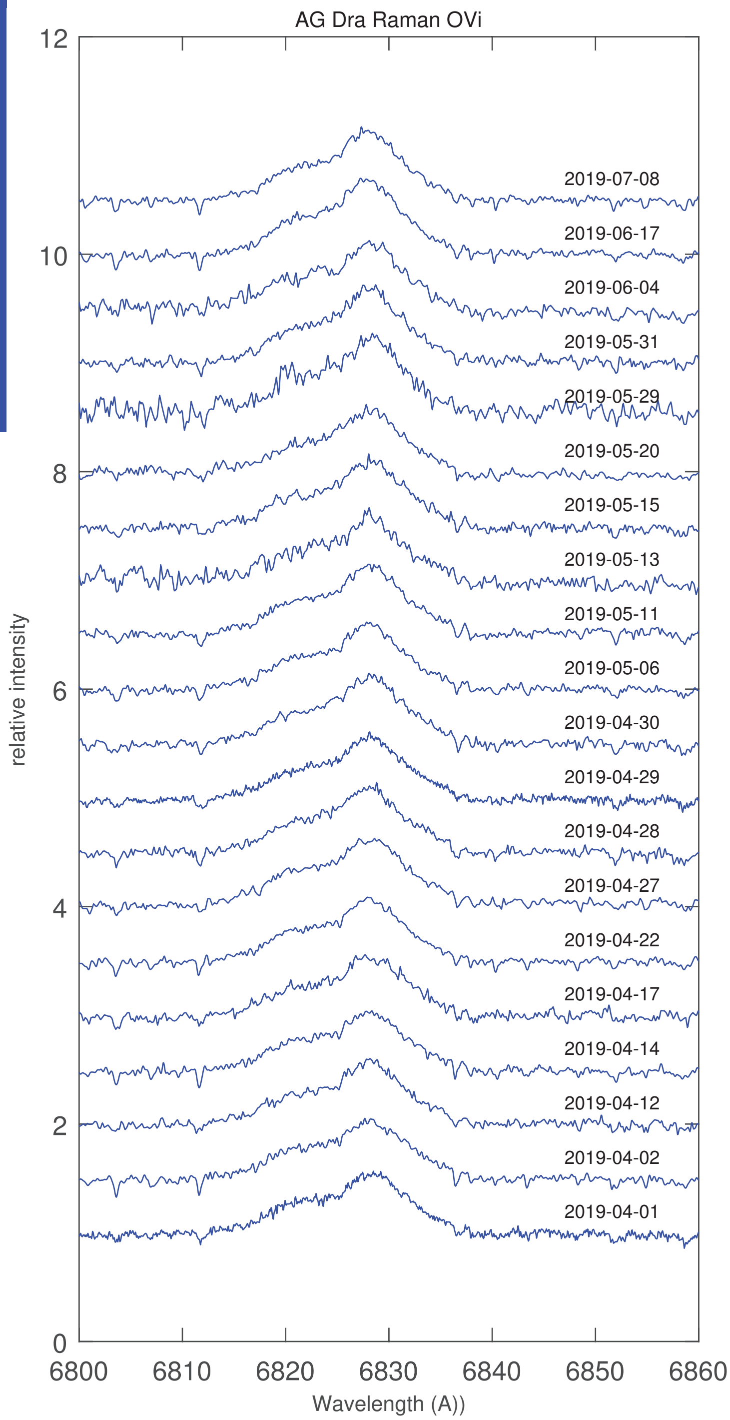
AG Dra

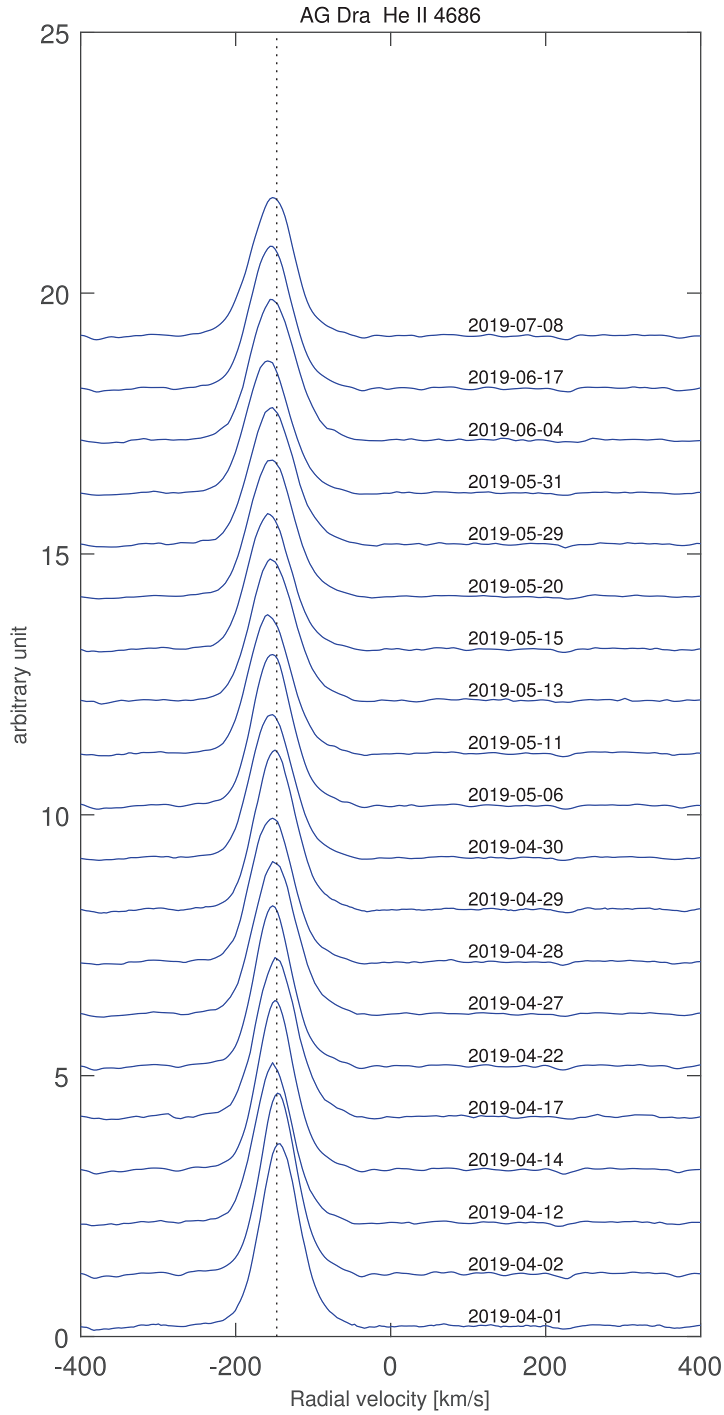
Pages 10-11: profiles of selected lines from Echelle spectra (R = 9000 to 13000)



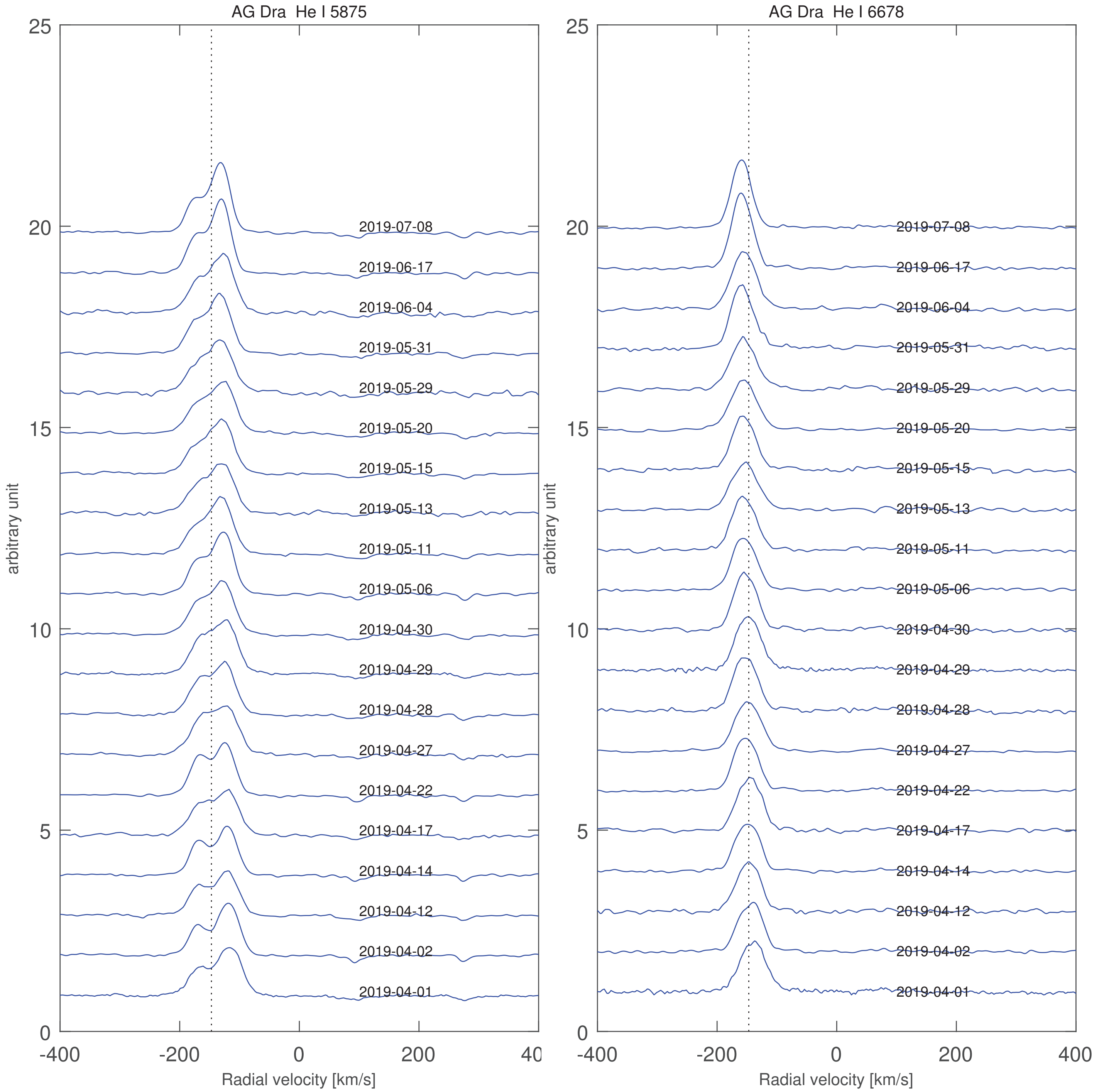


AG Dra


AG Dra Raman OVi
relative intensity
Wavelength (A))
2019-07-08
2019-06-17
2019-06-04
2019-05-31
2019-05-29
2019-05-20
2019-05-15
2019-05-13
2019-05-11
2019-05-06
2019-04-30
2019-04-29
2019-04-28
2019-04-27
2019-04-22
2019-04-17
2019-04-14
2019-04-12
2019-04-02
2019-04-01

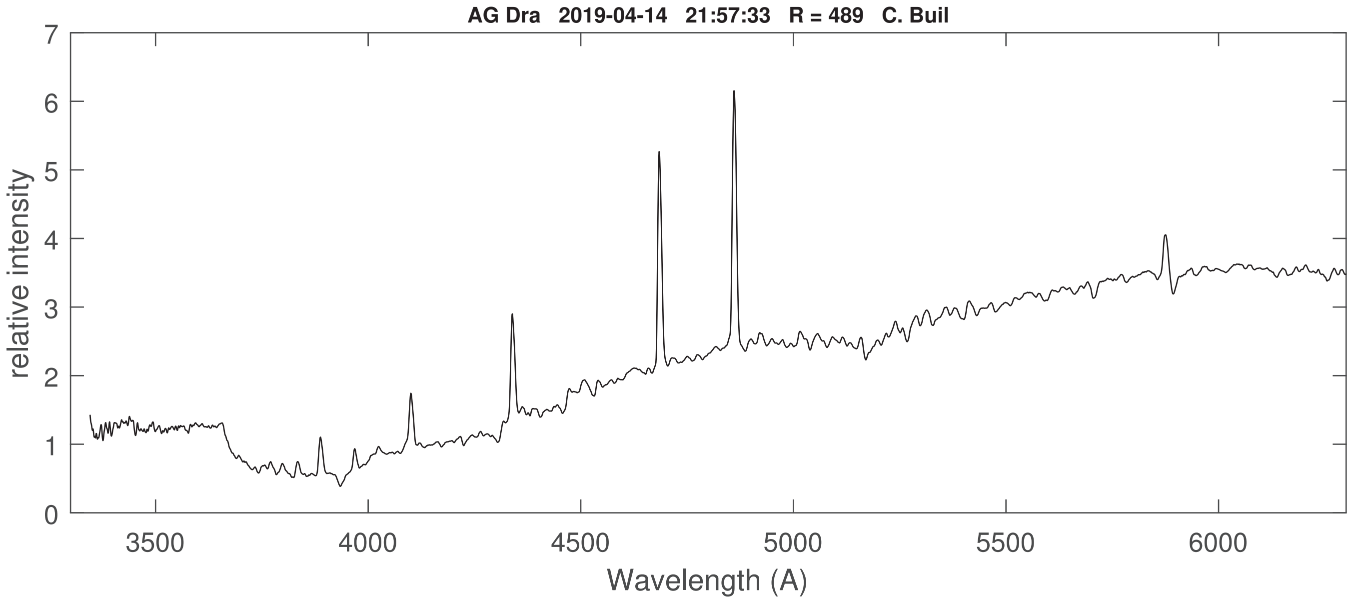

AG Dra He II 4686
arbitrary unit
Radial velocity [km/s]
2019-07-08
2019-06-17
2019-06-04
2019-05-31
2019-05-29
2019-05-20
2019-05-15
2019-05-13
2019-05-11
2019-05-06
2019-04-30
2019-04-29
2019-04-28
2019-04-27
2019-04-22
2019-04-17
2019-04-14
2019-04-12
2019-04-02
2019-04-01

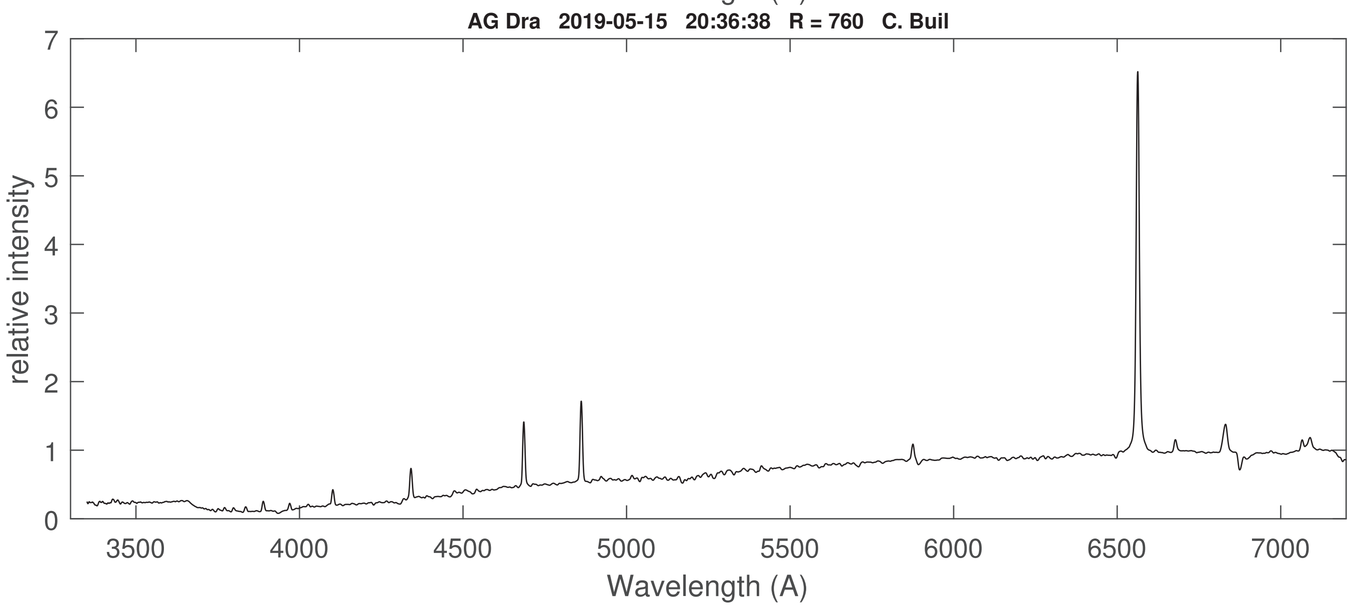
AG Dra

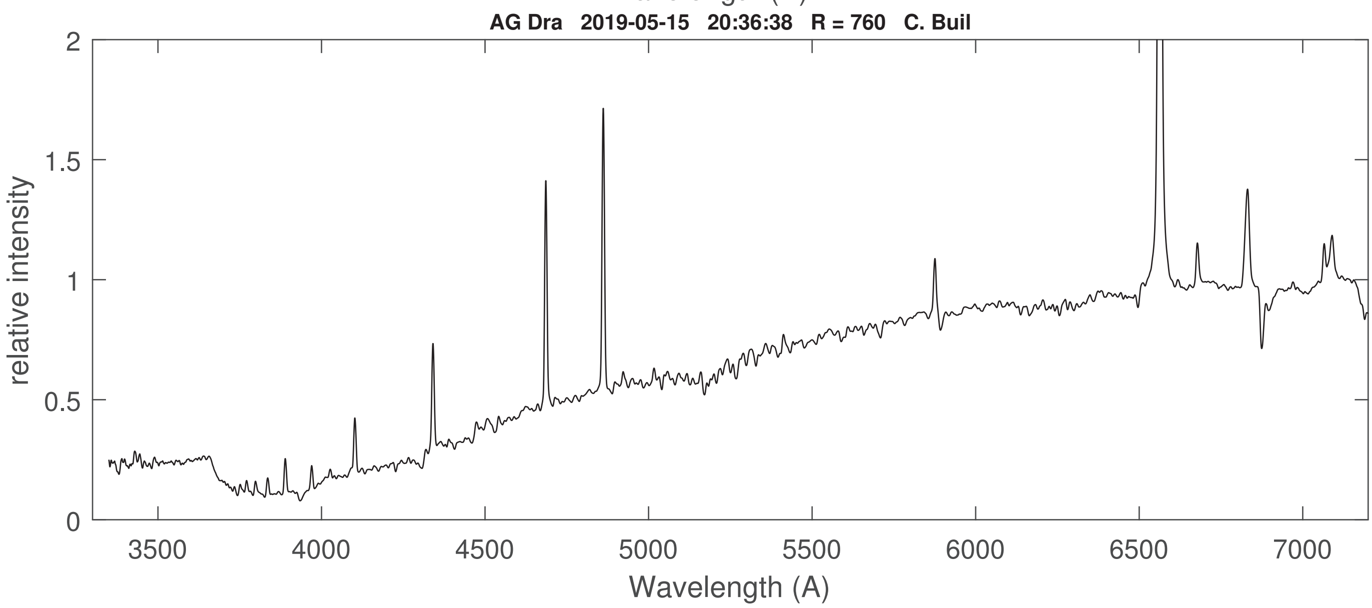

AG Dra He I 5875
AG Dra He I 6678
arbitrary unit
Radial velocity [km/s]
2019-07-08
2019-06-17
2019-06-04
2019-05-31
2019-05-29
2019-05-20
2019-05-15
2019-05-13
2019-05-11
2019-05-06
2019-04-30
2019-04-29
2019-04-28
2019-04-27
2019-04-22
2019-04-17
2019-04-14
2019-04-12
2019-04-02
2019-04-01

AG Dra

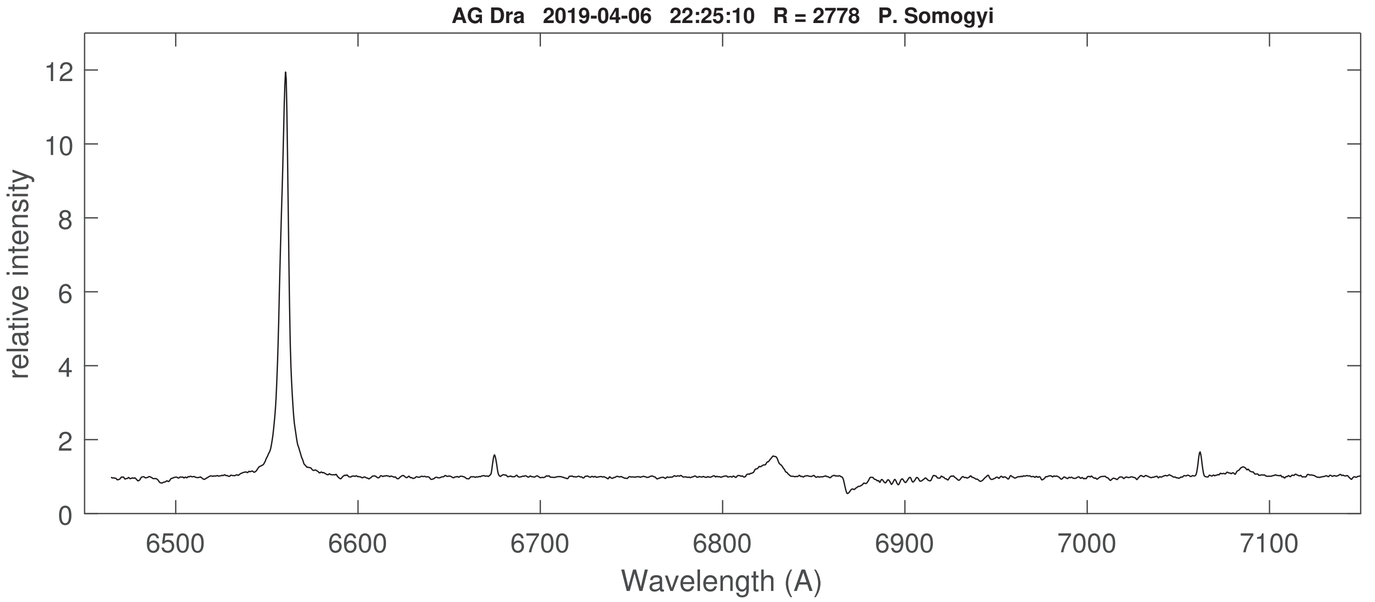
Spectra obtained by Christian Buil with his UVEX prototype until λ = 3350 Å in the near UV showing the Balmer Jump with good SNR

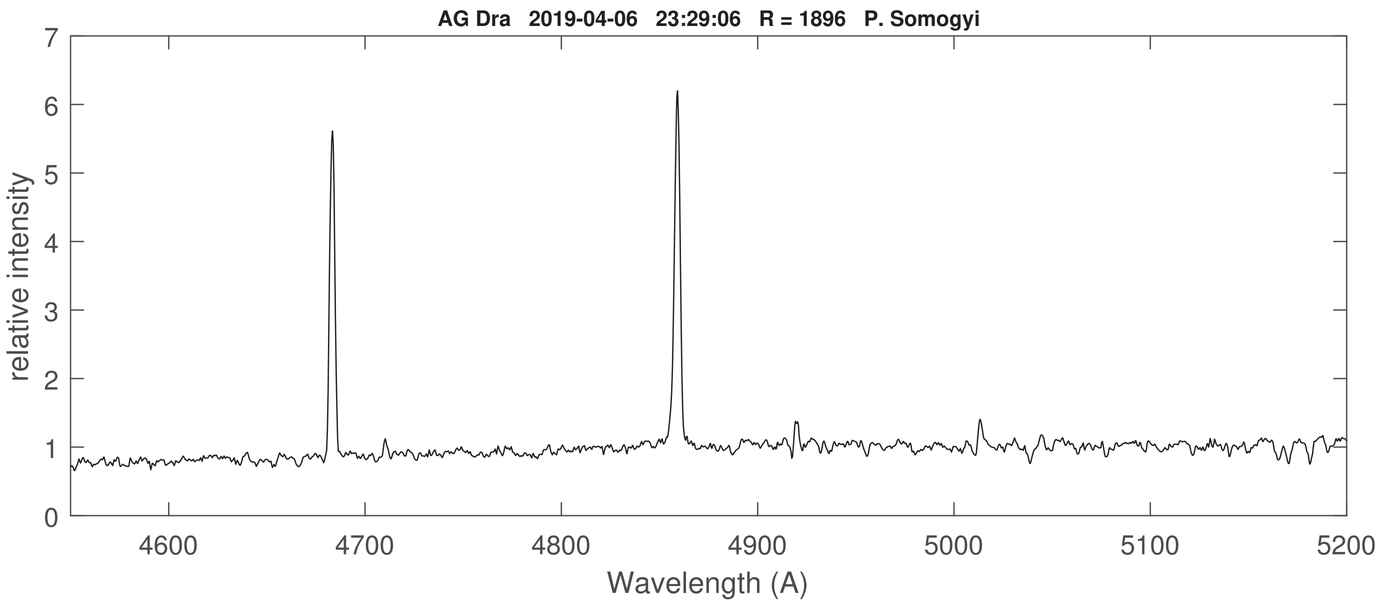




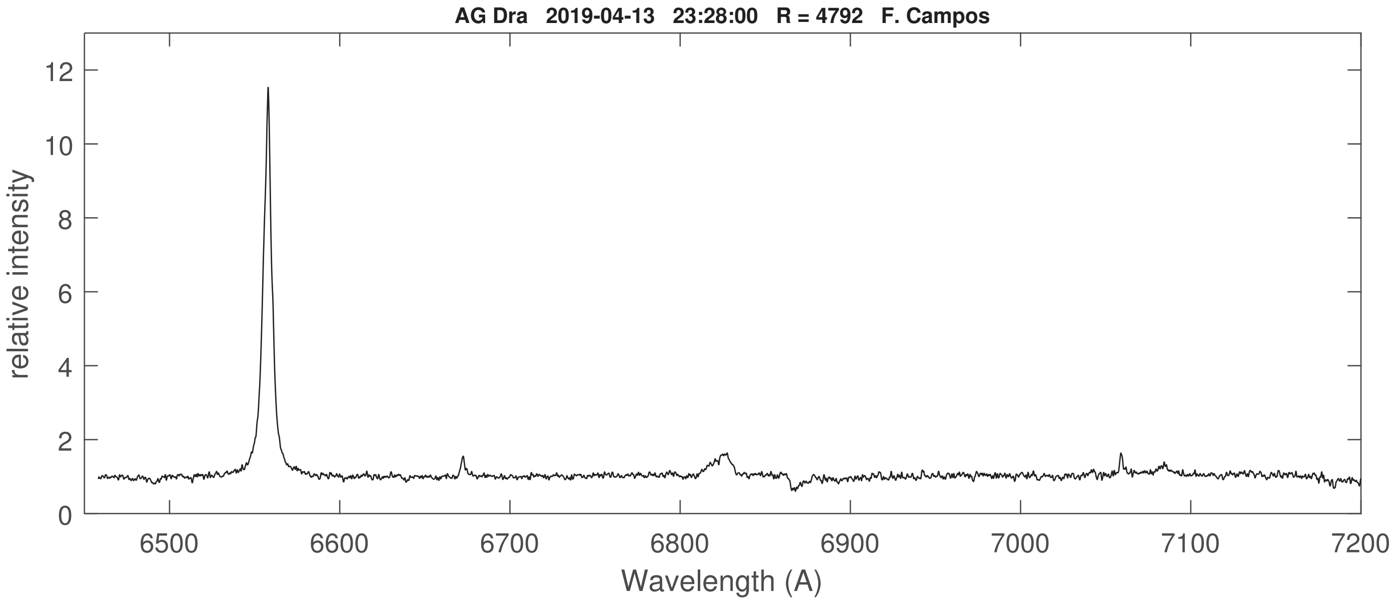


AG Dra

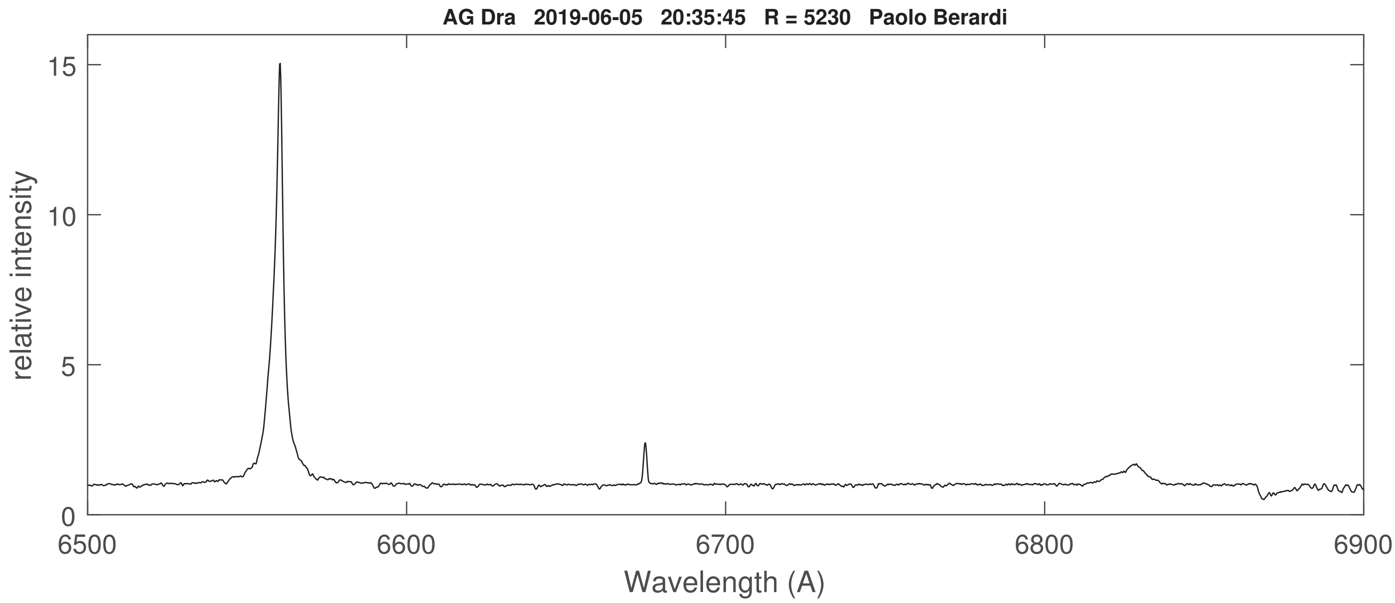

AG Dra 2019-04-06 22:25:10 R = 2778 P. Somogyi
relative intensity
Wavelength (A)
0
2
4
6
8
10
12
6500
6600
6700
6800
6900
7000
7100

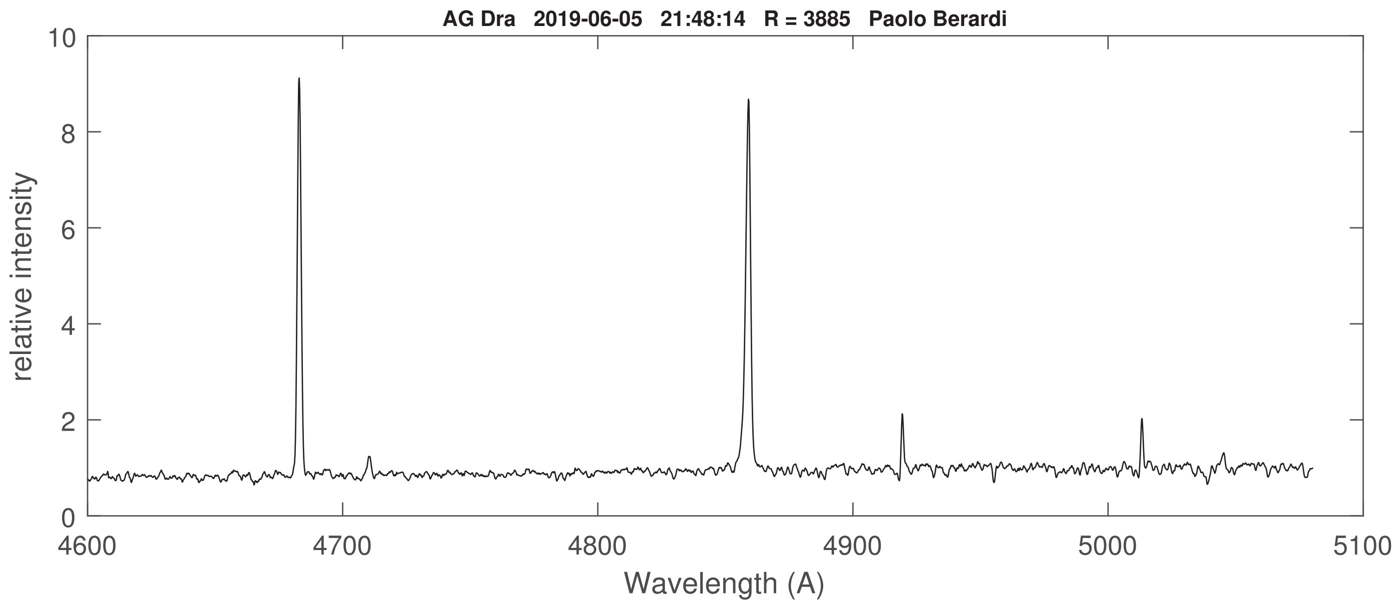

AG Dra 2019-04-06 23:29:06 R = 1896 P. Somogyi
relative intensity
Wavelength (A)
0
1
2
3
4
5
6
7
4600
4700
4800
4900
5000
5100
5200

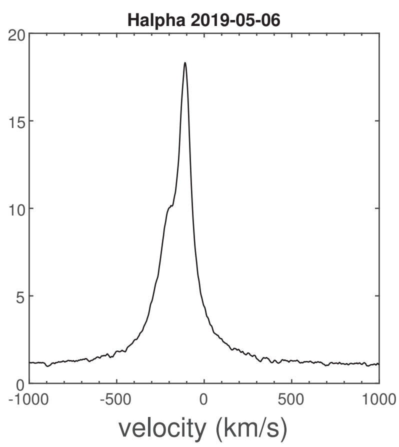
AG Dra


AG Dra 2019-04-13 23:28:00 R = 4792 F. Campos
relative intensity
0
2
4
6
8
10
12
6500
6600
6700
6800
6900
7000
7100
7200
Wavelength (A)

AG Dra

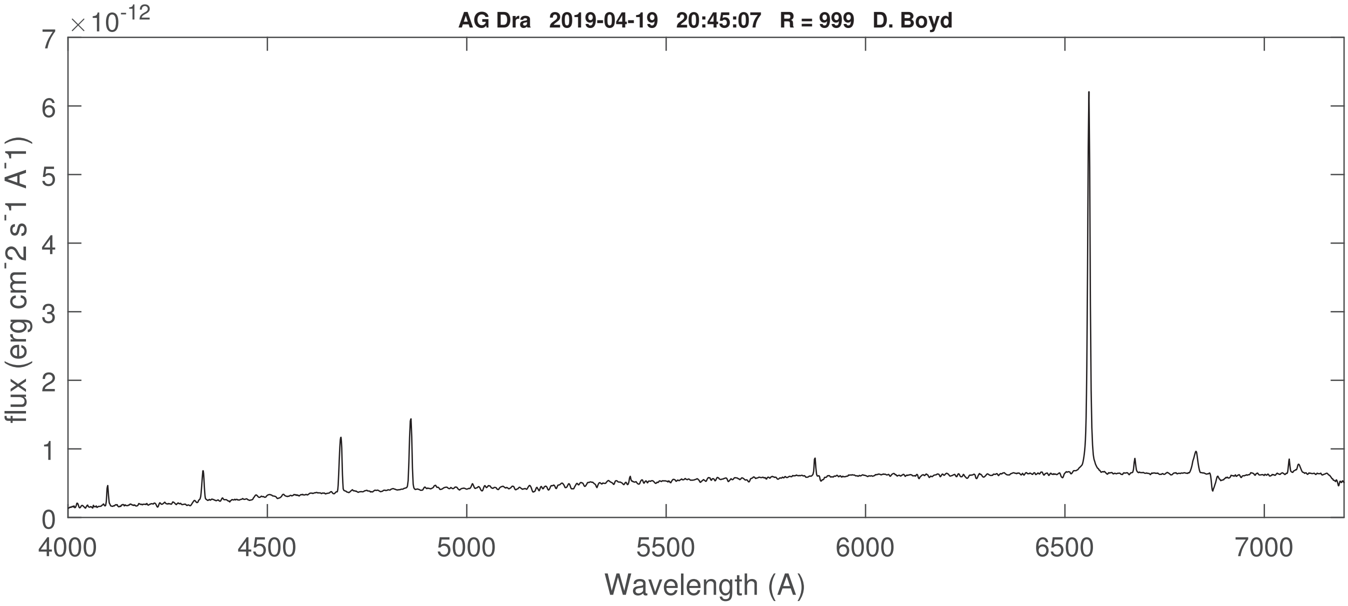

AG Dra 2019-06-05 20:35:45 R = 5230 Paolo Berardi
relative intensity
Wavelength (A)
0
5
10
15
6500
6600
6700
6800
6900

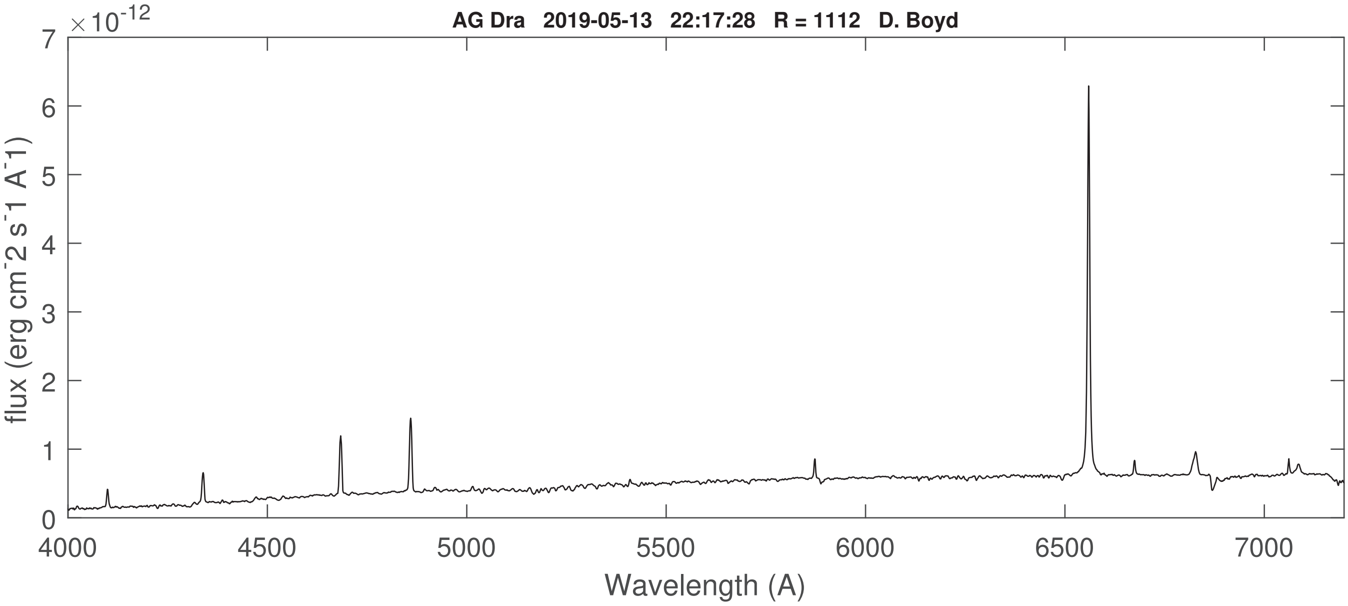

AG Dra 2019-06-05 21:48:14 R = 3885 Paolo Berardi
relative intensity
Wavelength (A)
0
2
4
6
8
10
4600
4700
4800
4900
5000
5100

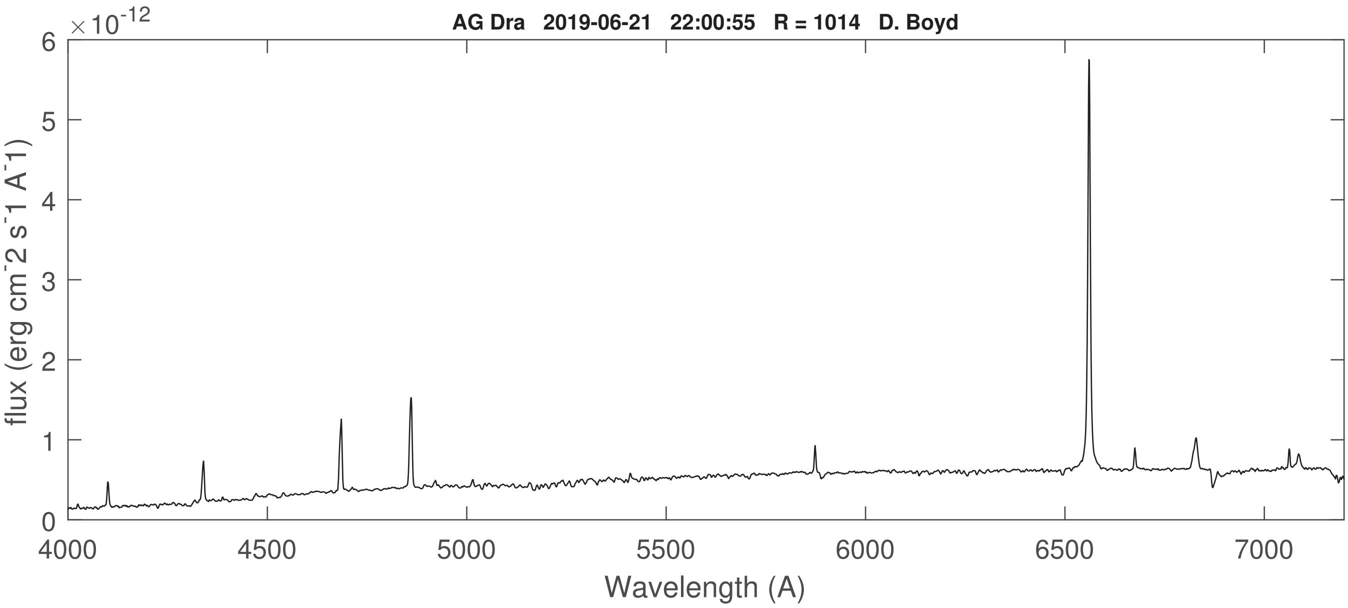

Halpha 2019-05-06
velocity (km/s)
0
5
10
15
20
-1000
-500
0
500
1000

AG Dra

Flux calibrated spectra obtained by Davis Boyd (LISA = 1000) and V band photometry





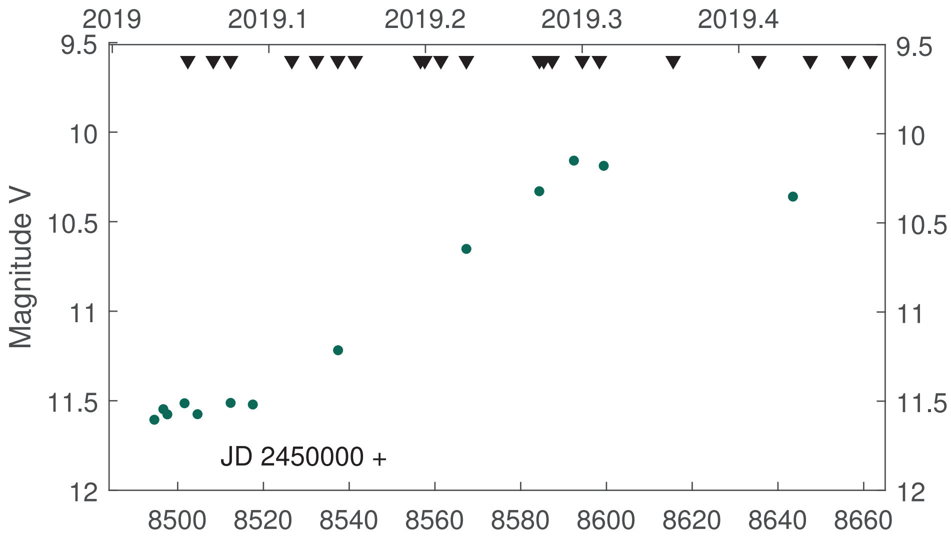


SYMBIOTICS

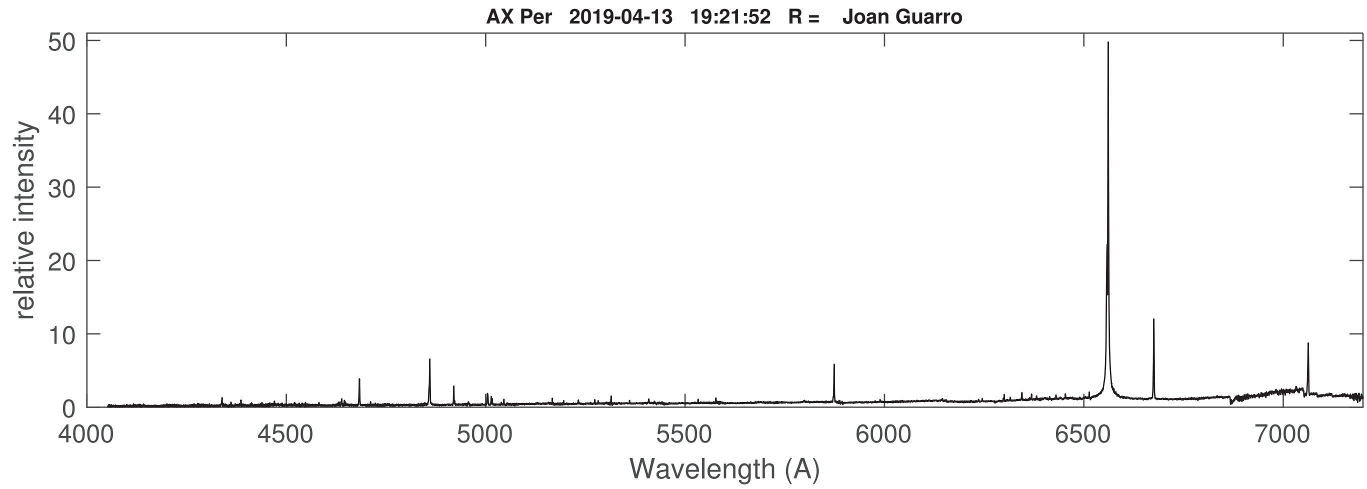
AX Per

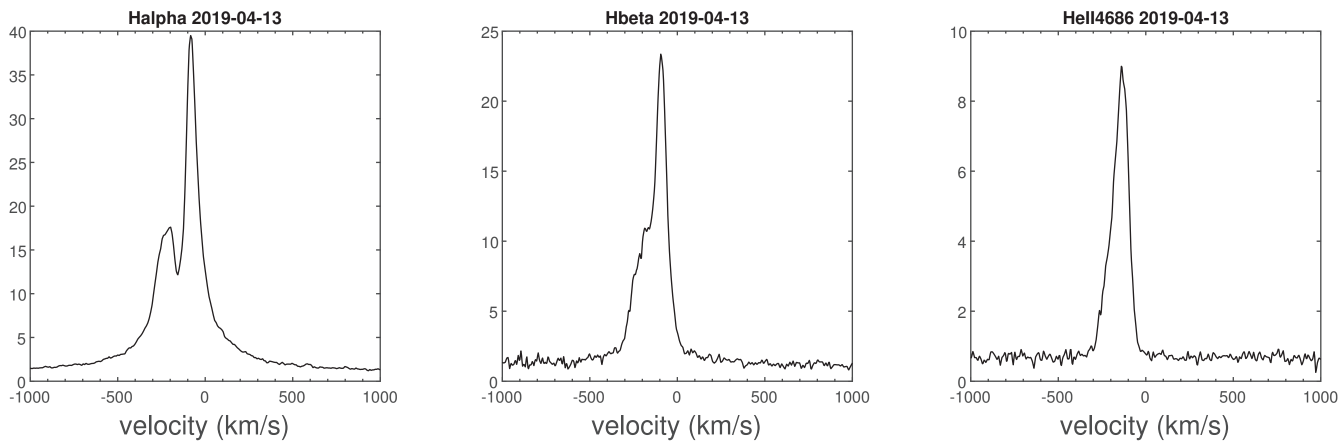
Coordinates (2000.0)	
R.A.	01 36 22.7
Dec	+54 15 02.4
Mag	11.5 (2019-01)

Outburst of AX Per, begining on JD ~ 2458517 at mag V = 11.5 and reaching maximum luminosity on JD 2458599 at mag V = 10.1 (Δ mag V = 1.4).
The decline was monitored by Christophe Boussin with an ALPY 600



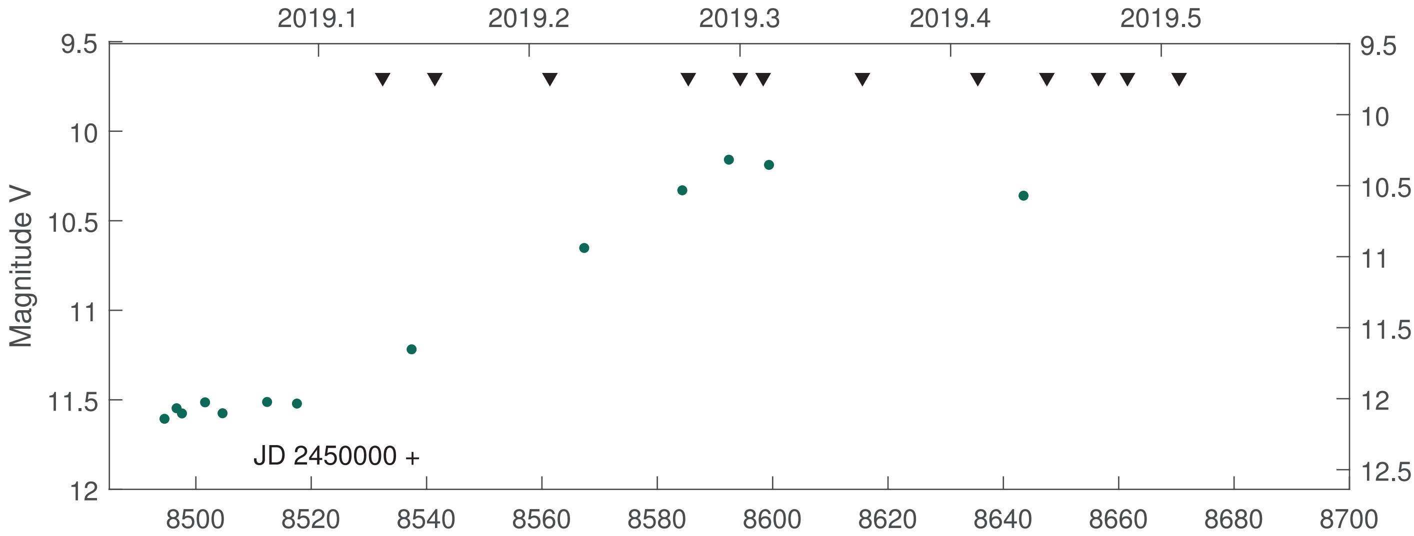
AAVSO (V) light curve and ARAS Spectra (triangles)

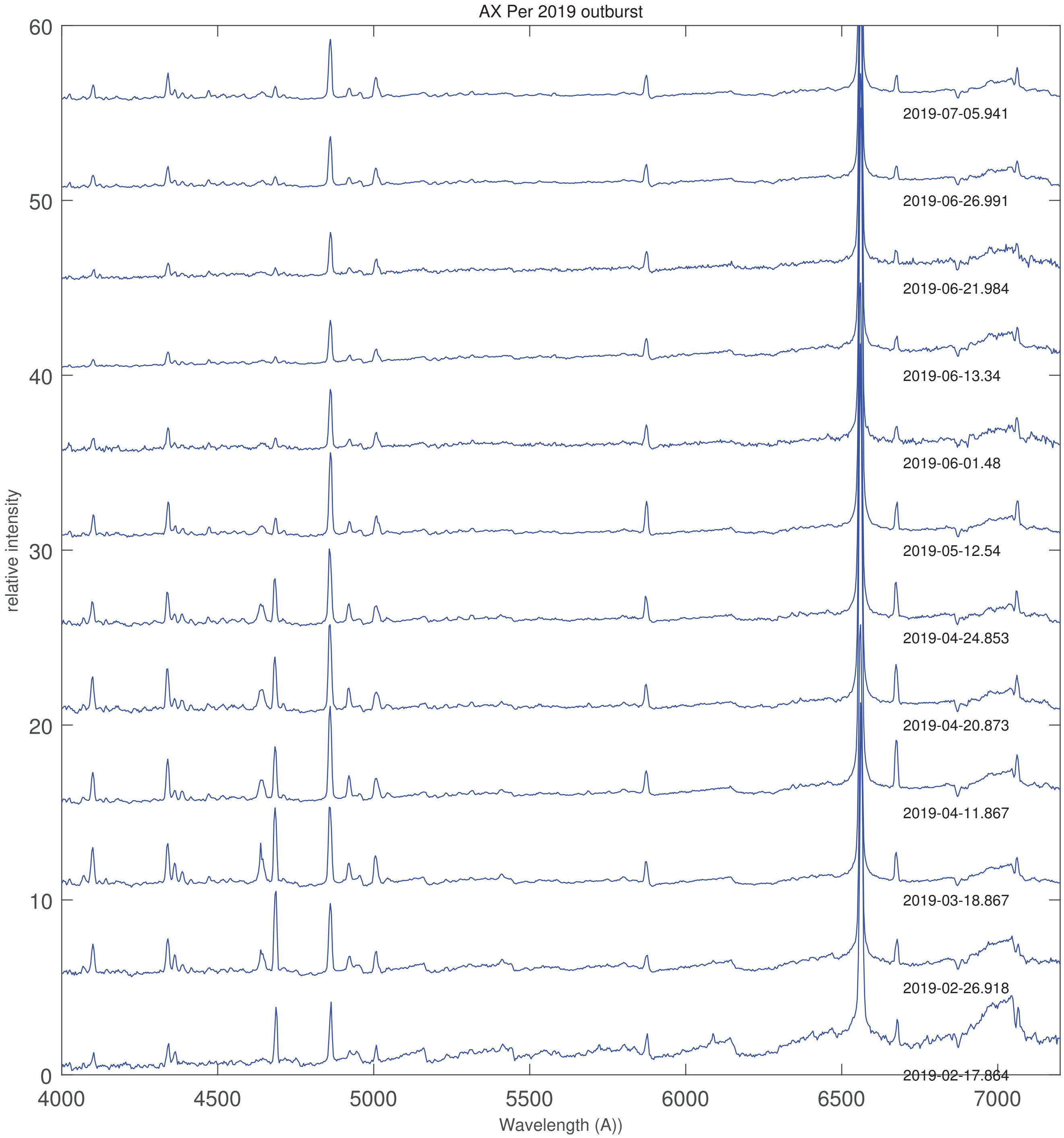




AX Per

The outburst monitored by Chistophe Boussin with ALPY600

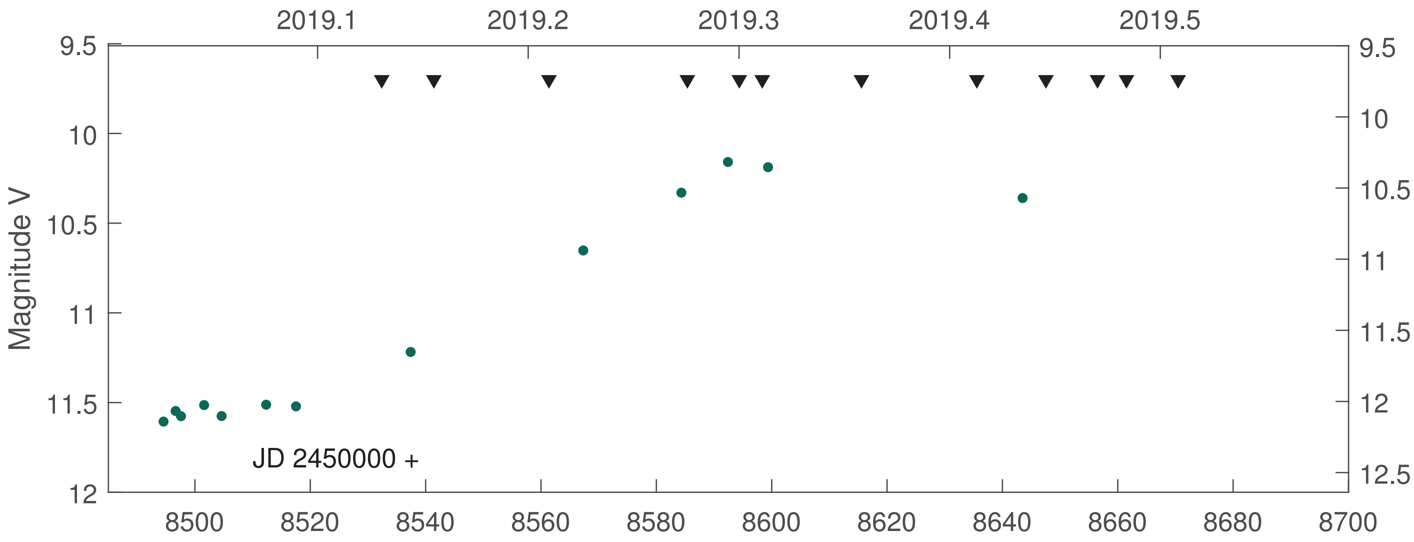


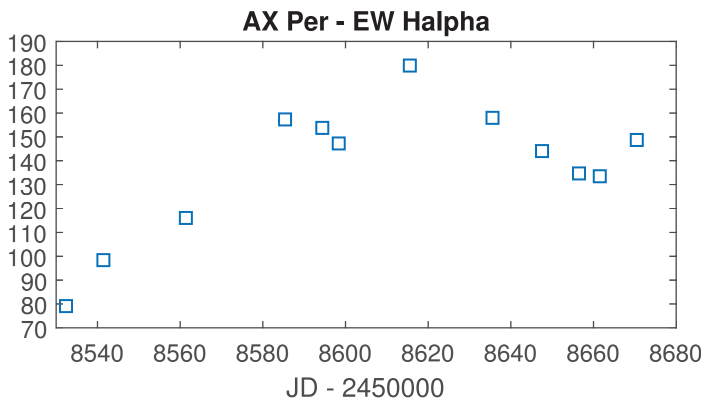


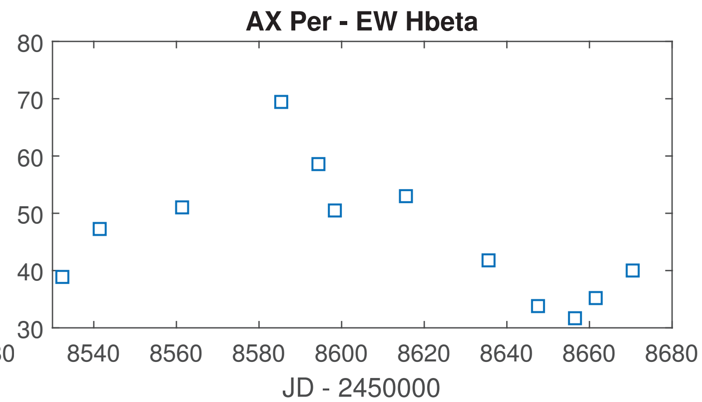
SYMBIOTICS

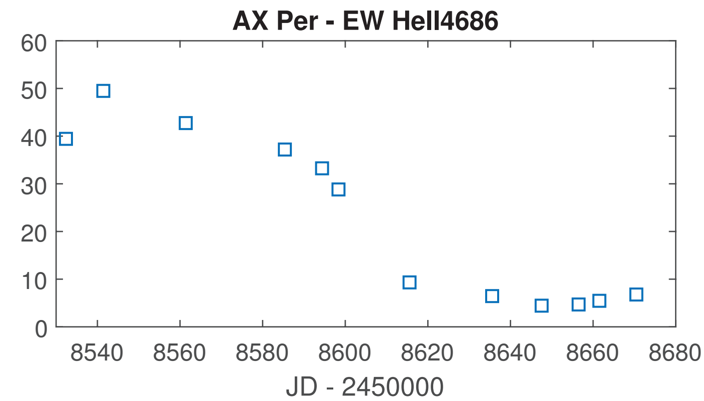
AX Per

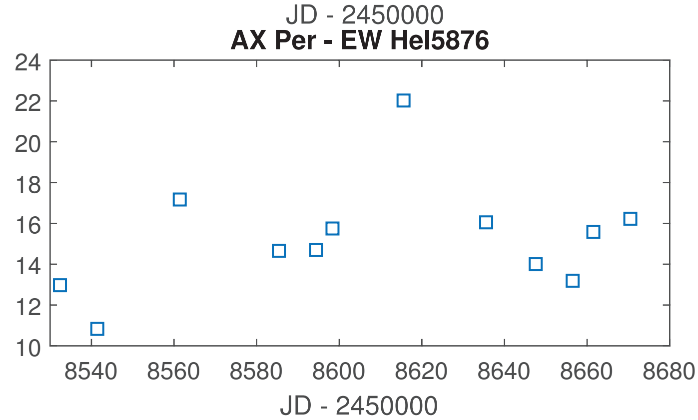
Equivalent widths of the main lines

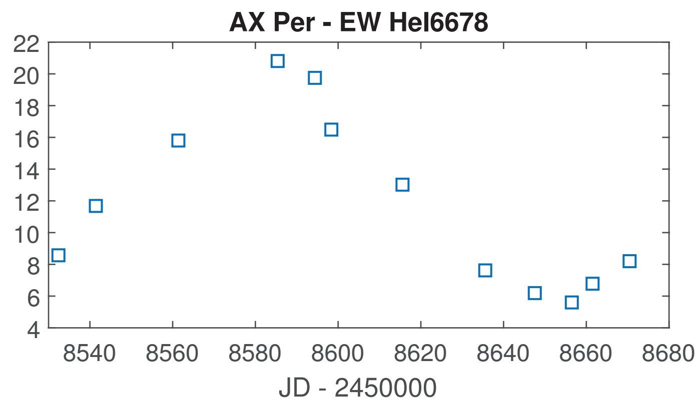








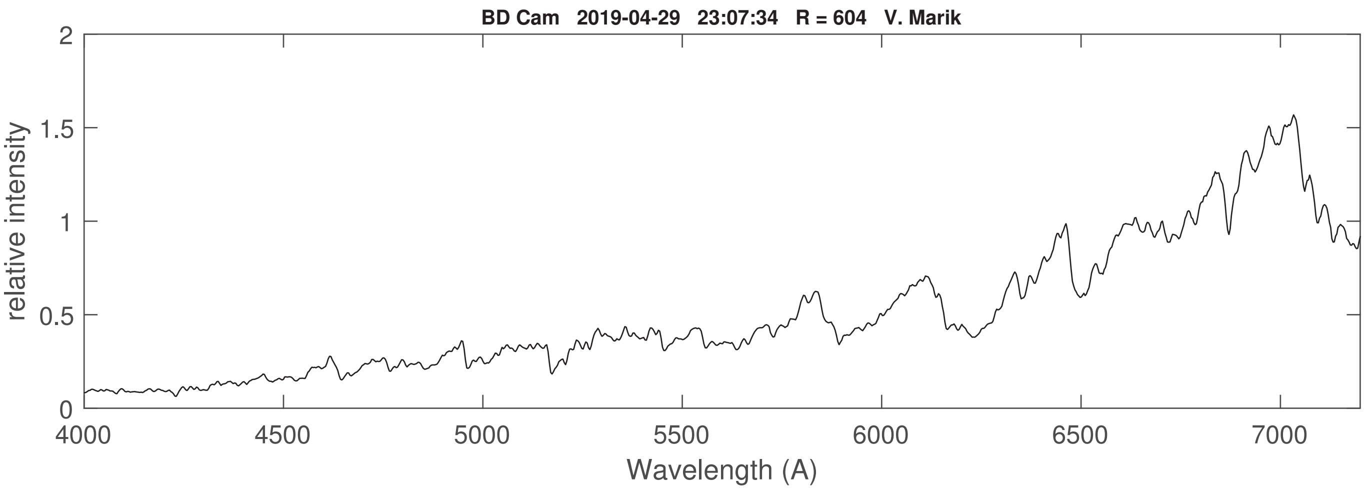




BD Cam

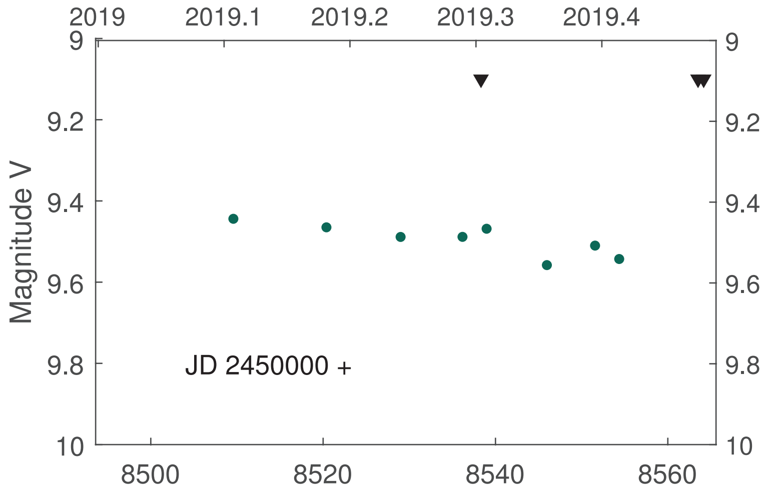
Coordinates (2000.0)	
R.A.	03 42 09.3
Dec	+63 13 00.0
Mag	

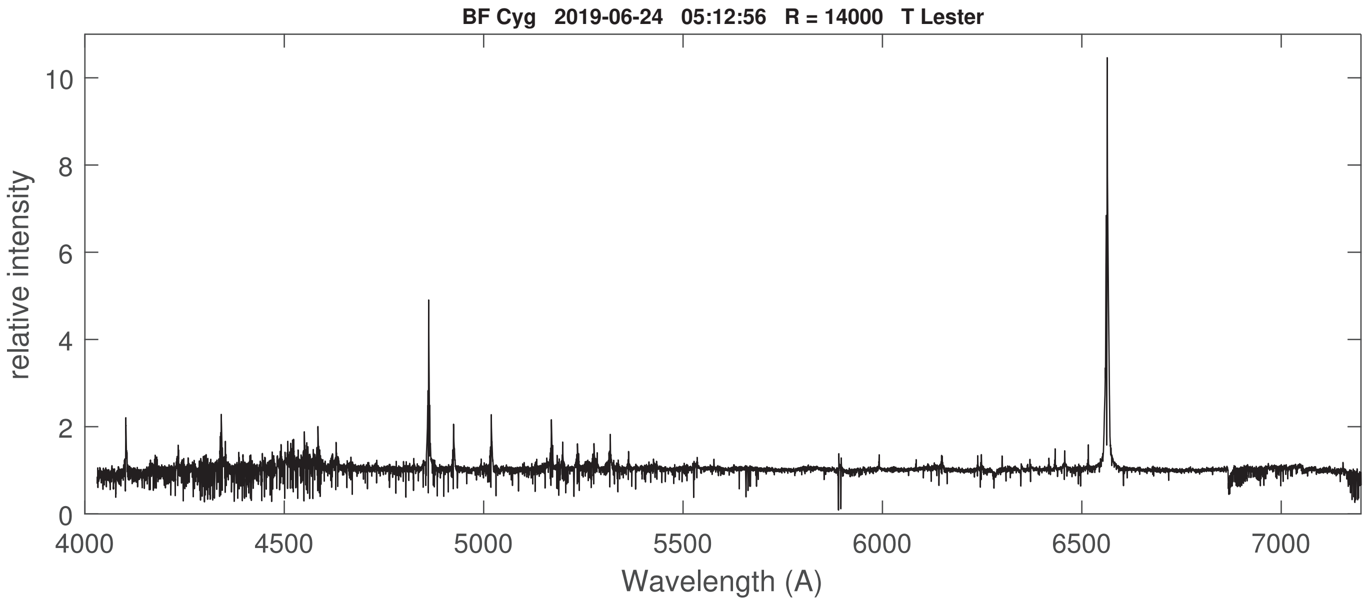
Still no emission lines in visible range

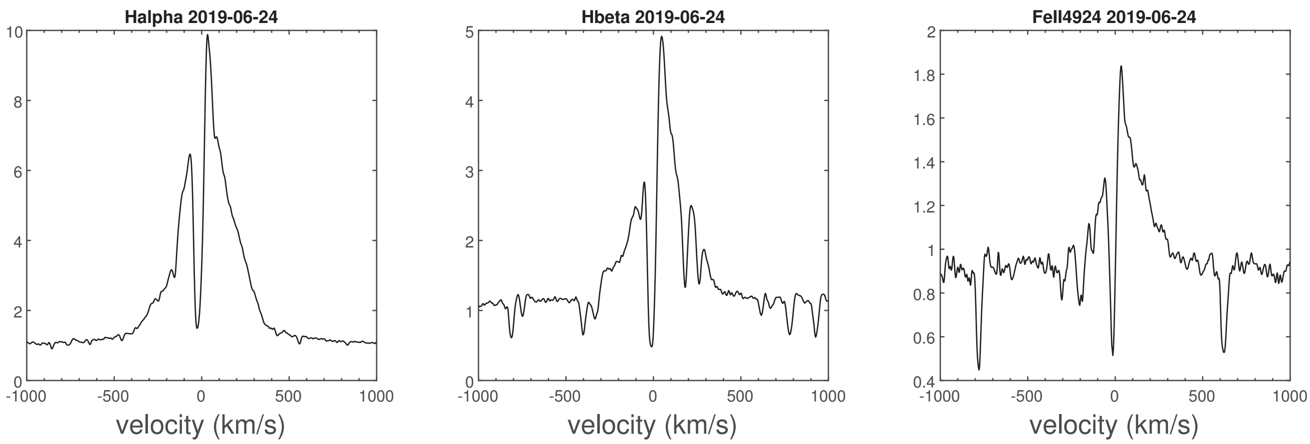


BF Cyg

Coordinates (2000.0)	
R.A.	19 23 53.5
Dec	+29 40 29.2
Mag	9.5 (2019-06)







SYMBIOTICS

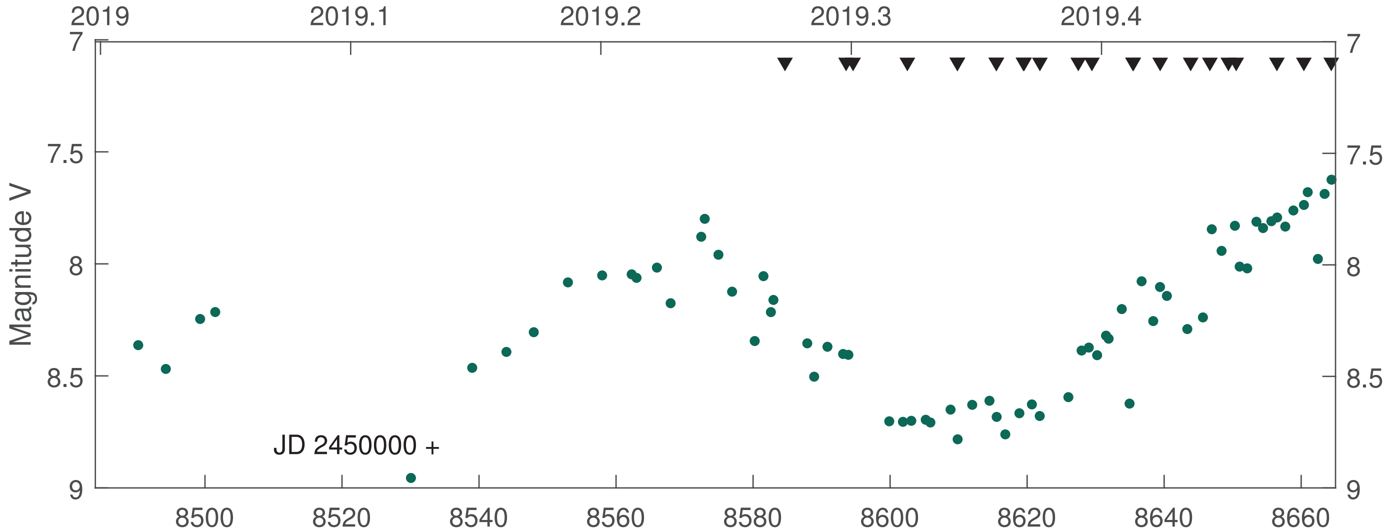
CH Cyg

Coordinates (2000.0)	
R.A.	19 24 33.1
Dec	+50 14 29.1
Mag	~ 7.2 (2017-07)

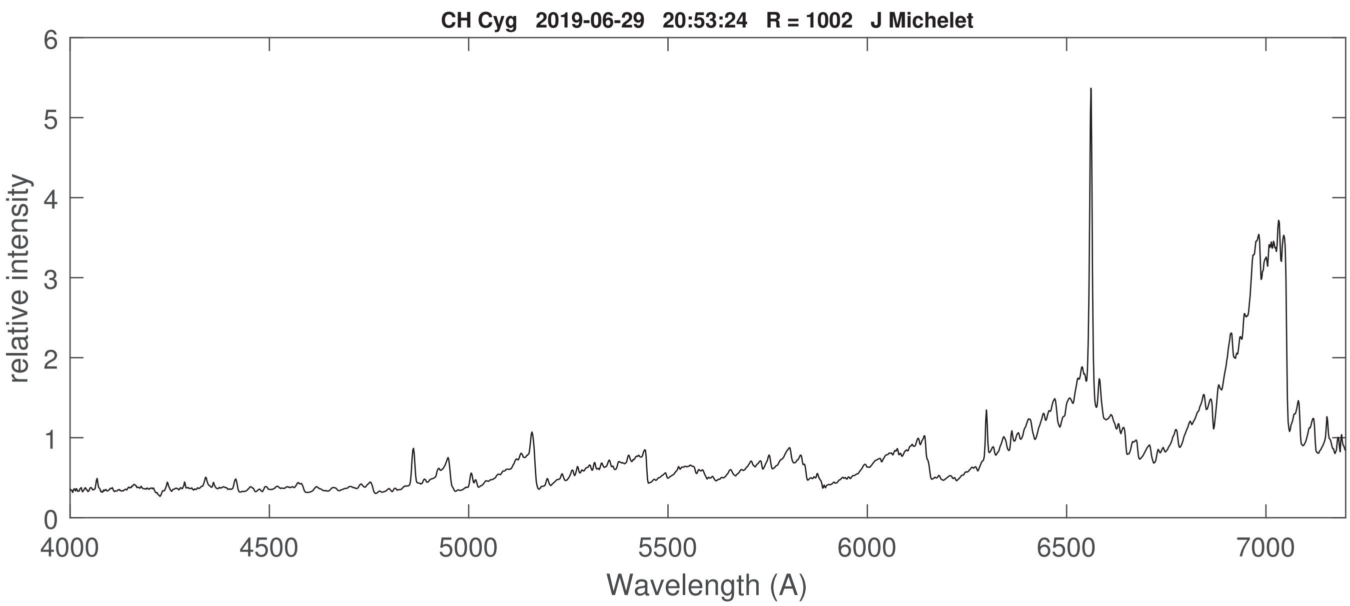
Ongoing campaign upon the request of Augustin Skopal At least one spectrum a month (high resolution and low resolution, with a correct atmospheric response)

The interesting thing is that CH Cyg (V and B) its getting fainter (abruptly) and in a relatively short time period; When this happened in the past, it indicated a jet ejection and dimming of the LC by the ejecta/dust in the inner circumbinary environment. So close spectral and photometric monitoring in the next few months would be of a great interest.
Margarita Karovska (communication to ARAS observers)

After its fading in the second part of 2018, CH Cygni remains at low luminosity (~ 8) and oscillates.

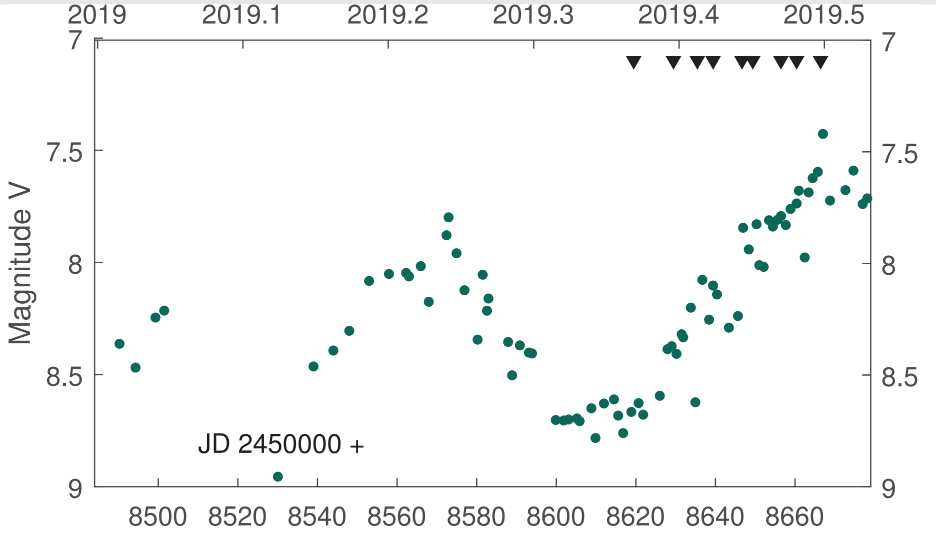


AAVSO V lightcurve (daily mean) and ARAS spectra (blue dots) from 2019-01 to 06



Spectrum obtained by J. Michelet with LISA R = 1000 near the maximum luminosity of the flare

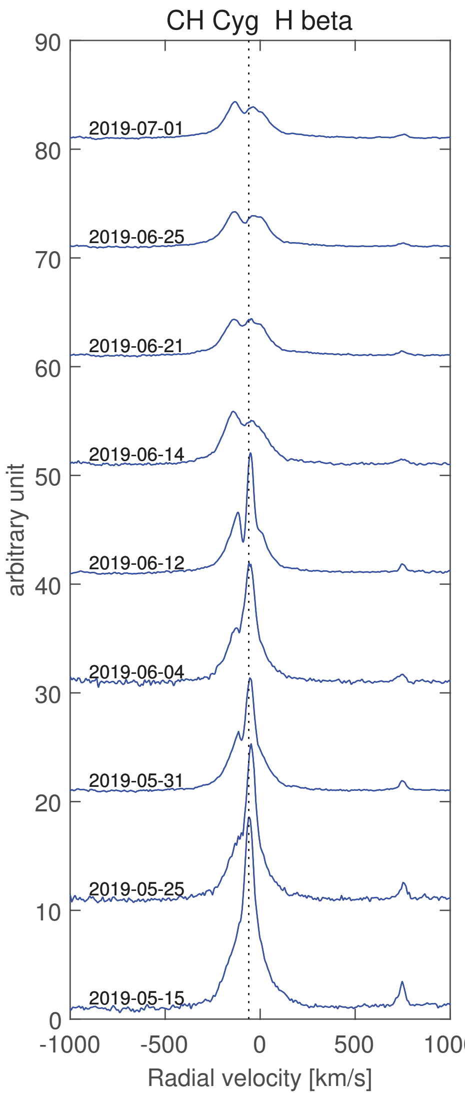
CH Cyg

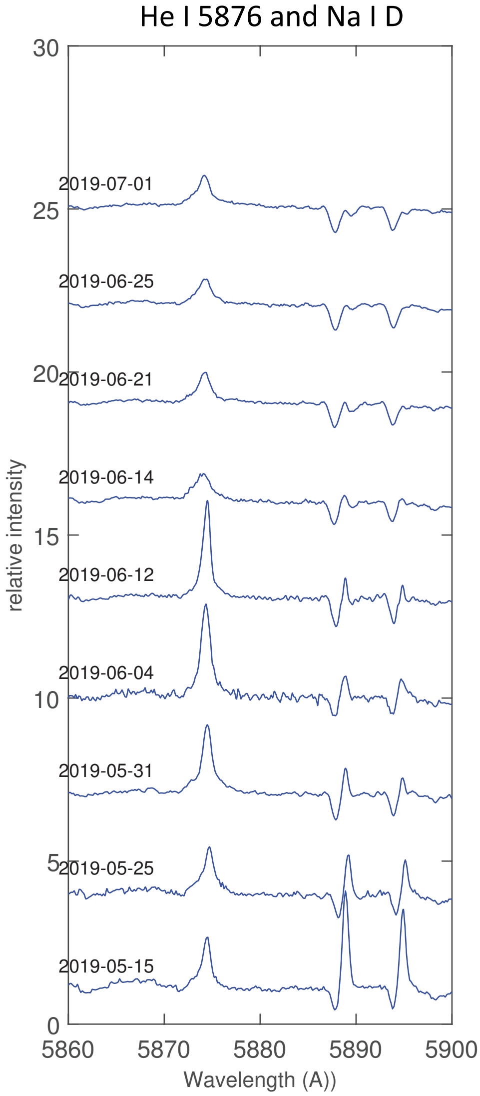


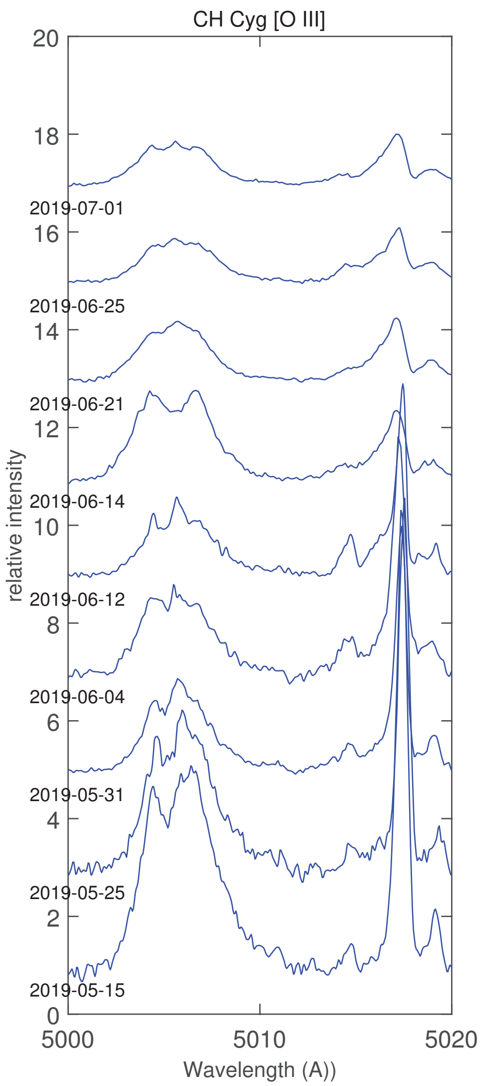
The second brightening of the year begins JD ~ 2458625 at mag 8.7 and raise the maximum luminosity mag ~ 7.5 on JD ~ 2458665. Delta mag = 1 in 40 days. AAVSO V band lightcurve.

Date	Obs	Res
15/05/2019	FMT	11000
25/05/2019	FMT	11000
31/05/2019	FMT	11000
04/06/2019	JGF	9000
12/06/2019	LES	14000
14/06/2019	JGF	9000
21/06/2019	JGF	9000
25/06/2019	JGF	9000
01/07/2019	JGF	9000

The relative intensity of the emissions decrease during the brightning. The profile of Hβ **change dramatically in only two days between 12-06 and 14-06** and the V/R ratio is inverted from V to R while He I lines fade. Rapid change of the profile of [OIII] looks to happen latter between 21-06 and 25-06. The emissions of Na I D weakens gradually until 21-06 .

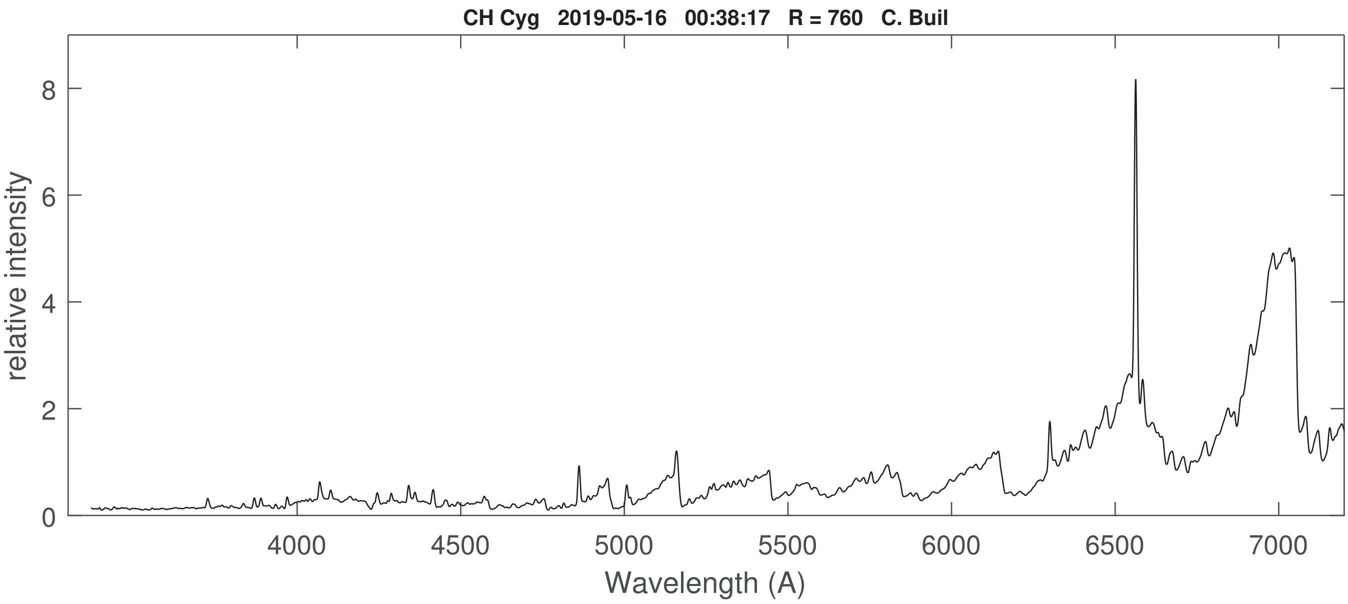


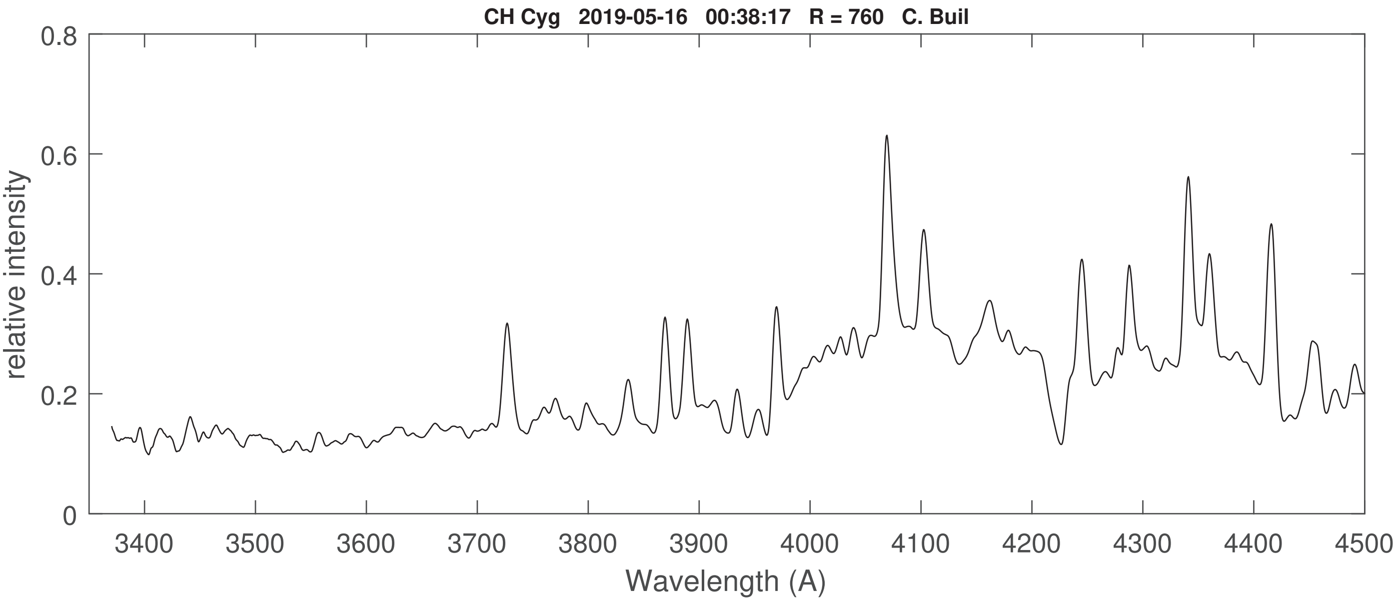


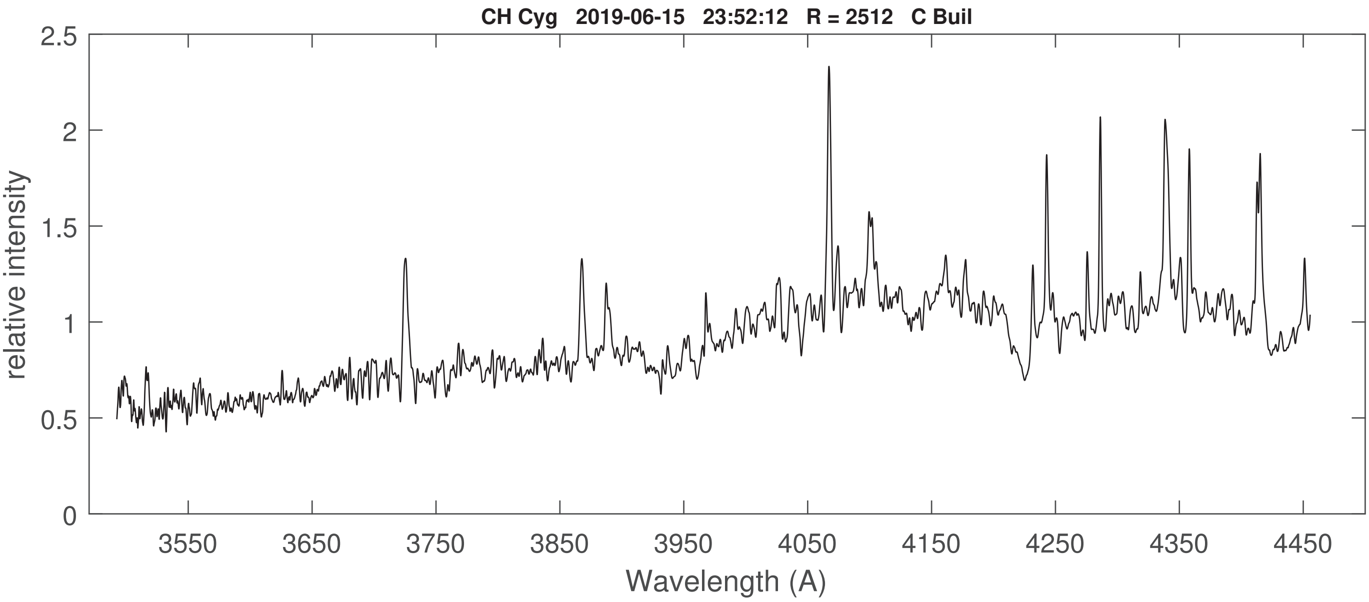


CH Cyg

Spectra obtained by Christian Buil with his prototype UVEX at resolution 760 (2019-05-16) until 3350 Å and R = 2500 (2019-06-15).



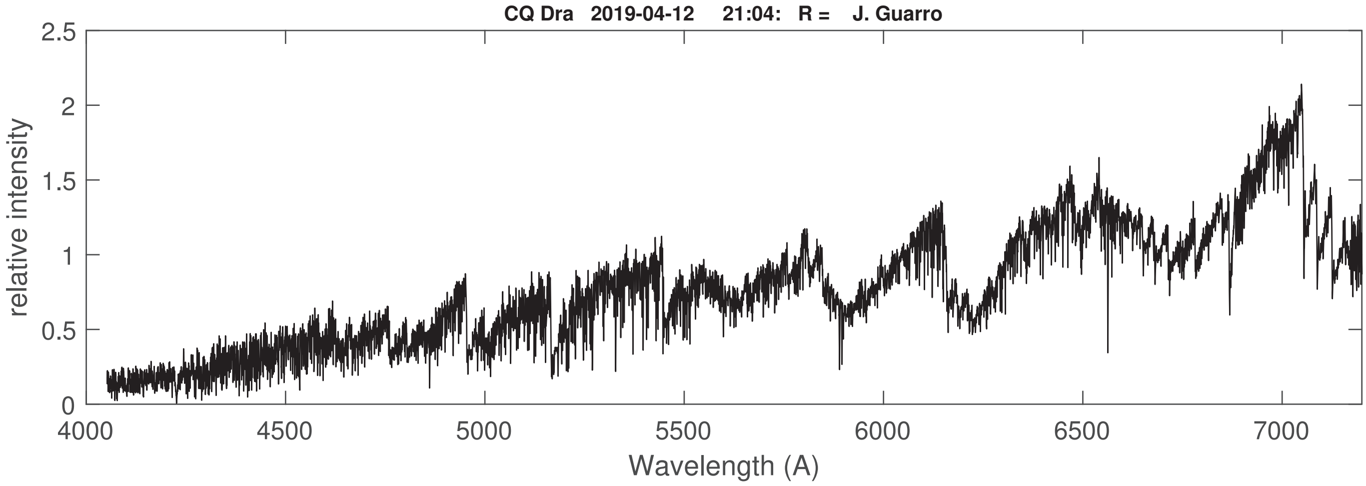


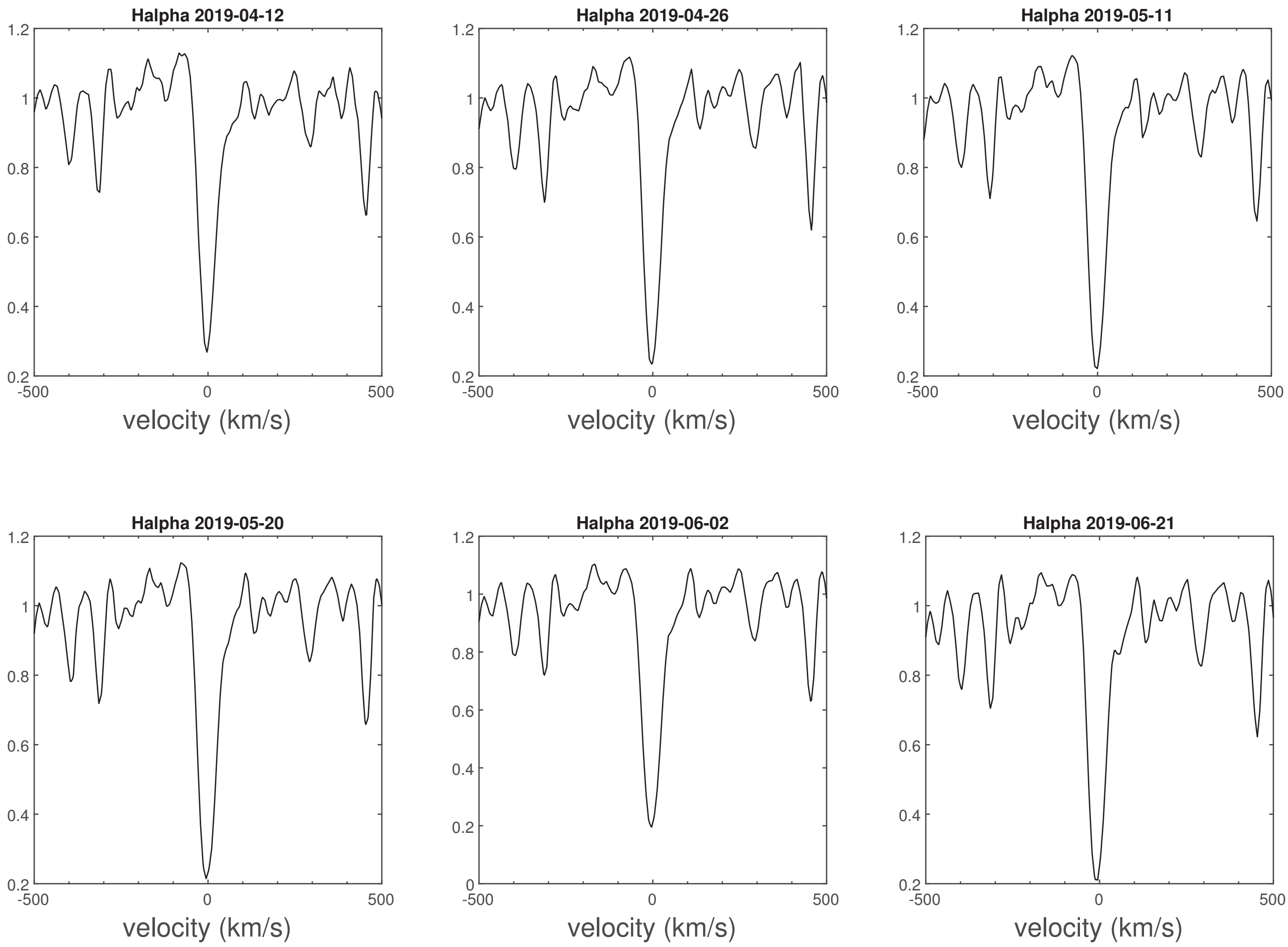


CQ Dra

Coordinates (2000.0)	
R.A.	12 30 06.7
Dec	+69 12 04.
Mag V	4.9

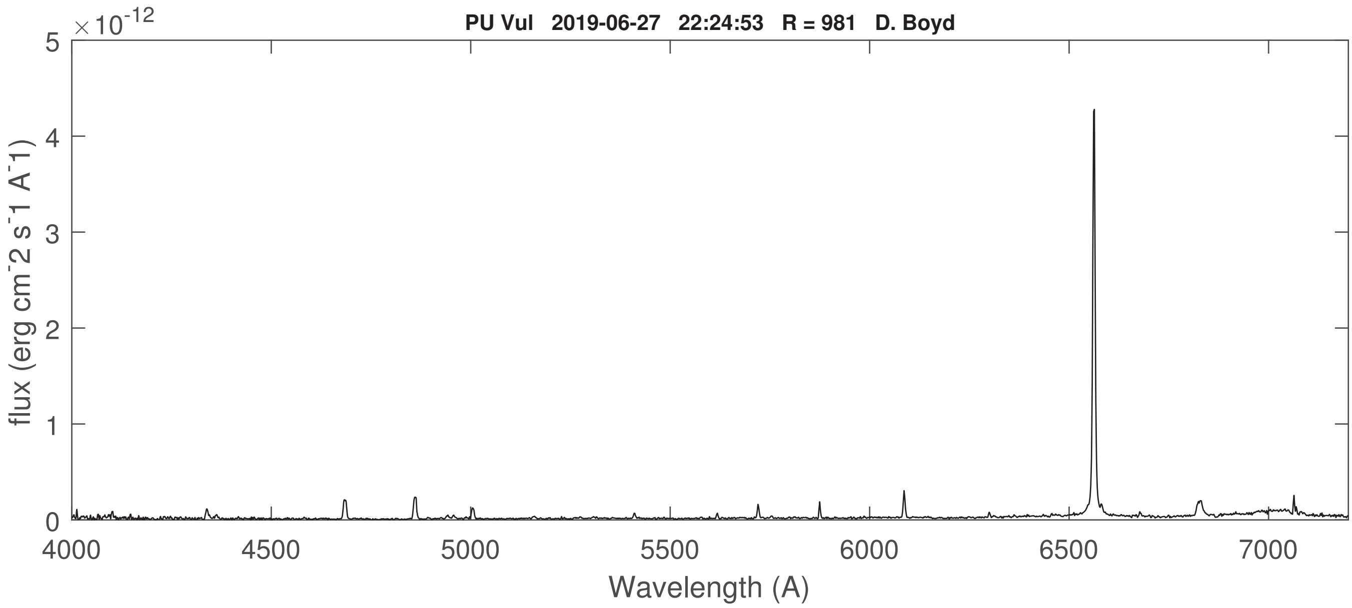
No emission lines

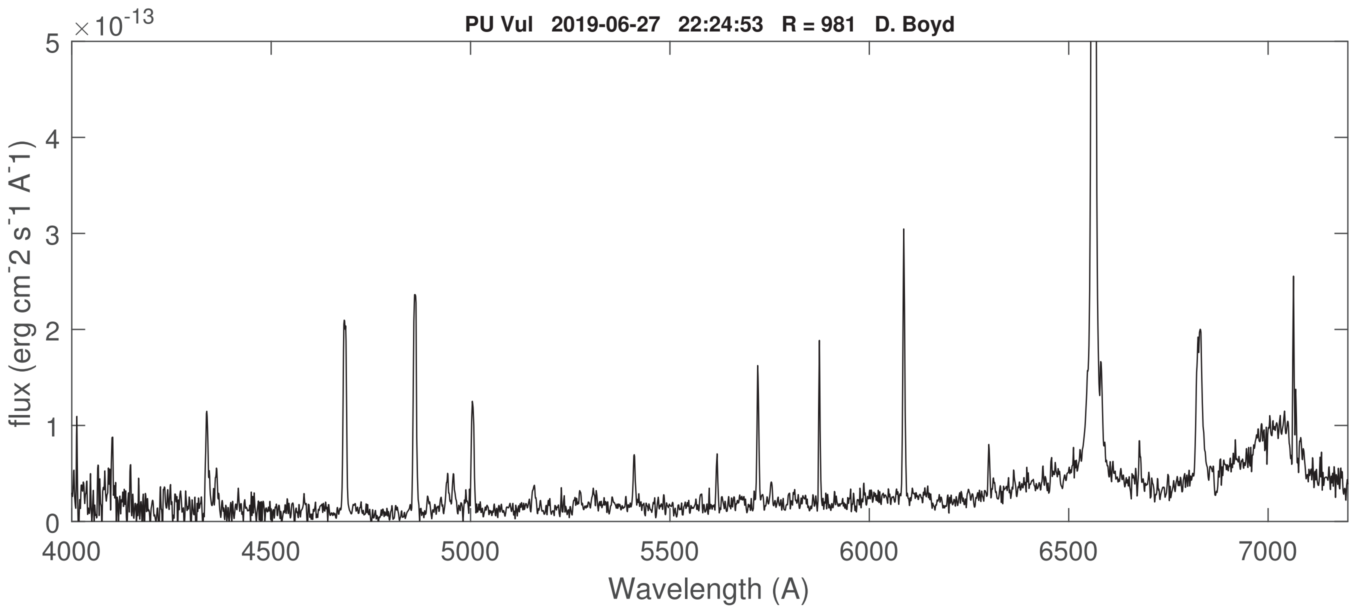




PU Vul

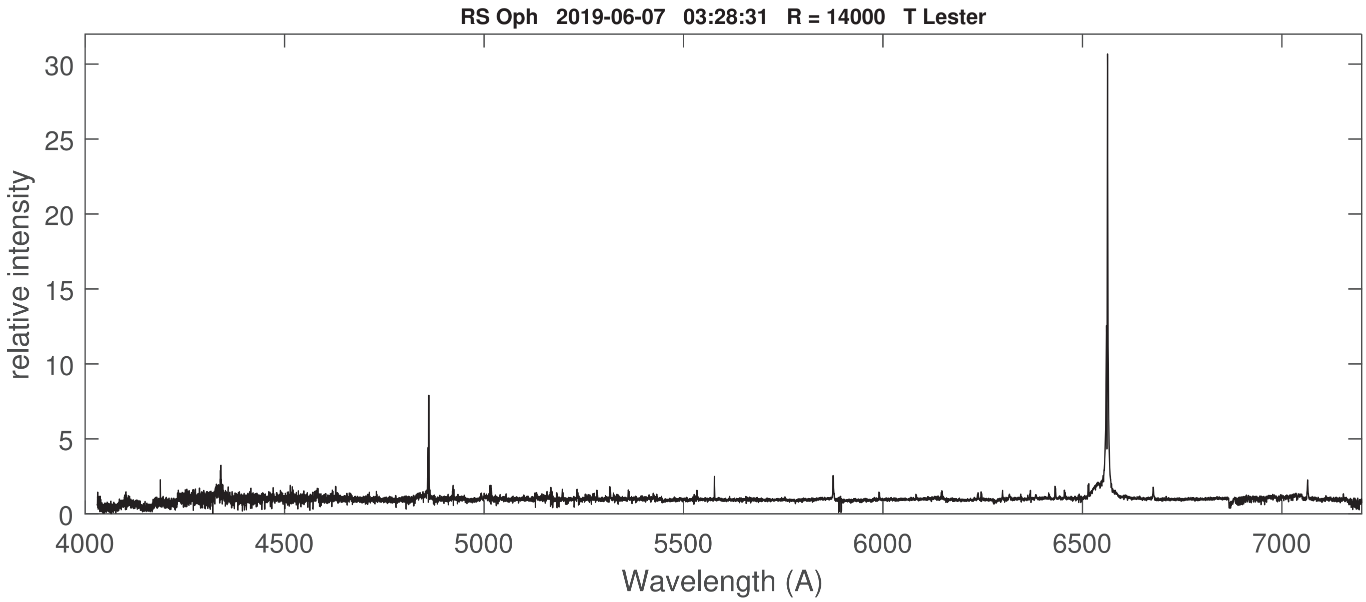
Coordinates (2000.0)	
R.A.	20 21 13.3
Dec	+21 34 18.7
Mag V	13.1 (2019-06)

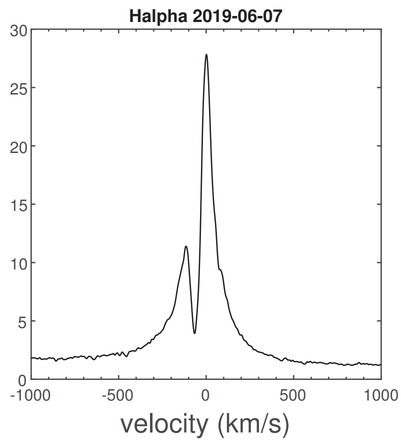


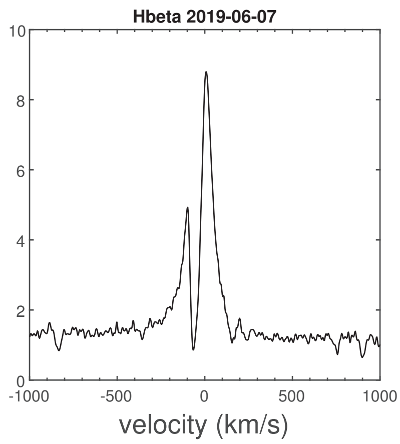


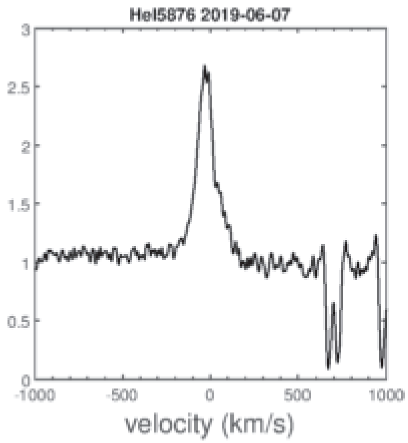
RS Oph

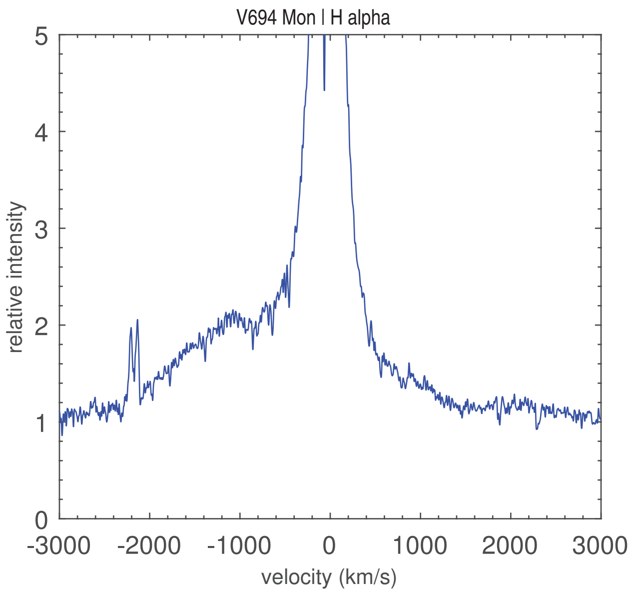
Coordinates (2000.0)	
R.A.	17 47 31.5
Dec	-06 41 39.5
Mag V	





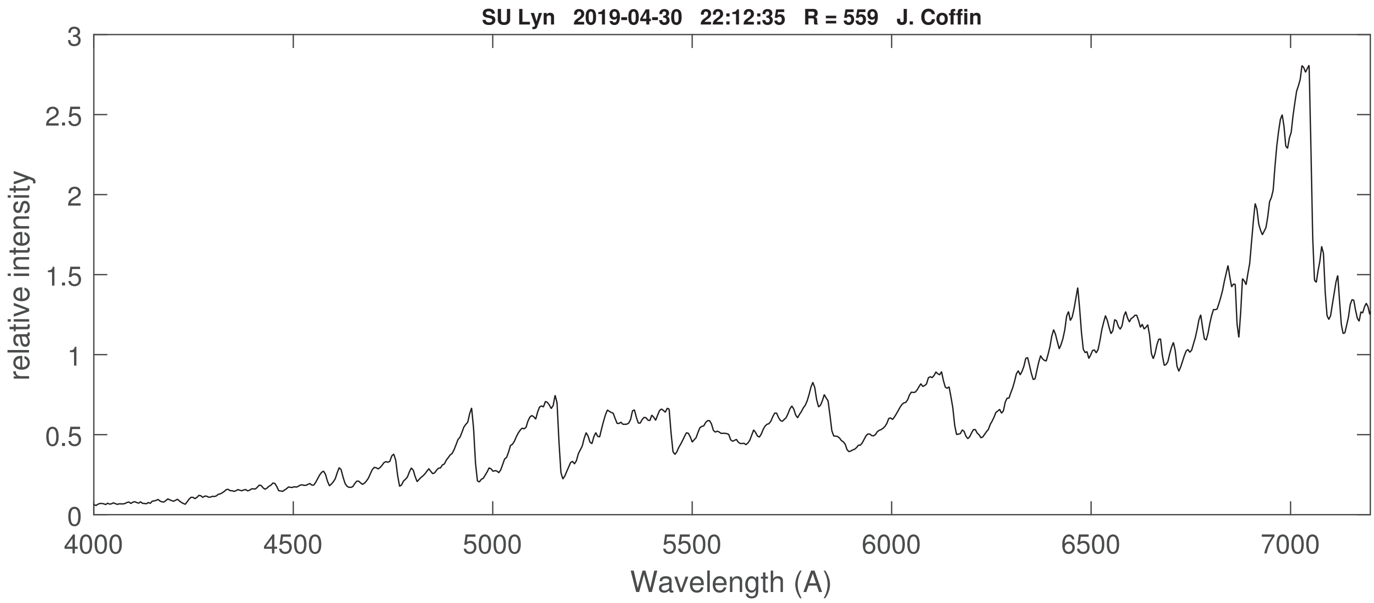






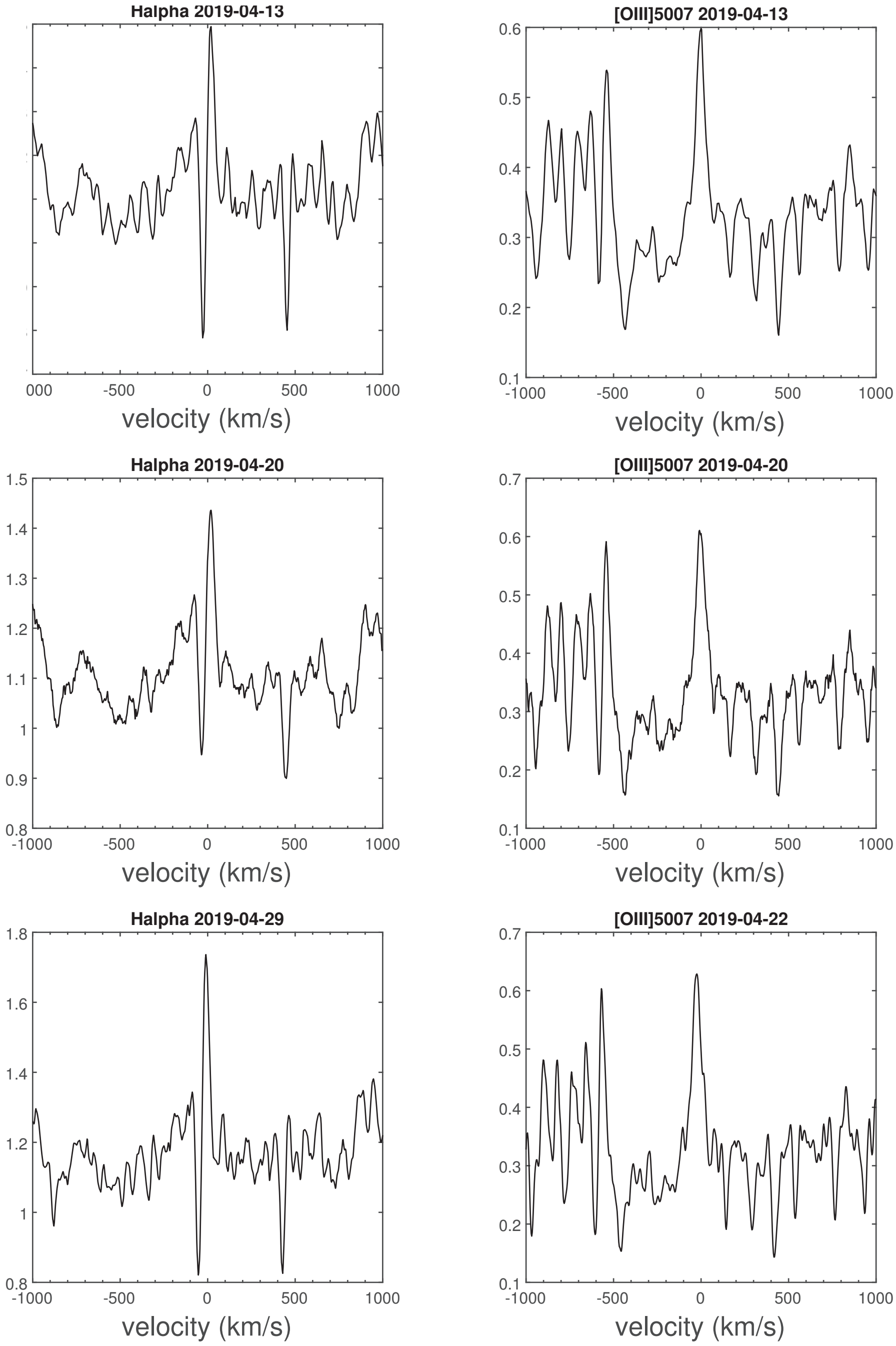
SU Lyn

Coordinates (2000.0)	
R.A.	06 42 55.1
Dec	+55 28 27.2
Mag V	~ 8.5



SU Lyn

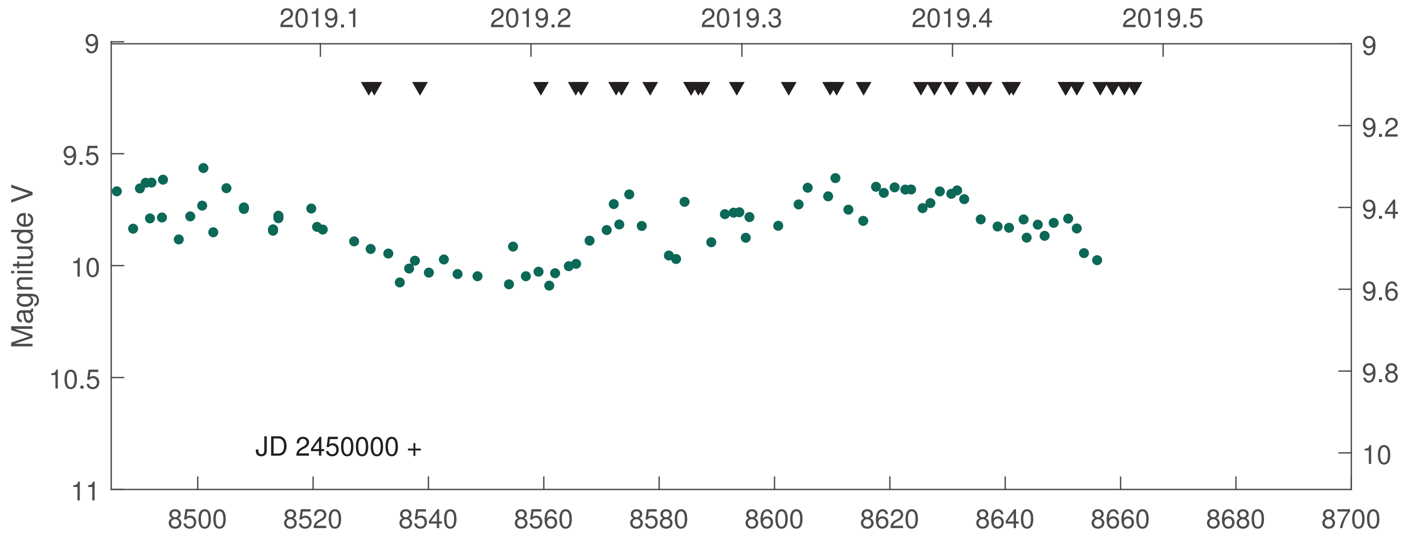
Ha and [OIII] variations
Echelle spectra R = 9000 to 13000 Stéphane Charbonnel, Joan Guarro, Tim Lester, François Teyssier



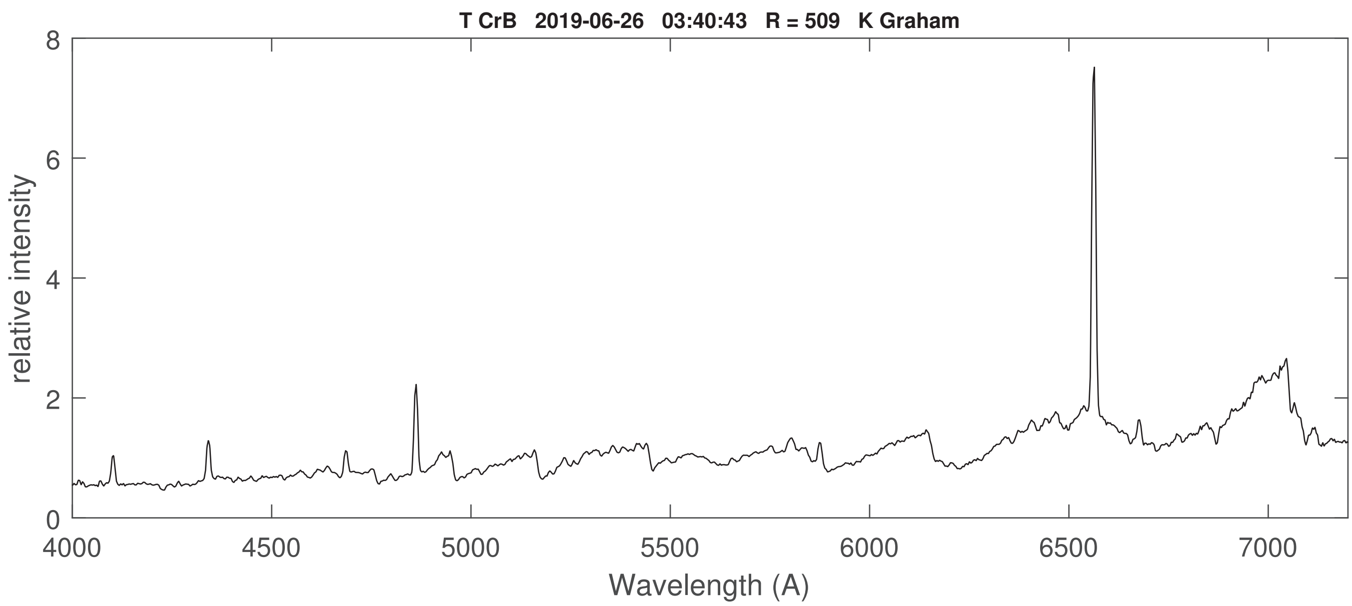
T CrB

Coordinates (2000.0)	
R.A.	15 57 24.4
Dec	+26 03 38.8
Mag V	9.8

Main target until the next nova event
See Schaefer (2019)

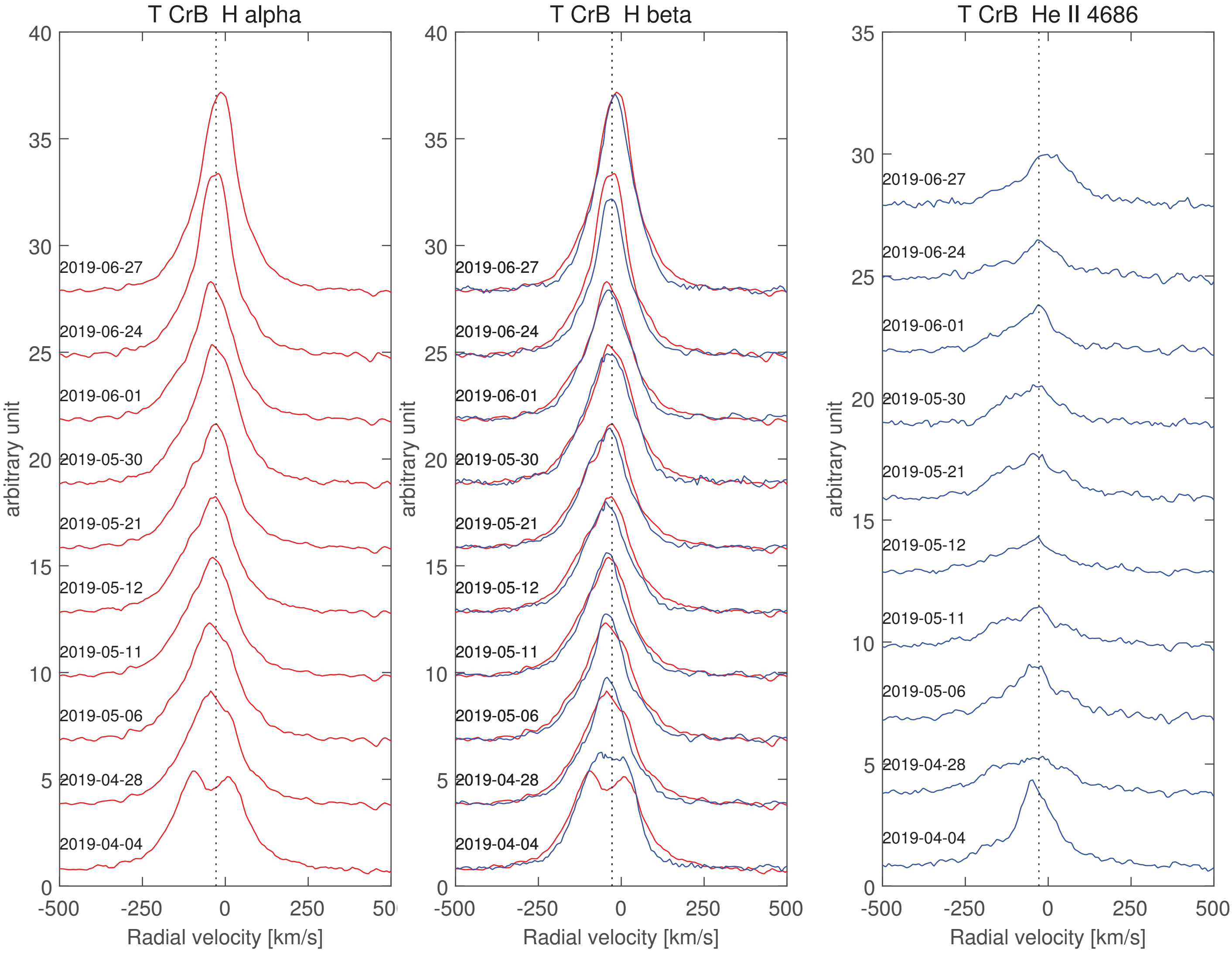


AAVSO lightcurve (V band - 1 day mean) and ARAS spectra (triangles) in 2019



T CrB

Profiles of selected lines from Echelle spectra obtained by Tim Lester, Stephane Charbonnel Joan Guarro François Teyssier.
Note the very similar profiles of Hα and Hβ

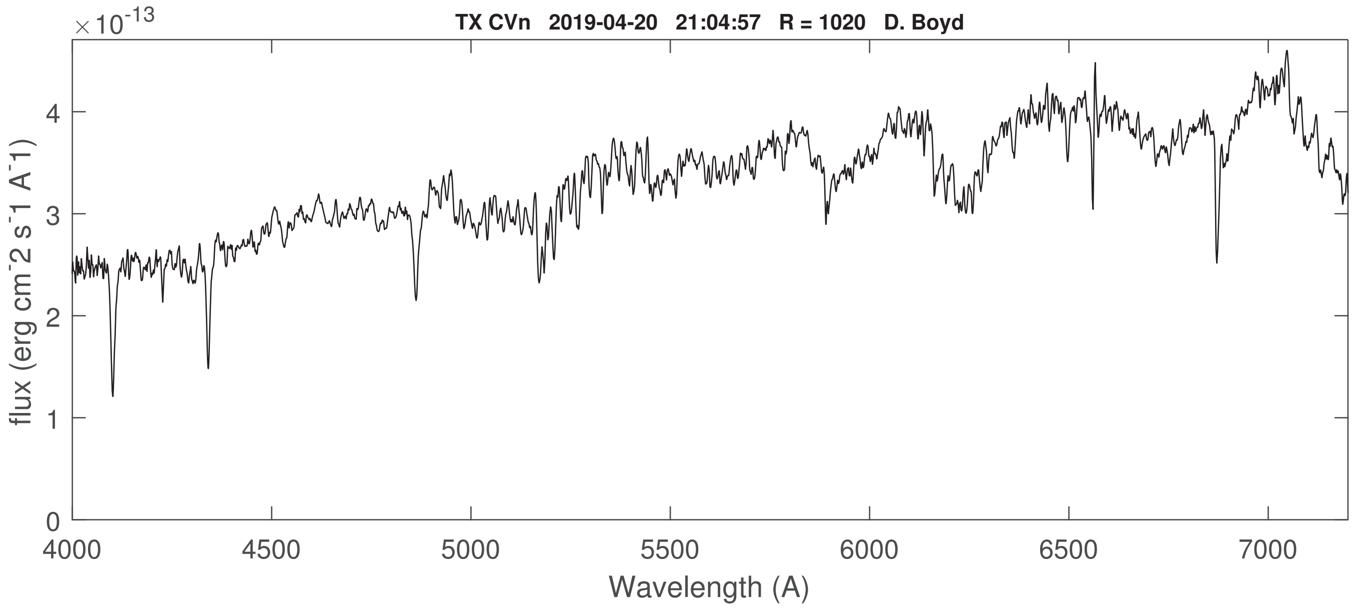


Hβ: blue Hα: red

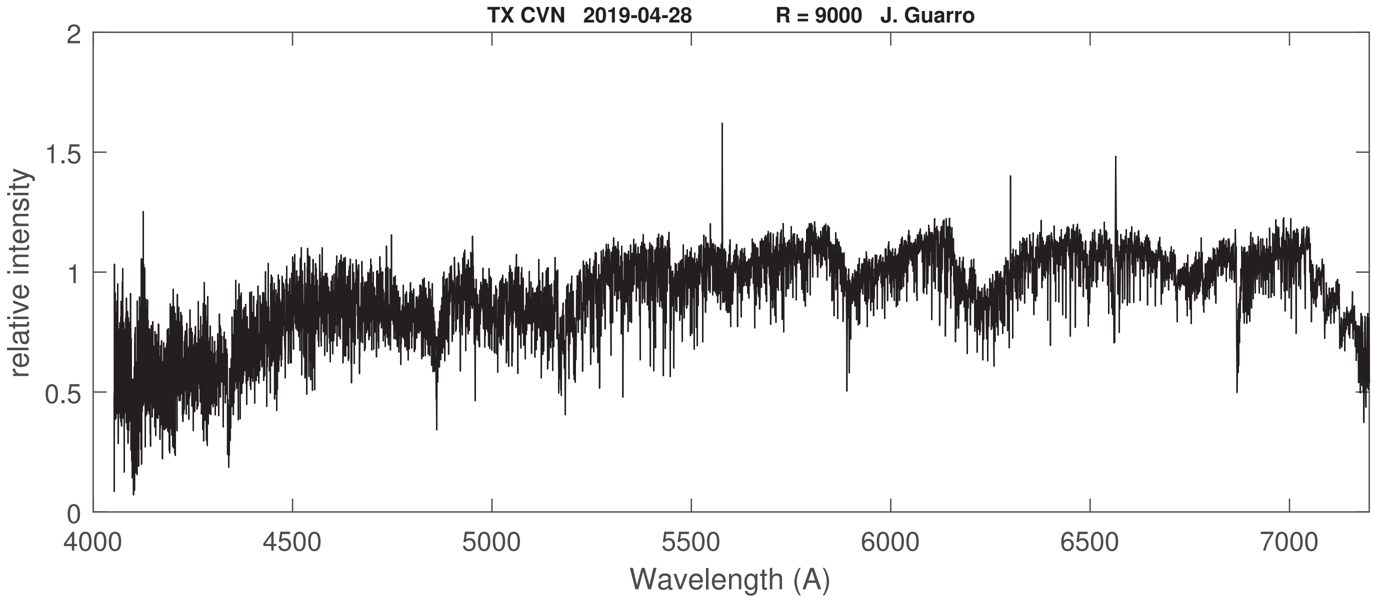
SYMBIOTICS

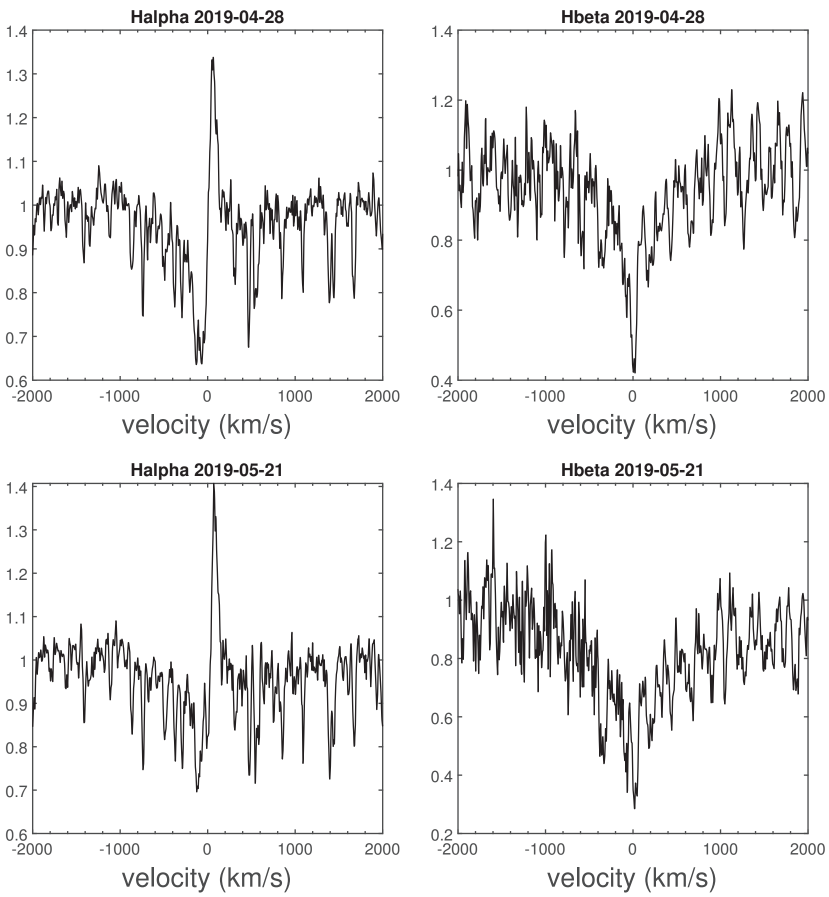
TX CVn

Coordinates (2000.0)	
R.A.	12 44 42.0
Dec	+36 45 50.6
Mag V	10.2



TX CVn


TX CVN 2019-04-28 R = 9000 J. Guarro
relative intensity
Wavelength (A)


Halpha 2019-04-28
Hbeta 2019-04-28
Halpha 2019-05-21
Hbeta 2019-05-21
velocity (km/s)

V694 Mon = MWC 560

Coordinates (2000.0)	
R.A.	07 25 51.28
Dec	-07 44 08.07
Mag	9.0

V694 Mon is in strong optical outburst, at V mag = 8.95 in 2019, April. The lines profiles are atypical for this star dring the current event. The emission lines of Balmer series and Fe II (42) shows a classical P Cygni profile while the classical broad absorption is absent or very weak

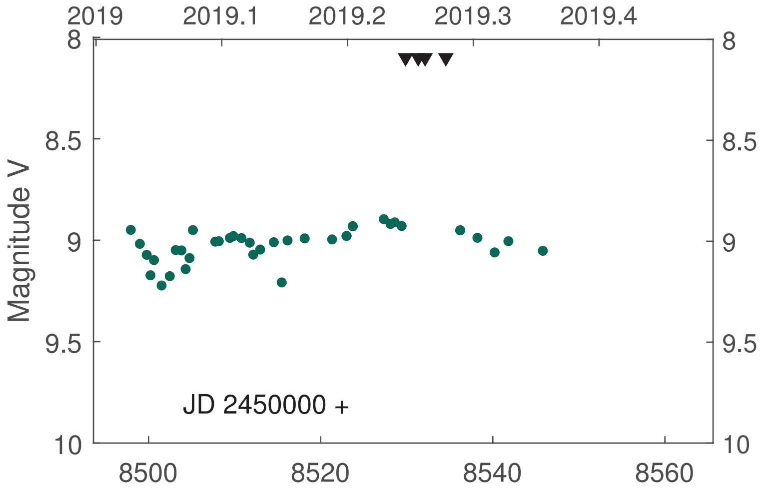


Fig. 1 - AAVSO (V) Light Curve and ARAS Spectra 2019-Q2 (triangles)

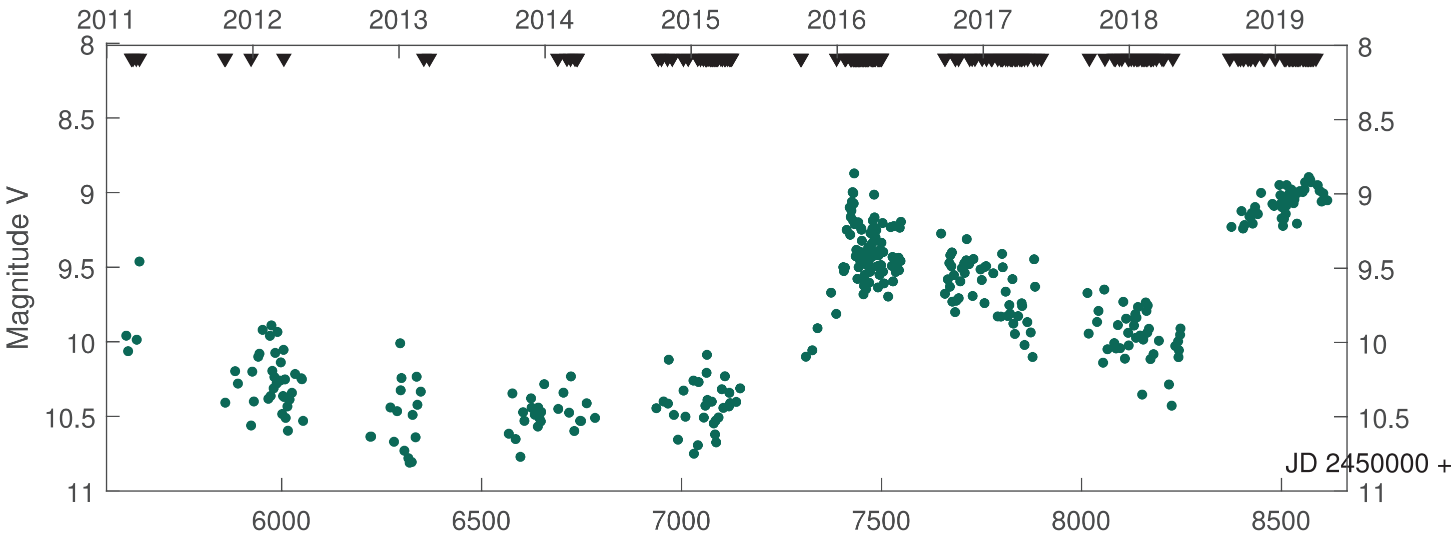
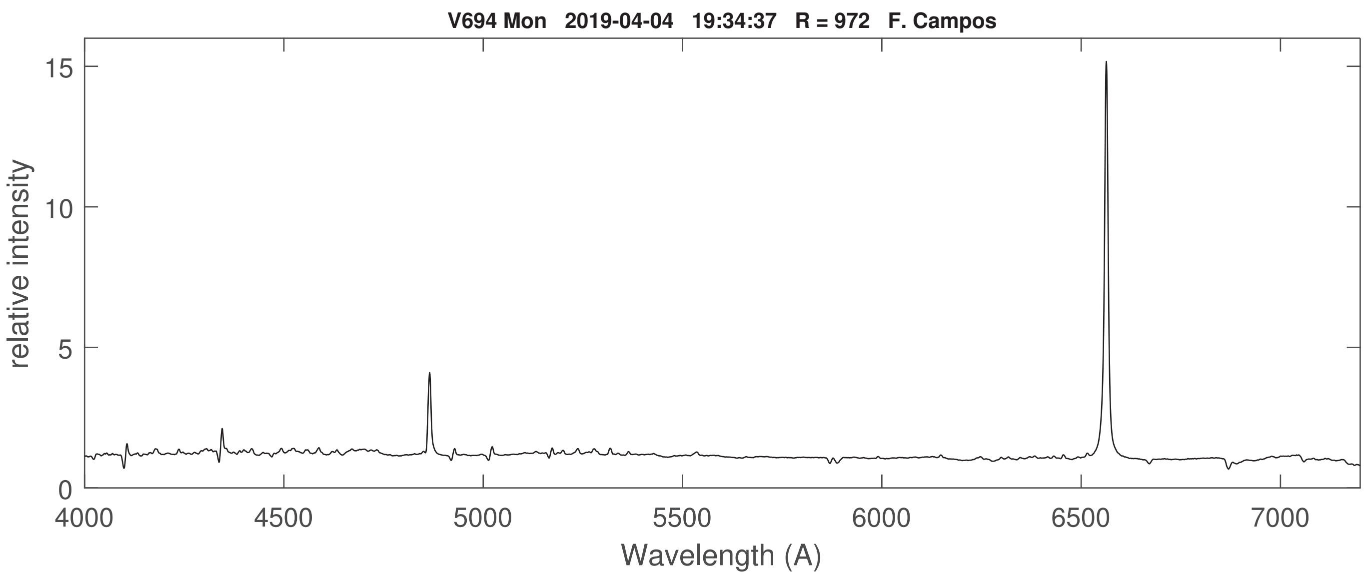
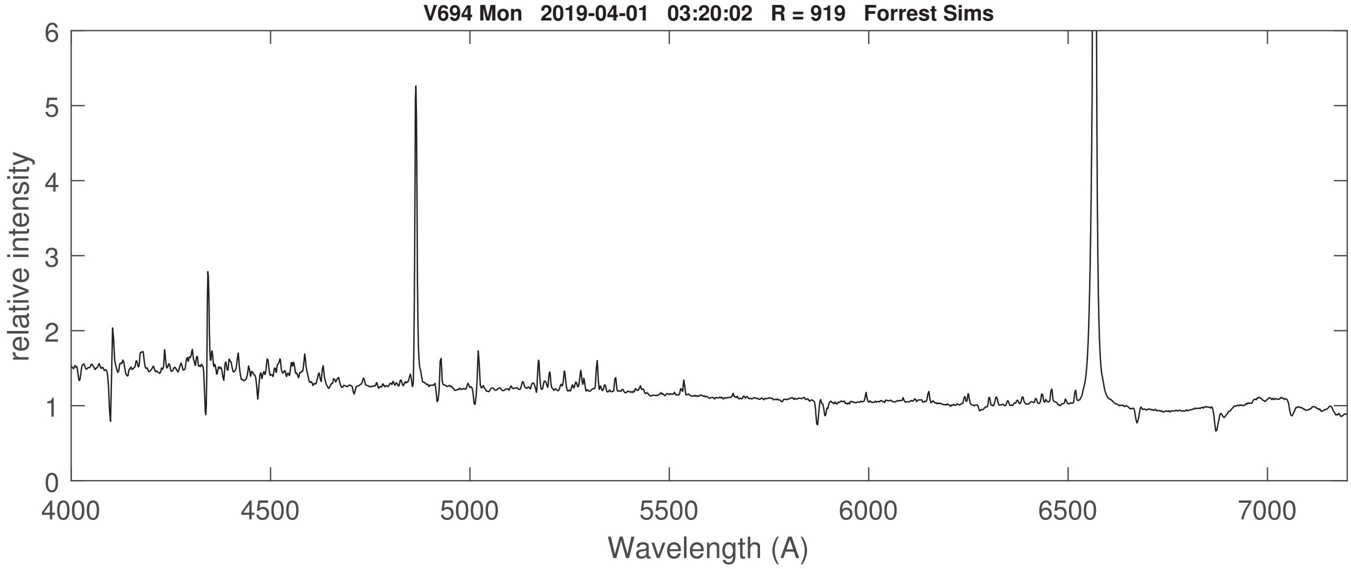
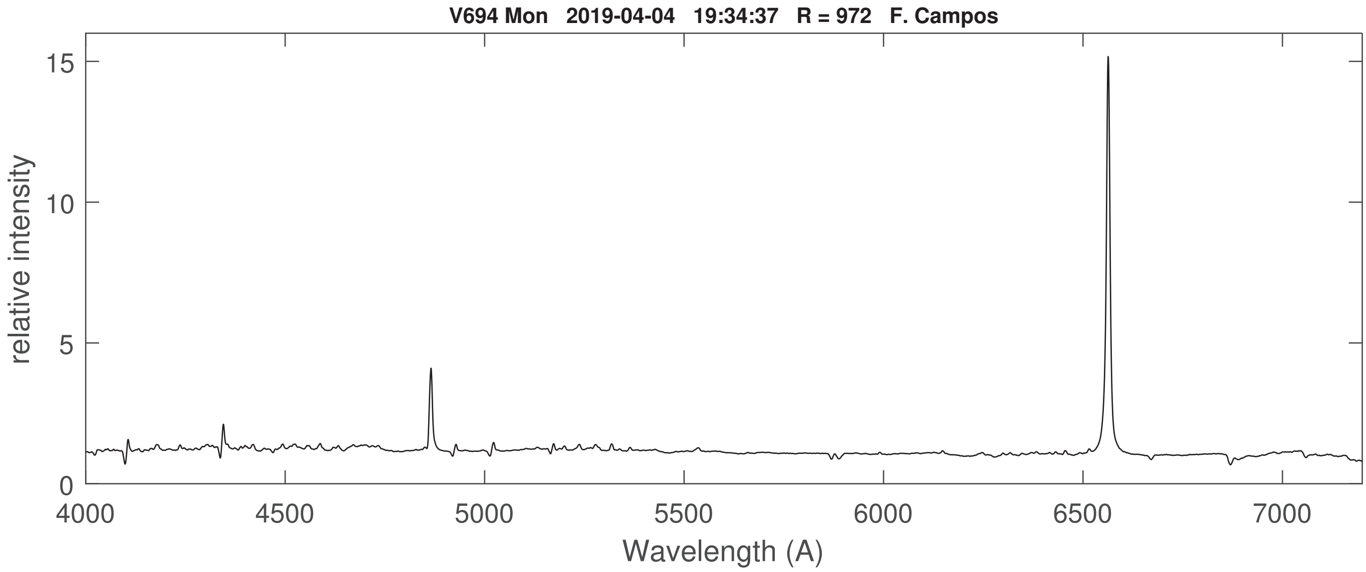


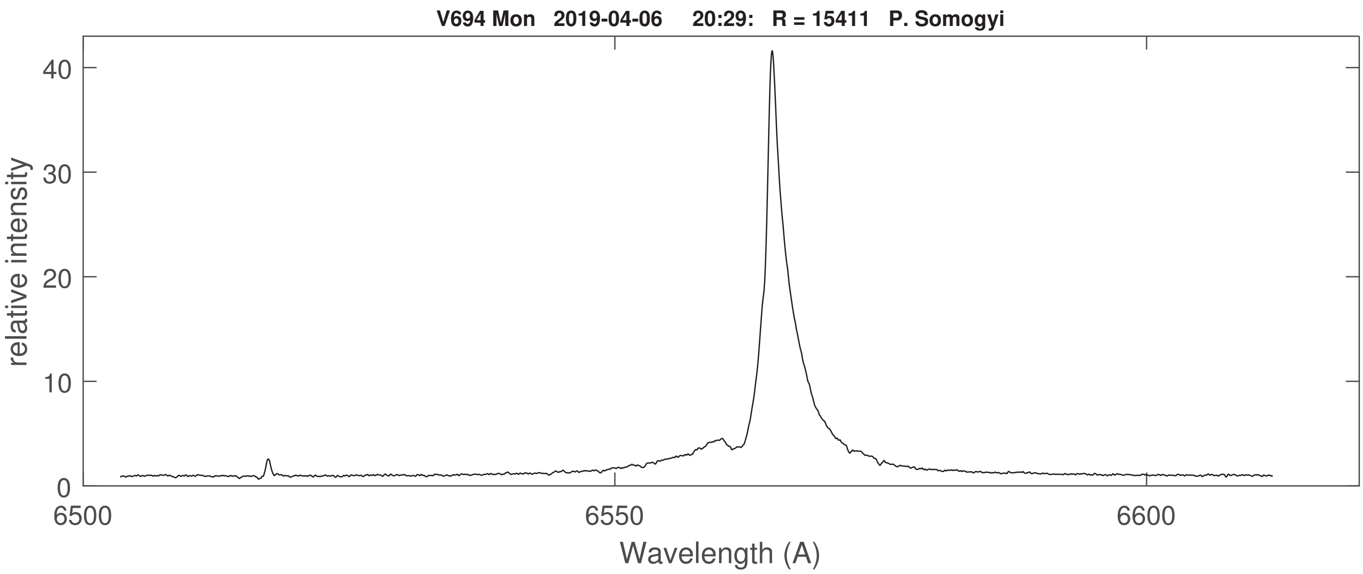
Fig. 2 - AAVSO (V) Light Curve and ARAS Spectra (297) since 2011 (triangles)



V694 Mon = MWC 560

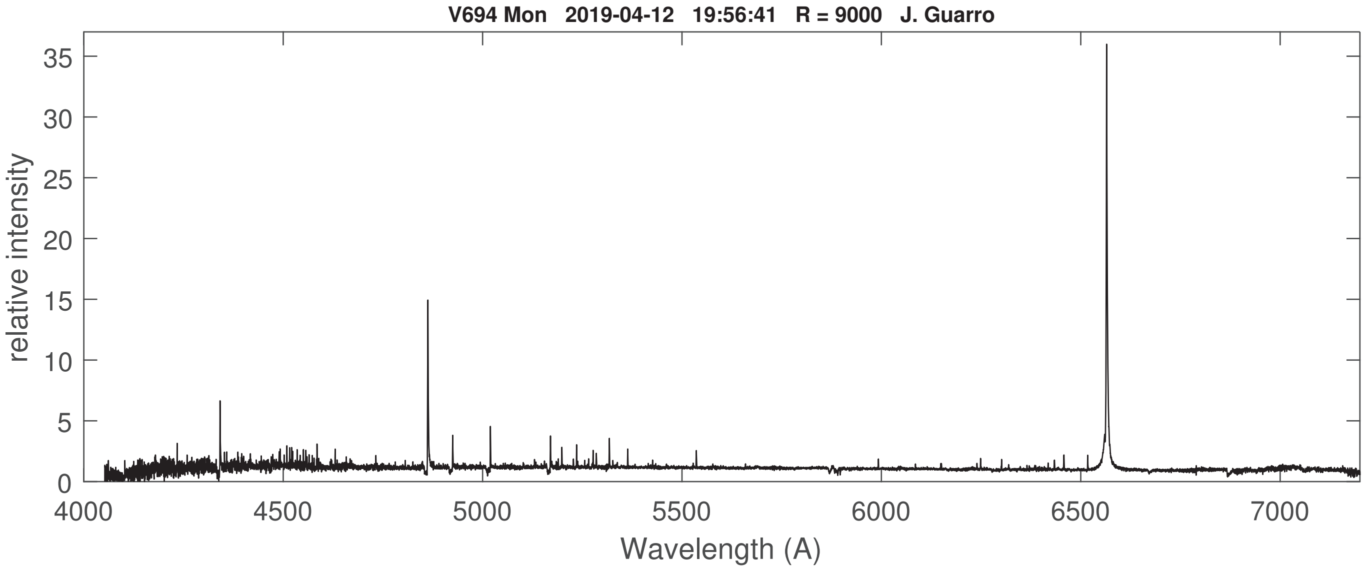


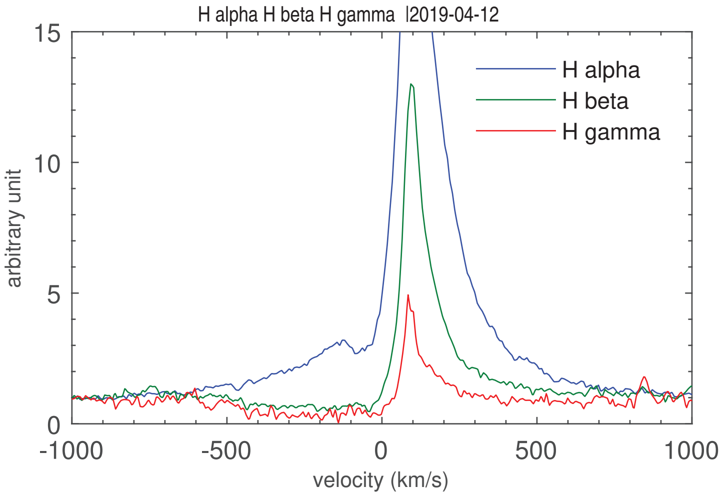


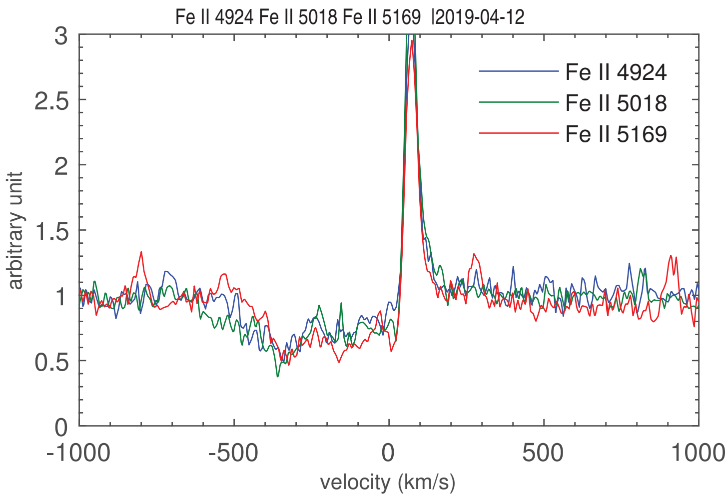


Ha region. Peter Somogyi Lhires III 2400 l /mm

V694 Mon = MWC 560





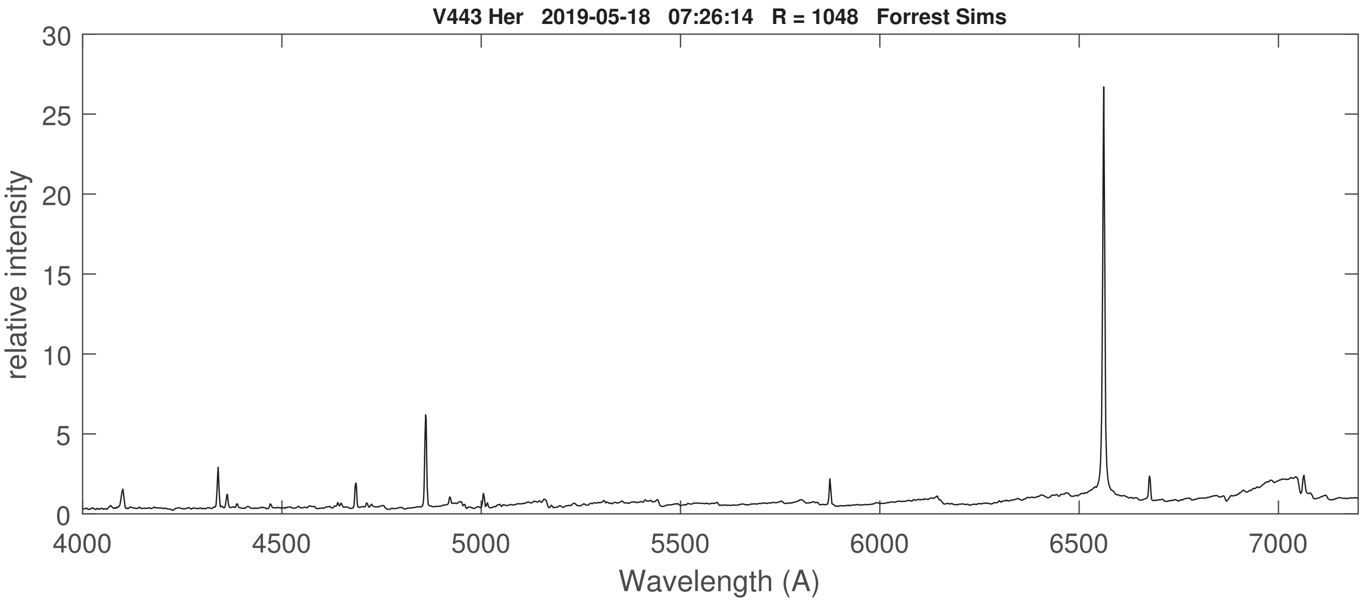


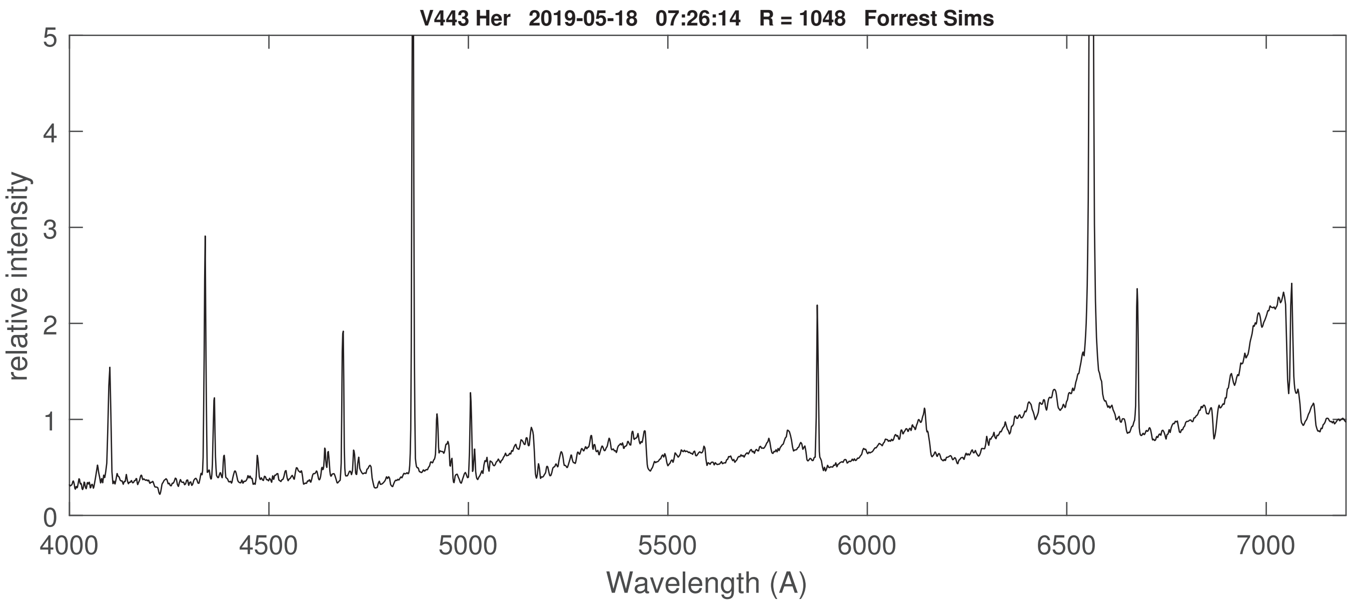
Last spectrum of the observing season obtained by Joan Guarro

Hα shows an absortion whiwk peaks at -83 km.s^{-1} and end at -125 km.s^{-1}
The minimum velocity of the absorptions in the blue edge of Hβ and Hγ is -550 km.s^{-1}. It implies that there is no evident stratification in the ejected material (A. Skopal, ESIL n° 14, 2015)

V443 Her

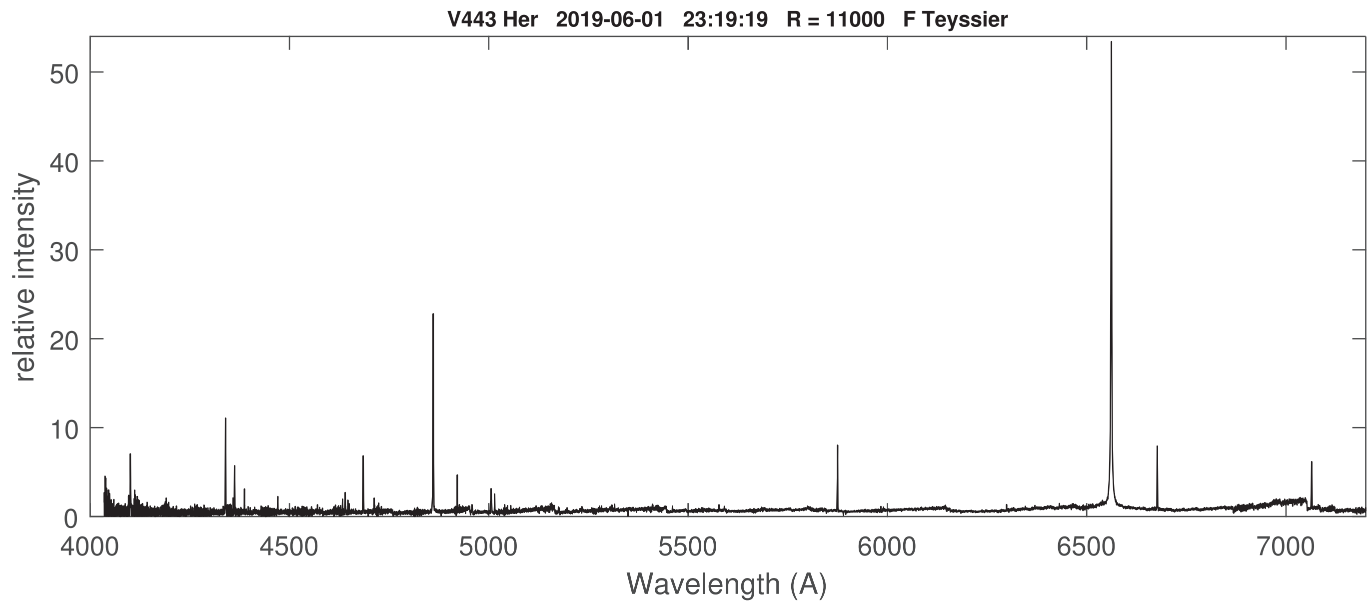
Coordinates (2000.0)	
R.A.	18 22 07.85
Dec	+23 27 19.9
Mag	11.5

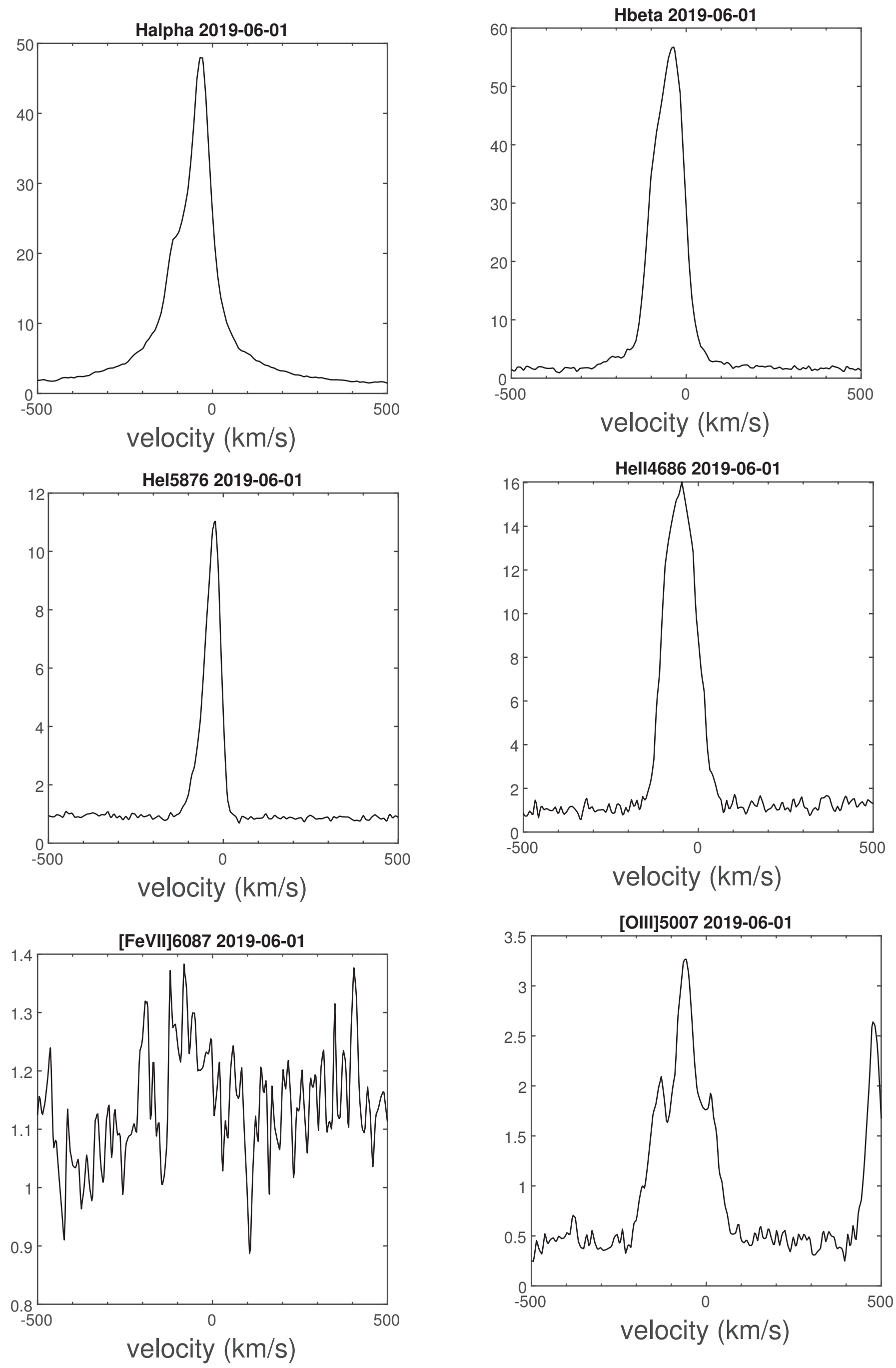




Enlarge scale
[Fe VII] is very weak if present. See also p. 42

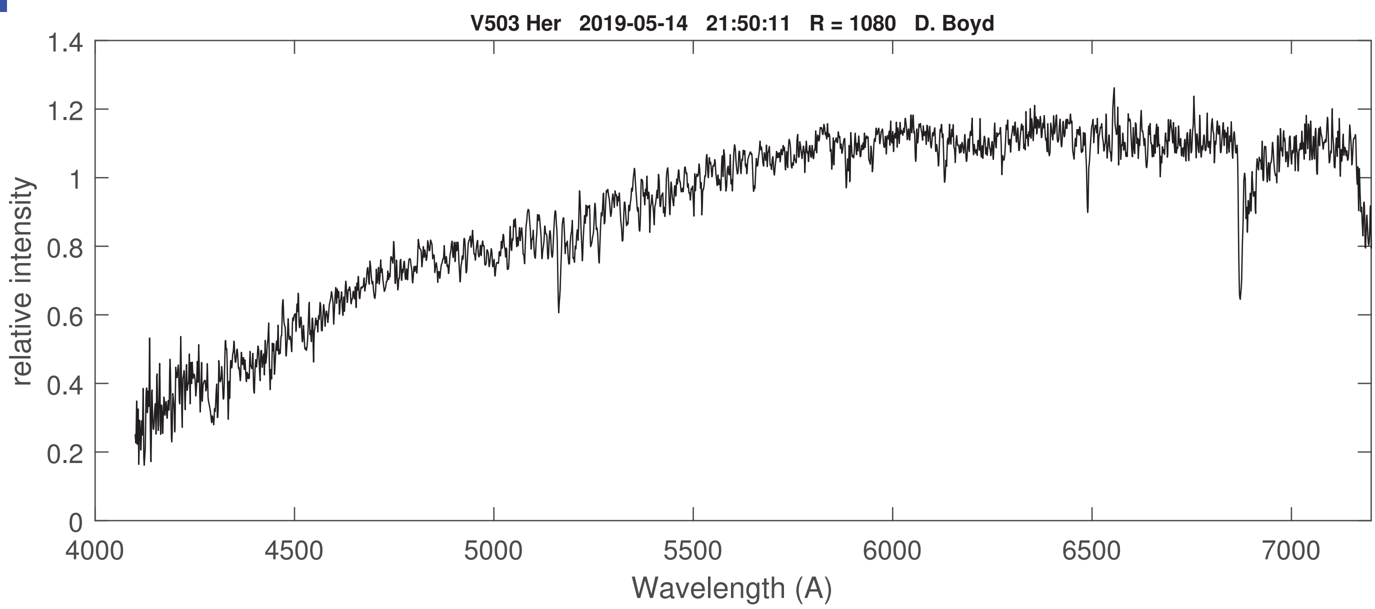
V443 Her


V443 Her 2019-06-01 23:19:19 R = 11000 F Teyssier
relative intensity
Wavelength (A)
0
10
20
30
40
50
4000
4500
5000
5500
6000
6500
7000


Halpha 2019-06-01
velocity (km/s)
Hbeta 2019-06-01
velocity (km/s)
HeI5876 2019-06-01
velocity (km/s)
HeII4686 2019-06-01
velocity (km/s)
[FeVII]6087 2019-06-01
velocity (km/s)
[OIII]5007 2019-06-01
velocity (km/s)

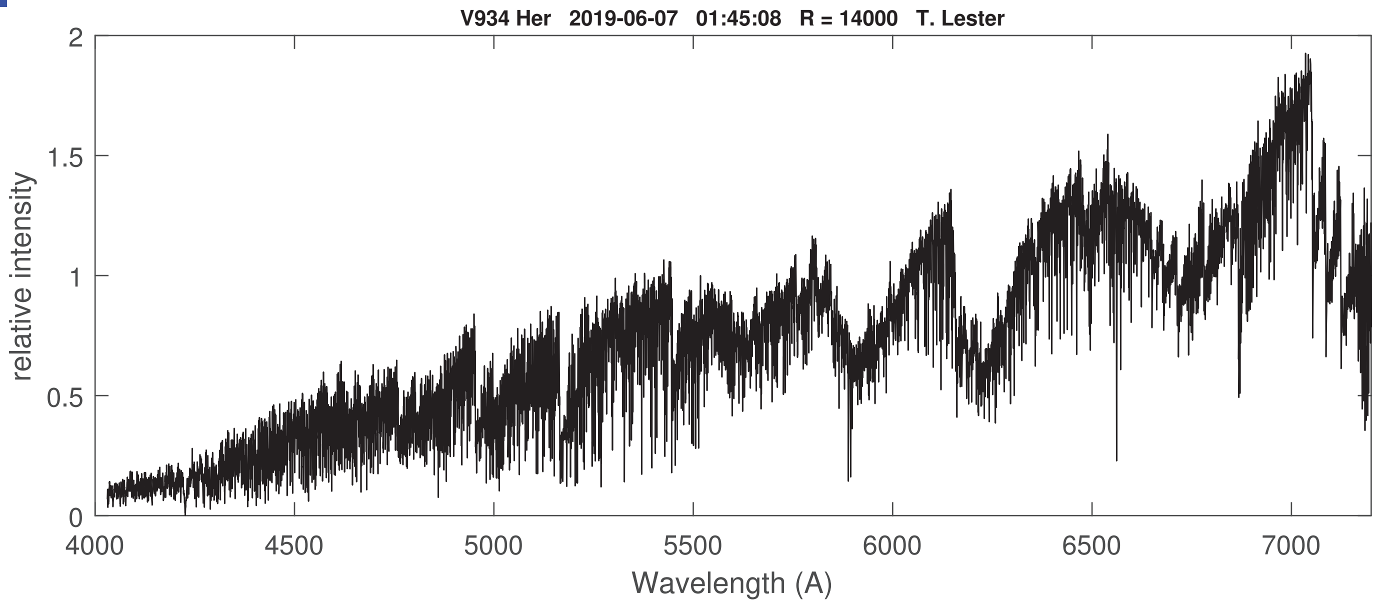
V503 Her

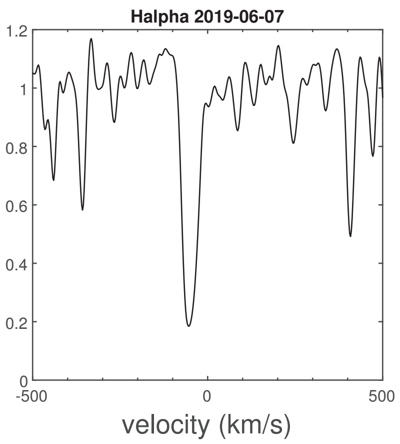
Coordinates (2000.0)	
R.A.	17 36 40.5
Dec	+23 18 11.7
Mag V	

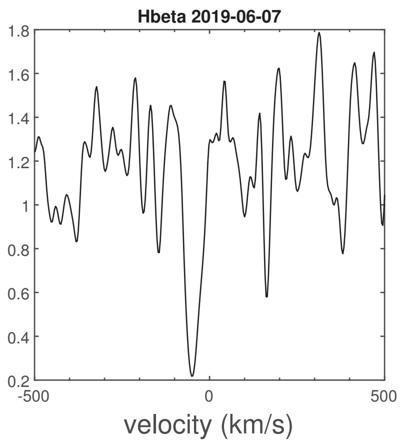


V934 Her

Coordinates (2000.0)	
R.A.	17 06 34.5
Dec	+23 58 18.7
Mag V	

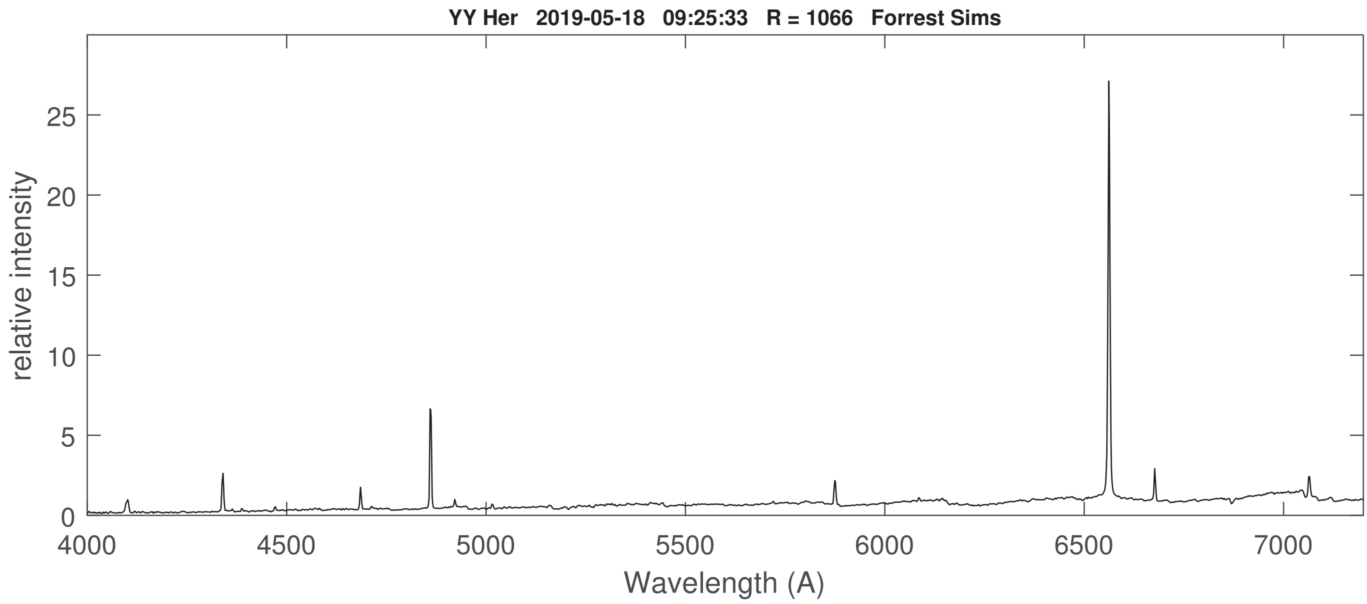


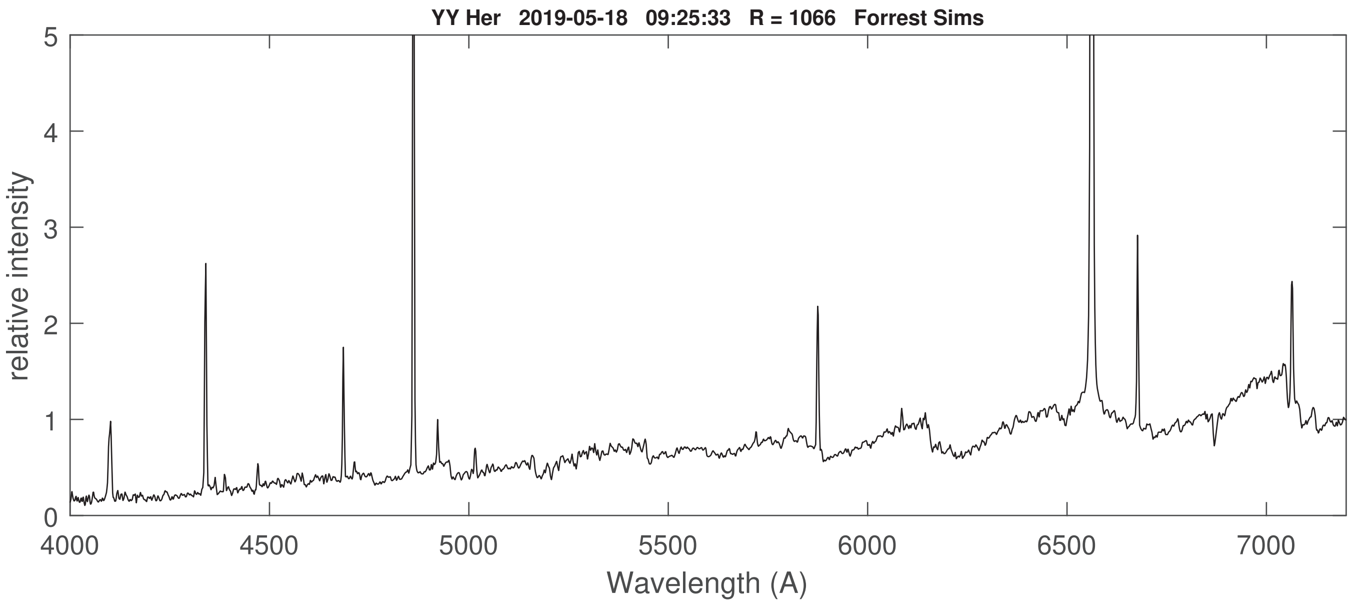




YY Her

Coordinates (2000.0)	
R.A.	18 14 34.2
Dec	+20 59 21.2
Mag V	



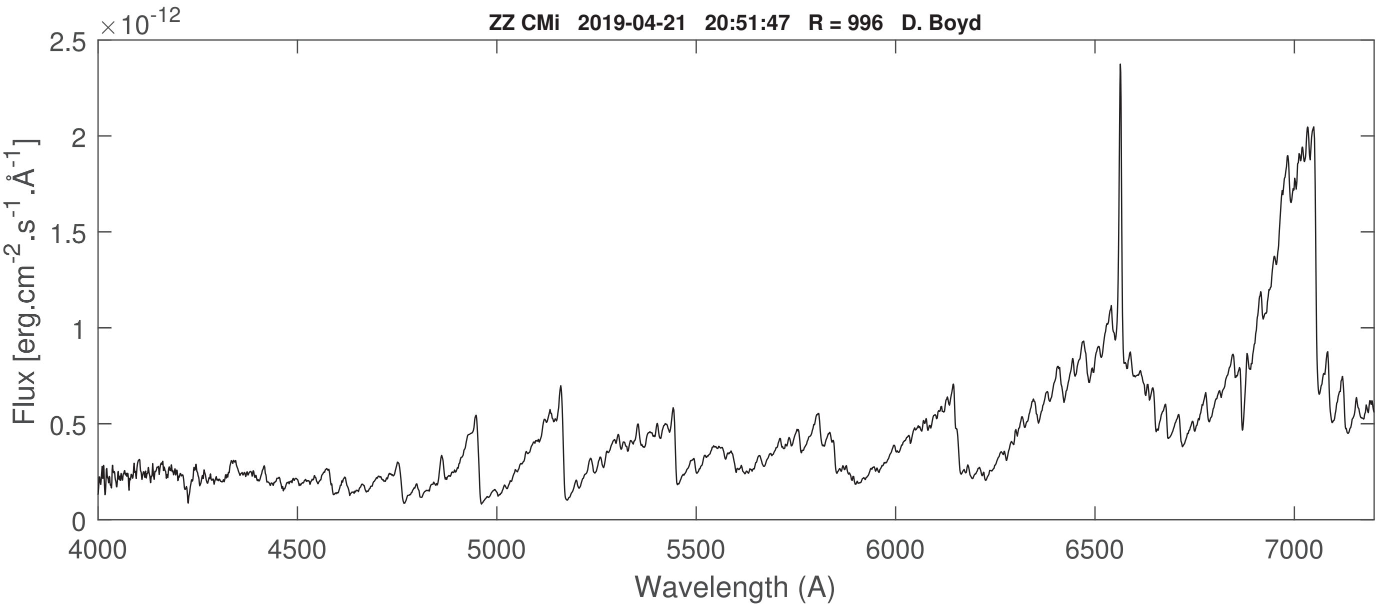


Enlarge scale

SYMBIOTICS

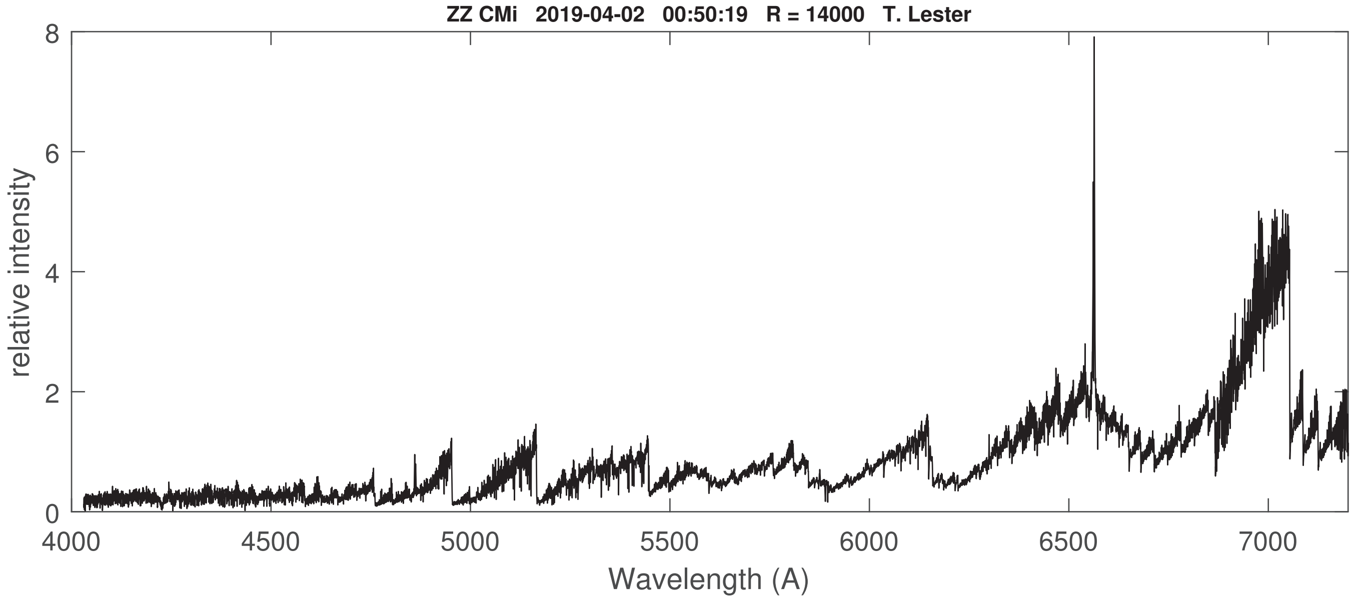
ZZ CMi

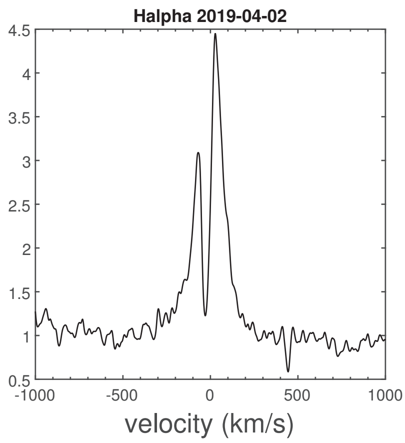
Coordinates (2000.0)	
R.A.	07 24 14.0
Dec	+08 53 51.8
Mag V	10.1 (2019-04)

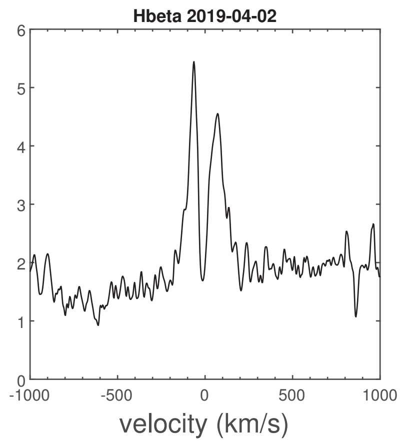


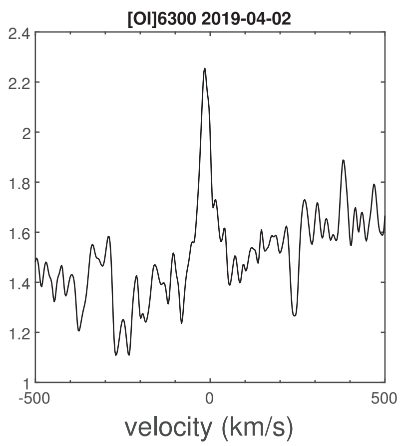
SYMBIOTICS

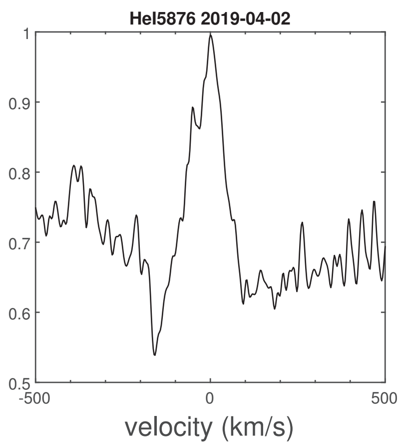
ZZ CMi


ZZ CMi 2019-04-02 00:50:19 R = 14000 T. Lester
relative intensity
Wavelength (A)


Halpha 2019-04-02
velocity (km/s)


Hbeta 2019-04-02
velocity (km/s)


[OI]6300 2019-04-02
velocity (km/s)

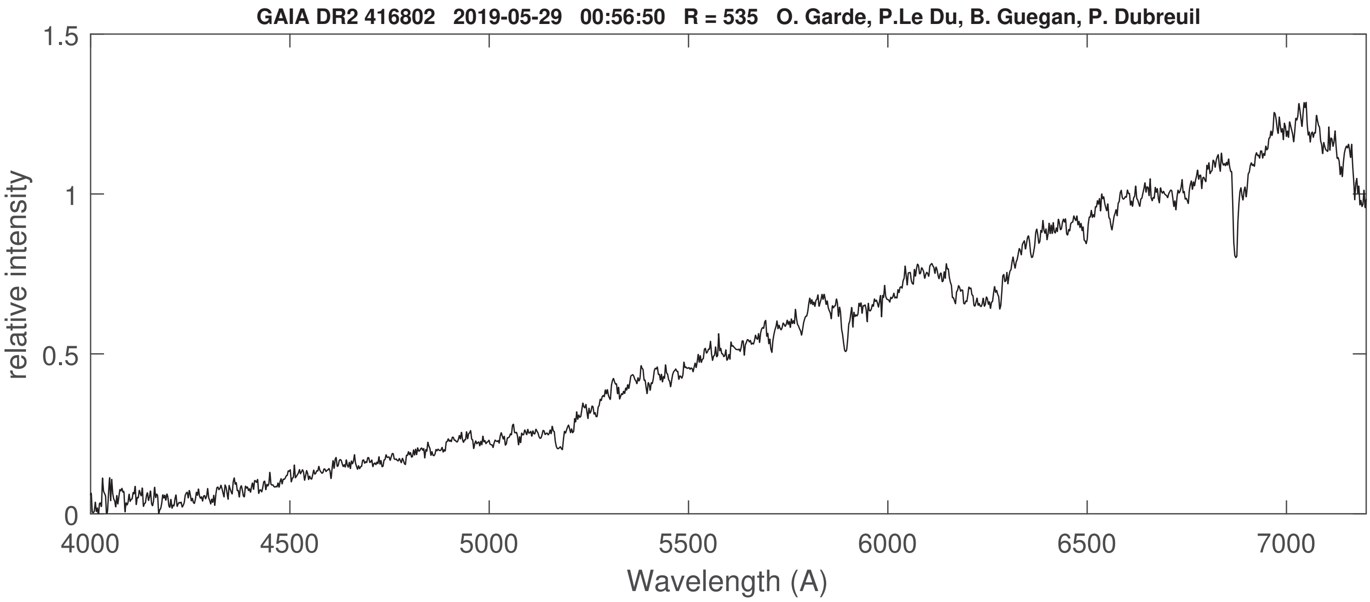

HeI5876 2019-04-02
velocity (km/s)

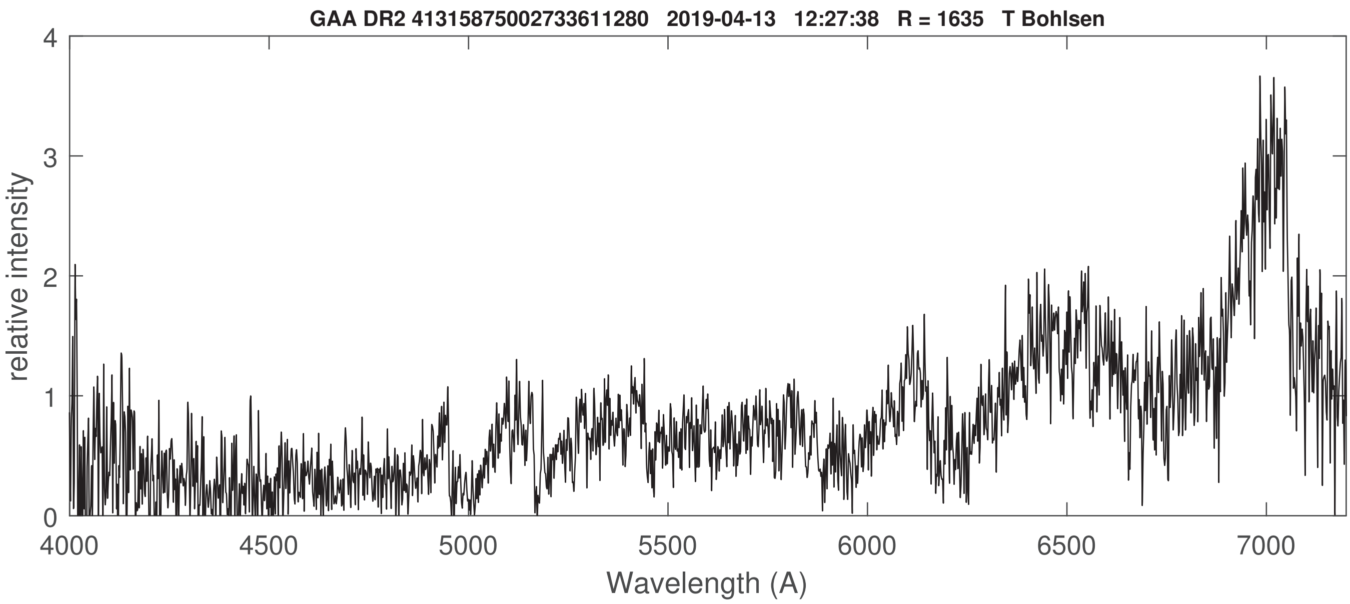
Campaign: Suspected Symbiotics Stars

This campaign is initiated by Adrian Lucy and Jennifer Sokoloski (Columbia University). The aim is to detect symbiotic stars among a list of suspected targets proposed by Adrian Lucy.
AAVSO Alert Notice https://www.aavso.org/aavso-alert-notice-650
One of the targets has been clearly identified as a symbiotic star (Lucy & al.)based on spectra obtained by Terry Bohlsen). Woody Sims obtained a spectrum of FAST 1100 showing [OIII] in emission (p.)
4 new targets was observed during 2019-Q2. No evidence for symbiotic phenomenon.
Share results and check the status of the campaign on ARAS forum:
http://spectro-aras.com/forum/viewtopic.php?f=37&t=2124

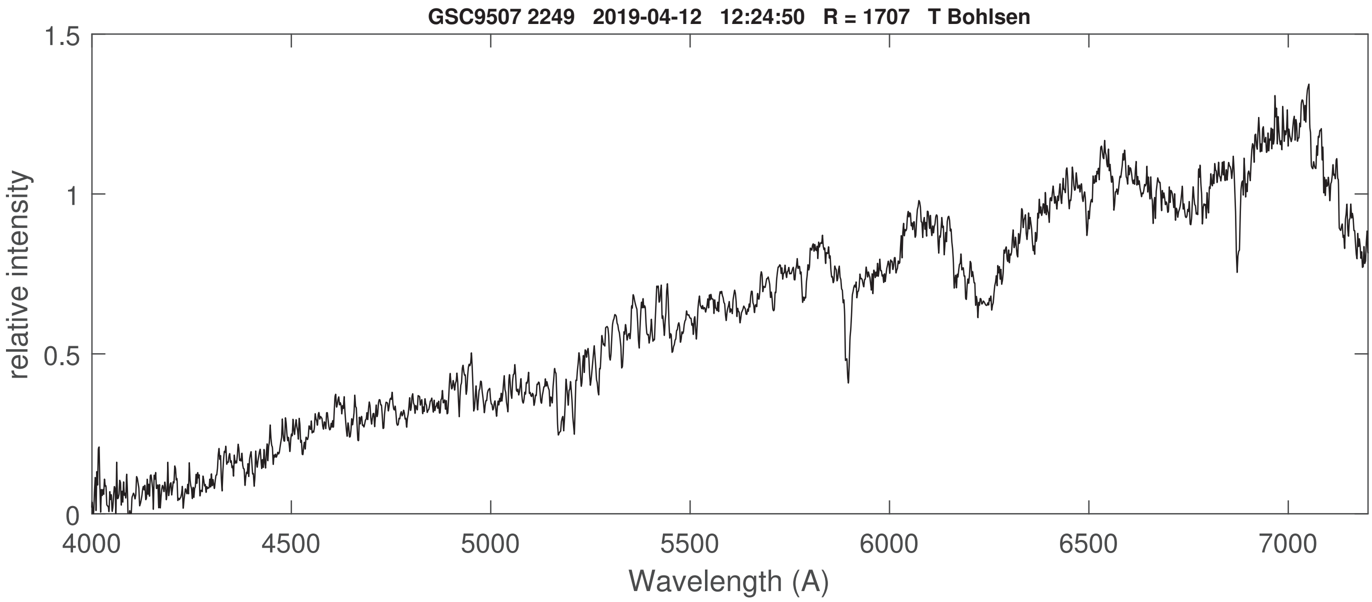
Suspected Symbiotics Stars
Summary of Observations

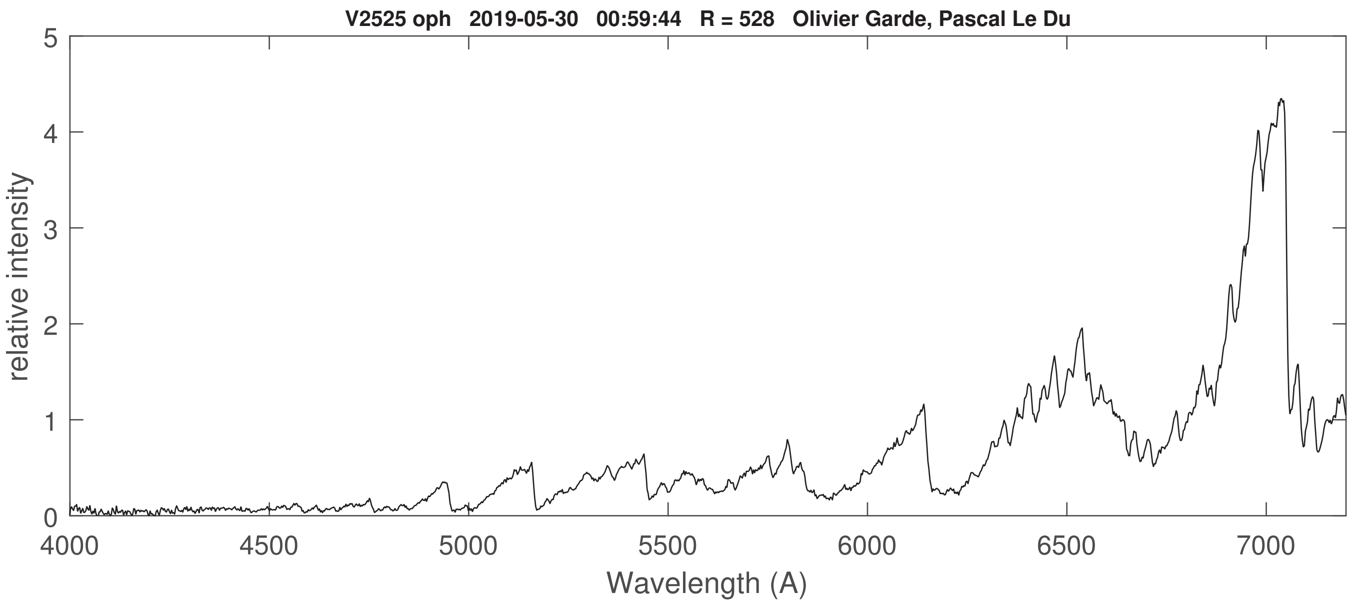
						Observations								
						2018					2019			
Name	RA (2000.0)	Dec (2000.0)	V mag*	M giant	Em. Lines	05	09	10	11	12	01	02	03	04
GAIA DR2 4636654969717900032	01 50 49.53	-76 49 42.6	12.9		no					1				
UCAC3 157:43452	06 55 51.36	-11 44 05.3	12.3		no					1				
GDS J0731468-195434	07 31 46.82	-19 54 34.5	13.2								1			
ASASSN-V_J081823.00-111138.9	08 18 23.00	-11 11 38.9	12.5		no						1			
UCAC3 80:46364	08 34 45.15	-50 26 58.2	13.7		no					1				
GSC9507:2249	11 03 10.83	-83 57 11.3	11.2									1		
	12 01 20.93	-79 20 14.7	12.3											
GAIA DR2 4131587500273361280	16 39 59.65	-18 44 38.1	13.9									1		
ASASSN-V J164007.54-382216.1	16 40 07.54	-38 22 16.1	13.86-14.74											
GAIA DR2 6019720819446985984	16 45 31.78	-36 22 31.6	12.9											
V2096 Oph	16 56 05.46	-24 06 37.0	12.9-14.0											
ER Oph	17 00 42.14	-26 10 12.4	11.8-<14.8											
ASASSN-V J170231.98-275954.2	17 02 31.98	-27 59 54.4	13.98-14.94											
GAIA DR2 4334886650491663104	17 06 08.44	-10 58 33.0	14.3											
SS 295	17 07 38.16	-07 44 48.6	13.1					1				1		
V2525 Oph	17 15 05.27	-09 23 50.1	11.9-<15.1									1		
GAIA DR2 4115021291723497088	17 17 45.67	-21 31 16.9	13.7											
GSC 09276-00130	17 18 09	-67 57 26.0	13.6										1	
GAIA DR2 4168021909706732672	17 25 26.34	-07 48 27.5	14.3									1		
GAIA DR2 4111779763989583232	17 26 18.27	-22 12 46.4	14.1											
GAIA DR2 4120809606303456896	17 27 08.69	-21 39 04.5	13.1											
GAIA DR2 5919388180059095296	17 30 58.39	-56 29 53.4	12.6		no		1							
ASASSN-V J173832.43-492840.2	17 38 32.42	-49 28 40.1	13.96-14.55											
FASTT 1100	17 53 45.30	-01 07 46.8	14.04-14.30		H a			1				1		
GAIA DR2 4150446010182968192	17 56 04.34	-13 10 03.4	13.1	M4				1						
GAIA DR2 4150099732733146112	17 59 43.87	-13 58 32.0	13.9											
SY Cra	18 03 21.54	-42 37 56.8	13.0-16.5p											
GAIA DR2 6345873798283774848	18 14 18.07	-85 59 06.5	11.7		no		1							
GAIA DR2 4048168377818693632	18 28 31.28	-28 45 02.9	11.9		no		1							
ASASSN-V J185421.70-274827.4	18 54 21.70	-27 48 27.8	12.89-13.63											
EN Sgr	19 22 42.08	-13 59 56.5	11.95-14.61		H I		2	2						
ASASSN-V J192916.53-224040.3	19 29 16.53	-22 40 40.3	12.52-13.02	M 3.5	Ha Hb		1							
ASAS J195948-8252.7	19 49 48.4	-82 52 37.5	11.6		yes	2								


GAIA DR2 416802 2019-05-29 00:56:50 R = 535 O. Garde, P.Le Du, B. Guegan, P. Dubreuil
relative intensity
Wavelength (A)

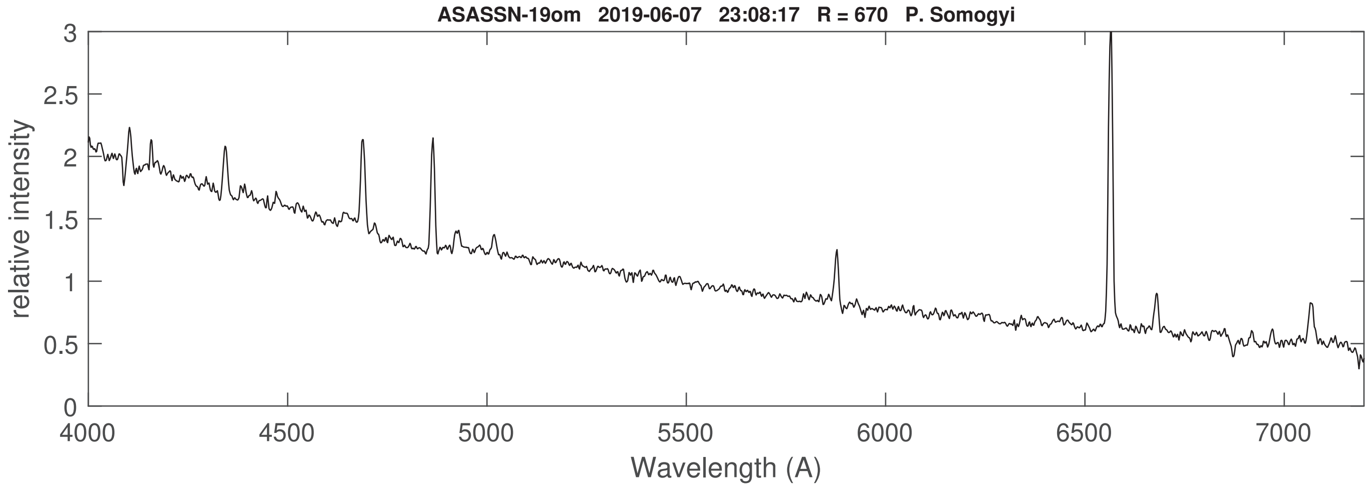

GAA DR2 4131587500273361280 2019-04-13 12:27:38 R = 1635 T Bohlsen
relative intensity
Wavelength (A)

Campaign: Suspected Symbiotics Stars





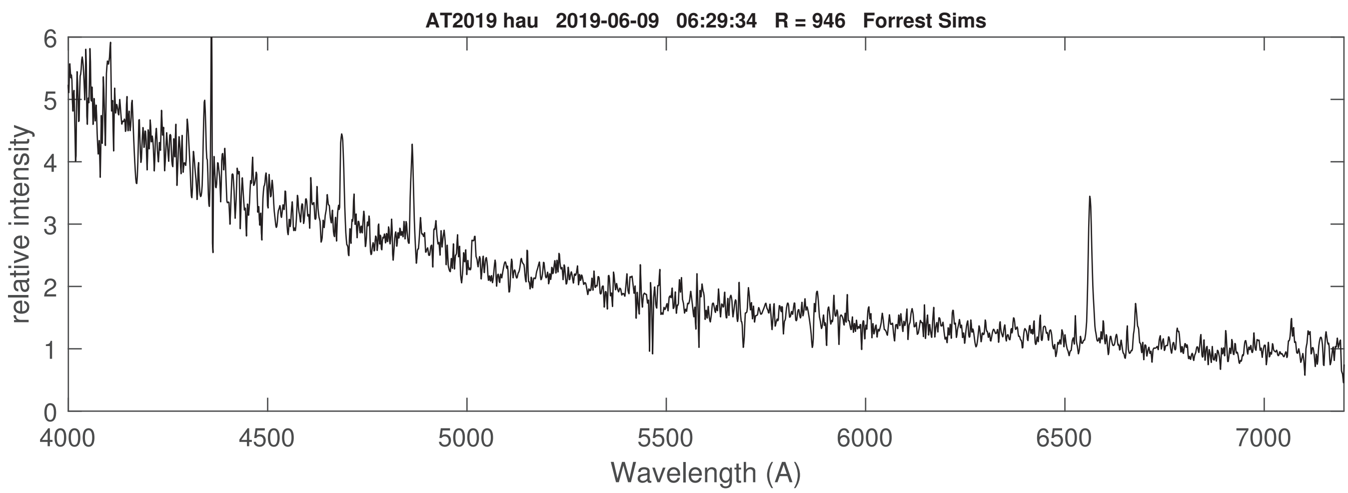
AT2019hau = ASASN-19om Dwarf nova outburst in 2019-



K. Z. Stanek, C. S. Kochanek, for the ASAS-SN team report/s the discovery of a new astronomical transient.

IAU Designation: AT 2019hau
Discoverer internal name: ASASSN-19om
Coordinates (J2000): RA = 19:28:22.236 (292.09265) DEC = +55:32:01.28 (55.53369)
Discovery date: 2019-06-07 08:52:48 (JD=2458641.87)
https://wis-tns.weizmann.ac.il/object/2019hau/discovery-cert

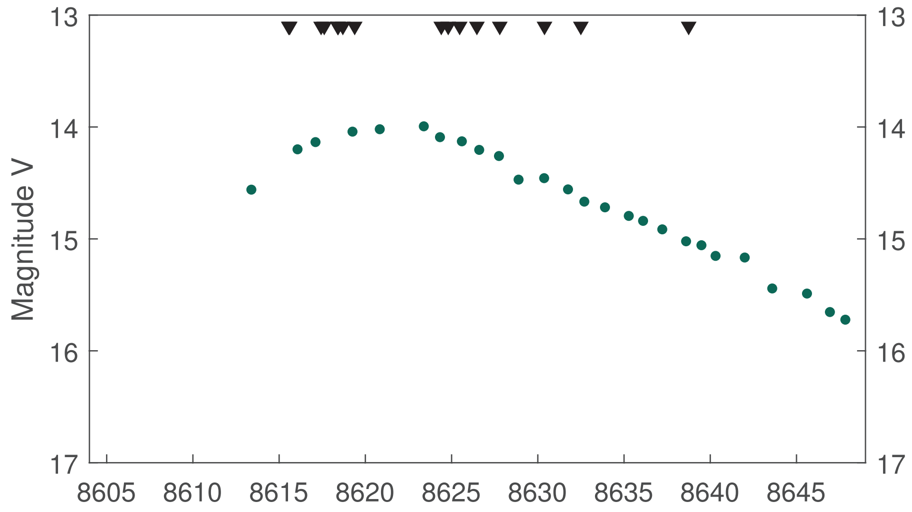
Another spectrum obtained on 08-06-2019 can be downloaded from ARAS database



SUPERNOVAE

SN 2019ein in NGC 5353

R.A. 05h39m04.10s
De. +47°48'03.0" (J2000.0)
2019 Mar. 14.4227 UT, 13.3 mag
(CCD, unfiltered)
Discoverer: Yuji Nakamura (Kameyama, Mie, Japan)

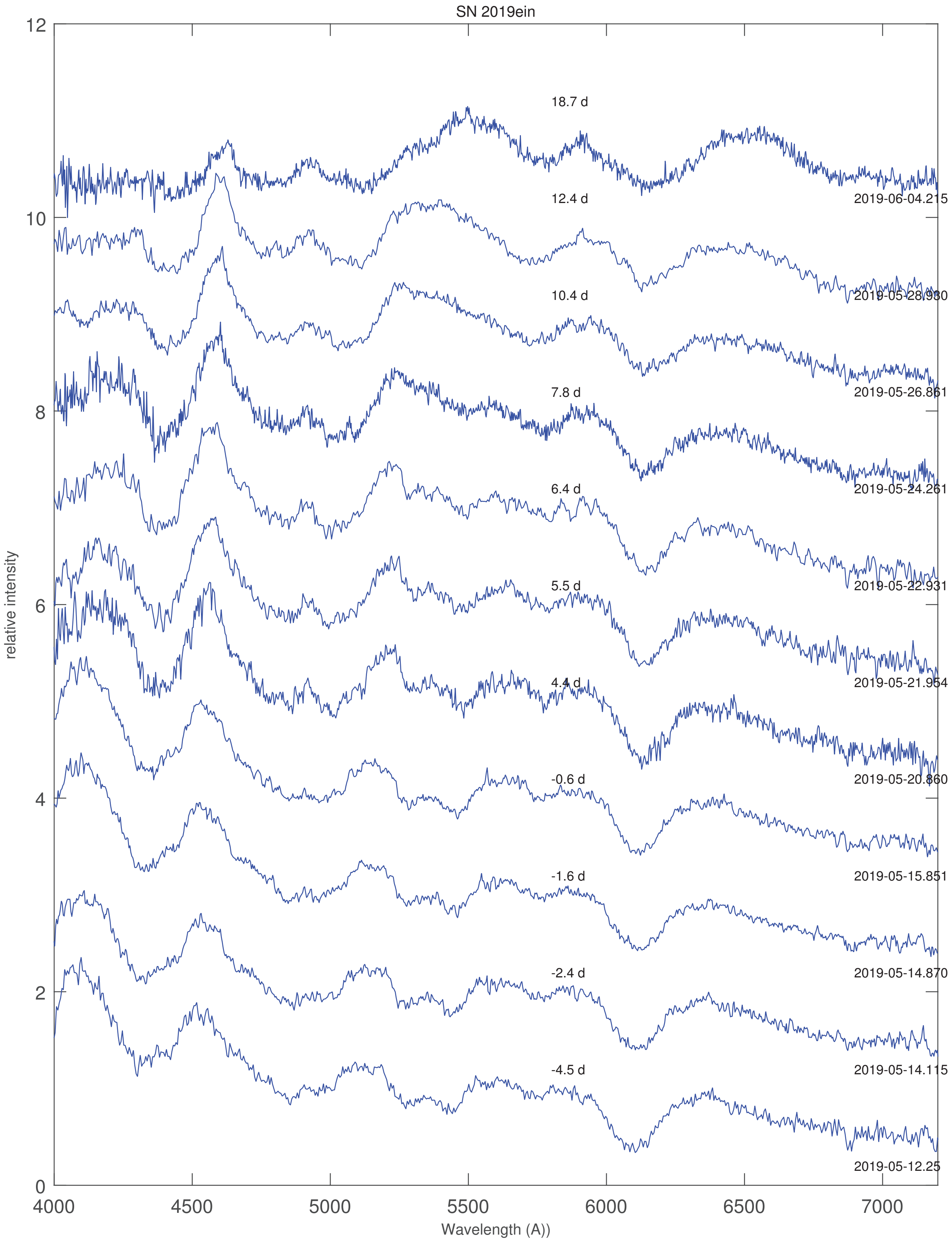


Date	Time	JD	Obs.	Res.
12/05/2019	00:37	2458615.558	RLE	506
12/05/2019	02:57	2458615.612	PLD	527
13/05/2019	21:22	2458617.433	EBE	513
14/05/2019	02:46	2458617.616	PLD	528
14/05/2019	20:42	2458618.422	CBU	760
14/05/2019	20:53	2458618.399	VLE	552
15/05/2019	03:55	2458618.695	FAS	902
15/05/2019	20:26	2458619.381	VLE	552
20/05/2019	20:39	2458624.402	EBE	518
21/05/2019	06:33	2458624.805	FAS	1065
21/05/2019	22:54	2458625.469	PLD	528
22/05/2019	22:22	2458626.467	RLE	509
24/05/2019	06:17	2458627.794	FAS	1050
26/05/2019	20:41	2458630.388	VLE	522
28/05/2019	22:20	2458632.496	RLE	511
04/06/2019	05:10	2458638.747	FAS	822

Log of observations

RLE = Robin Leadbeater
PLD = Pascal Le Du
EBE = Etienne Bertrand
CBU = Christian Buil
VLE = Vincent Lecoq
FAS = Woody sims

SN 2019ein


SN 2019ein
relative intensity
Wavelength (A))
18.7 d
12.4 d
10.4 d
7.8 d
6.4 d
5.5 d
4.4 d
-0.6 d
-1.6 d
-2.4 d
-4.5 d
2019-06-04.215
2019-05-28.980
2019-05-26.861
2019-05-24.261
2019-05-22.931
2019-05-21.954
2019-05-20.860
2019-05-15.851
2019-05-14.870
2019-05-14.115
2019-05-12.25

ARAS observing proposal: Probing the accretion process onto the white dwarf in the recurrent symbiotic nova RS Oph between its nova explosions

Augustin Skopal and Natalia Shagatova

Symbiotic stars are the widest interacting binaries, whose orbital periods run from hundreds of days (S-type systems containing a normal giant) to decades or even to hundreds of years (D-type systems containing a Mira variable surrounded by a dust shell). The evolved red giant (the cool component) is the donor star and a hot compact star, mostly a white dwarf (WD, the hot component), accretes from the giant's wind. Accretion process generates a very hot ($T_h > 10^5$ K) and luminous ($L_h \sim 10 - 10^4$ solar units) source of radiation, which ionizes a fraction of the neutral giant's wind giving rise to nebular emission. This configuration represents the so-called quiescent phase, during which the processes of the mass-loss, accretion and ionization are in a mutual equilibrium, and thus the symbiotic system releases its energy approximately at a constant rate and temperature.

Main energy sources

During quiescent phase, the accreting WD can generate its luminosity by two different ways:

(i) In most cases, a large amount of energy in order of thousands solar luminosities is believed to be powered by stable nuclear burning of hydrogen on the WD surface (e.g., Z And, BF Cyg, SY Mus, AG Dra). This means that the hydrogen rich material is burnt at the same rate as it is accreted. However, this situation requires a certain range of accretion rates that depends on the WD mass. For example, low-mass WDs ($M_{WD} \sim 0.5 - 0.6$ solar masses) need to accrete a few times 10^{-8} up to $\sim 10^{-7}$ solar masses per year, while massive WDs ($M_{WD} \sim 1.3 - 1.4$ solar masses) need to accrete around of 4 – 5 times 10^{-7} solar masses per year to burn the incoming fuel at the same rate – i.e. to sustain stable hydrogen burning on their surface.

(ii) In rare cases, low luminosities of a few times $10^1 - 10^2$ solar units are generated solely by the accretion process onto the WD, when its gravitational potential energy is converted into the radiation by the disk (e.g., EG And, CH Cyg, 4 Dra, SU Lyn). This happens when the accretion rate is below the stable-burning limit. Then the accreting H-rich material cannot nuclearly burn, and thus is gradually accumulated on the WD surface via the accretion disk. Due to the viscosity, the disk material is gradually heated at the expense of its binding energy (kinetic and potential). This leads to its shifting in radial direction to the central accretor by spiraling to regions with smaller and smaller potential energy, and finally decelerating at the WD surface, losing the rest of its kinetic energy in a thin layer, called the boundary layer. In this way, the accretion disk effectively converts the gravitational-potential energy of its material to the radiation. Therefore, maximum luminosity liberated during the accretion process is given by the initial potential energy of the accreting material in the gravitational field of the WD, i.e., $L_{acc} = G\ M_{WD}\ (dM/dt)_{acc}\ /R_{WD}$. Thus, depending on mass and radius of the WD and the accretion rate, $(dM/dt)_{acc}$, we observe a relatively low luminosities with respect to the case (i).

If the accretion rate for some reasons increases above the level sustaining the stable burning (e.g., due to an increase of the mass-transfer from the giant and/or a disk instability), a fraction of the accreting material blows up from the WD in the form of wind. The system brightens up in the optical by a few magnitudes and shows signatures of a mass-outflow. The luminosity can be as high as the Eddington limit. The corresponding brightening is called as `Z And-type' outburst. It evolves on the time-scale of weeks to years, often showing multiple outbursts in the optical light curve. This stage is called as active phase of symbiotic star.

On the nova phenomenon

Considering the case (ii) above, the amount of material accreted onto the WD will increase up to a critical value, M_{crit}, which applies a critical pressure at the base of the accreted envelope, P_{crit} that ignites thermonuclear runaway (TNR) on the surface of WD – we observe the nova phenomenon.

If this happen in a short-period binary with a Roche-lobe filling subdwarf, we talk about classical novae. If the TNR occurs in symbiotic binary, we talk about symbiotic novae (e.g., V1016 Cyg, V1329 Cyg, PU Vul, HM Sge). In the latter case we observe much smaller amplitudes of the brightening ($\Delta m > 3$ mag) than in the former case, because the light from TNR is superposed with the light from the bright red giant.

Depending on the WD mass and the accretion rate we observe either very slow novae, whose outbursts last for dozens of years, or very fast novae lasting for several days to months. After the nova explosion, accretion process re-establishes, new material is accumulating again up to the critical value, at which a new TNR is ignited. From this point of view all novae are recurrent. However, we use the term 'recurrent novae' only for those, whose recurrence time is comparable with the human life. Symbiotic stars that show this type of regular outbursts are called as recurrent symbiotic novae (e.g., RS Oph, T CrB). It is quite easy to show that the recurrence time strongly depends on the WD mass. The critical mass is attracted to the WD surface by the gravitational force $F_{grav} = G\, M_{WD}\, M_{crit} / R_{WD}^2$, which for spherical envelope exerts the pressure, $P_{crit} = F_{grav} / 4\pi R_{WD}^2 = G\, M_{WD}\, M_{crit} / 4\pi R_{WD}^4$.

According to the WD mass-radius relation (e.g., $R_{WD} \sim 0.01\, R_{Sun}$ and a few times $0.001\, R_{Sun}$ for a $0.5\, M_{Sun}$ and $1.3\, M_{Sun}$ WD, respectively), one can recognize that high mass WD can accrete significantly smaller value of M_{crit} (a few times $10^{-6}\, M_{Sun}$) than a low mass WD (M_{crit} can be as high as $\approx 10^{-2}\, M_{Sun}$) to obtain a TNR for given Pcrit of, say, $\approx 10^{20}$ dyne/cm^2. For example, accretion at $\sim 10^{-7}\, M_{Sun}$ /year onto a high mass WD will accumulate M_{crit} for decades only, while for a 0.5 M_{Sun} WD this will take in order of 10^5 years. That is why recurrent novae contain high mass WDs, near the Chandrasekhar limit, and thus represent promising progenitors of Supernova Ia explosions.

Recurrent symbiotic nova RS Oph – accreting to explode in 2026

One of the famous recurrent symbiotic novae is the star RS Ophiuchi (RS Oph). The binary consists of a late-type K7 III giant and a WD with a mass close to the Chandrasekhar limit, in a 454-day orbit. Its nova-like outbursts are characterized with brightening by about 7 mag and a recurrence period of about 20 years. Historically, 6 eruptions have been recorded unambiguously. The first one in 1898, the last one on February 12.83, 2006 and the next one is thus expected during 2026-27. So, currently RS Oph occurs at the stage of intense accretion of material onto the WD from the wind of its red giant companion. The short recurrence time and a bright peak magnitude, V = 4-5, make RS Oph a good target for multifrequency observational campaigns. Figure 1 shows light curves of RS Oph from its last 2006 outburst to 2018.6.
During the quiescence, i.e., between the nova outbursts, the flat UV/optical continuum satisfies radiation produced by a large optically thick accretion disk ($R_{disk} > 10\, R_{Sun}$). Example of the spectral energy distribution (SED) model from far-UV to near-IR on day 614 after the maximum of the 2006 outburst is shown in Fig. 2.

The luminosity of the disk, ≈ 400/cos(i) L_{Sun} , corresponds to an accretion rate of ~2.4 x 10^{-7} M_{Sun} / year for M_{WD} = 1.3 M_{Sun} , R_{WD} = 0.004 R_{Sun} , i = 50 degrees and considering that one quarter of the total gravitatioinal-potential energy of WD is converted into radiation. verted into radiation. This implies that the high mass WD in RS Oph is accreting just below the stable burning limit. During the 20 years of quiescence, the WD thus accumulates the mass of ~4.8 x10^{-6} M_{Sun}, which is sufficient to ignite a new explosion that is expected during 2026. The presence of a disk-like formation around the WD during the out-of-outburst stage of RS Oph is also supported by a significant 0.4 mag rapid light variation on the time scale of decades of minutes (see Fig. 3). Another interesting feature of the RS Oph spectrum between outbursts, which reflects a strong accretion process, are markedly variable broad Hα emission wings. Figure 4 shows example of the bottom part of the Hα line profiles with the satellite emission components. They can reflect a high-velocity bipolar outflows from the accreting WD. Probably a result of transient abrupt accretion from the disk.

Proposal for spectroscopic observations

To understand better the connection between the disk and the mass accretion/ejection onto/from the high-mass WD in RS Oph during its `quiet' stage before the expected 2026 nova explosion, we suggest to carry out spectroscopic observations for the following reasons:

1. Medium resolution spectra with R > 9000 will be used for:
(i) measuring abrupt changes in the profiles of Hα and Hβ lines.
(ii) to support the presence of a cool shell around the WD by radial velocities of absorption lines of neutral metals. They should be placed at the anti-phase to those from the red giant.
(iii) to estimate the mass-loss rate via the irregular clumpy mass ejections by means of the Hα method.
(iv) to identify the source of the rapid variability indicated in the continuum by the flickering fluctuations on the time-scale of minutes to hours.

2. Low-resolution spectra with R = 500-1000 covering the largest wavelength range as possible will be used to model the SED. On the basis of disentangling the composite optical continuum we will reconstruct the structure of the WD pseudophotosphere.

A. Skopal & N. Shagatova

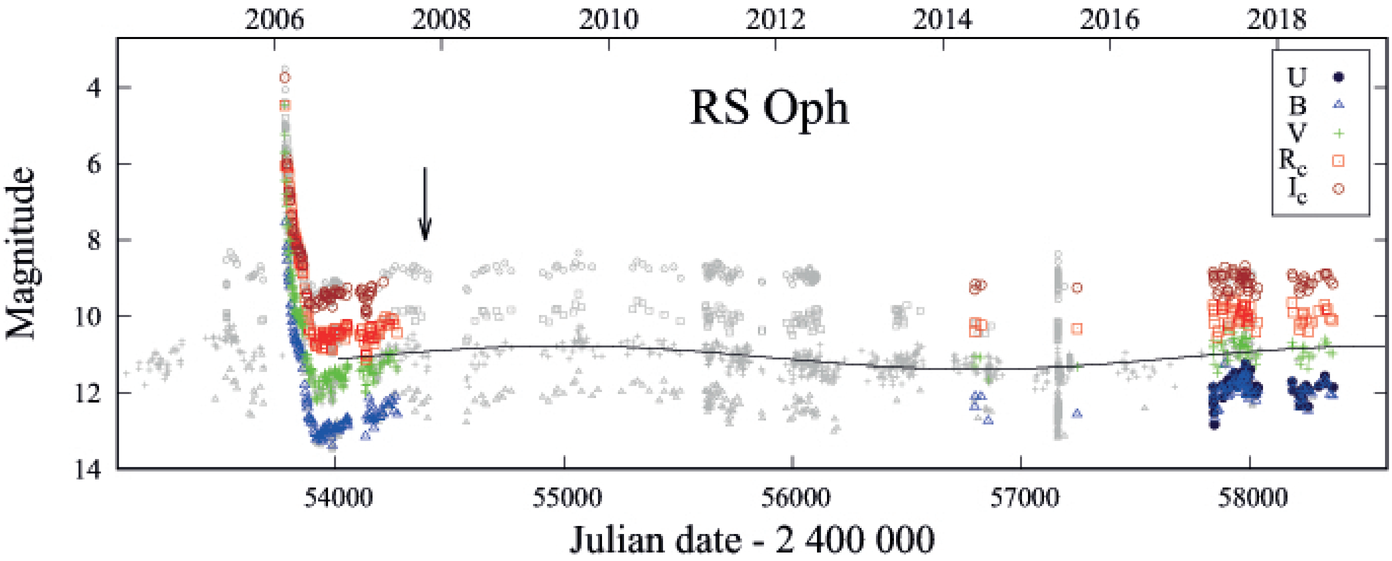


Figure 1. Light curves of RS Oph from ~2004 to 2018.6, containing the last outburst peaked on February 12.83, 2006. Gray points represent data from the AAVSO database. The arrow marks date of the SED model shown in Fig. 2. The solid line represents a sine function with amplitude ΔV ~ 0.3 mag and a period of ~9.4 years (according to Sekeráš et al. 2019, CoSka, 49, 19-66).

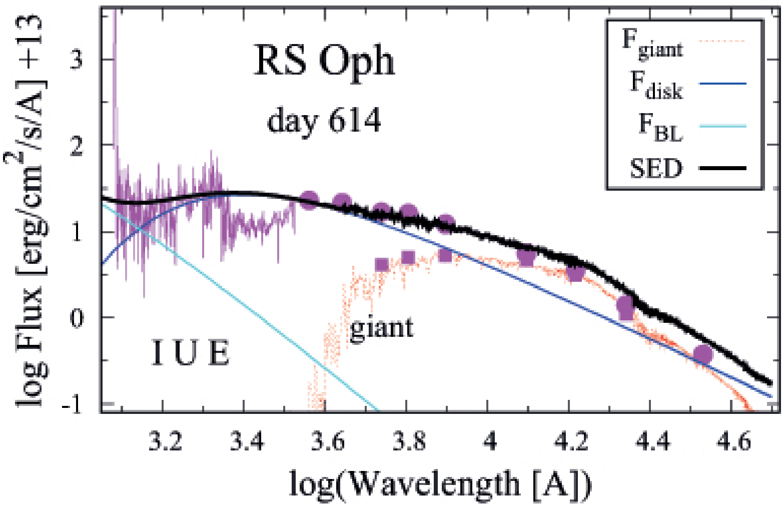


Figure 2. The SED model (black line) during the post-outburst phase of RS Oph (at the nova age of 614 days after the 2006 maximum, marked by arrow in Fig. 1). The observed SED is determined by the IUE spectrum and photometric flux-points (in magenta). The model is given by superposition of radiation from accretion disk (blue line), boundary layer (cyan) and the giant (dotted red line). Adapted according to Skopal, 2015, NewA, 34, 123-133.

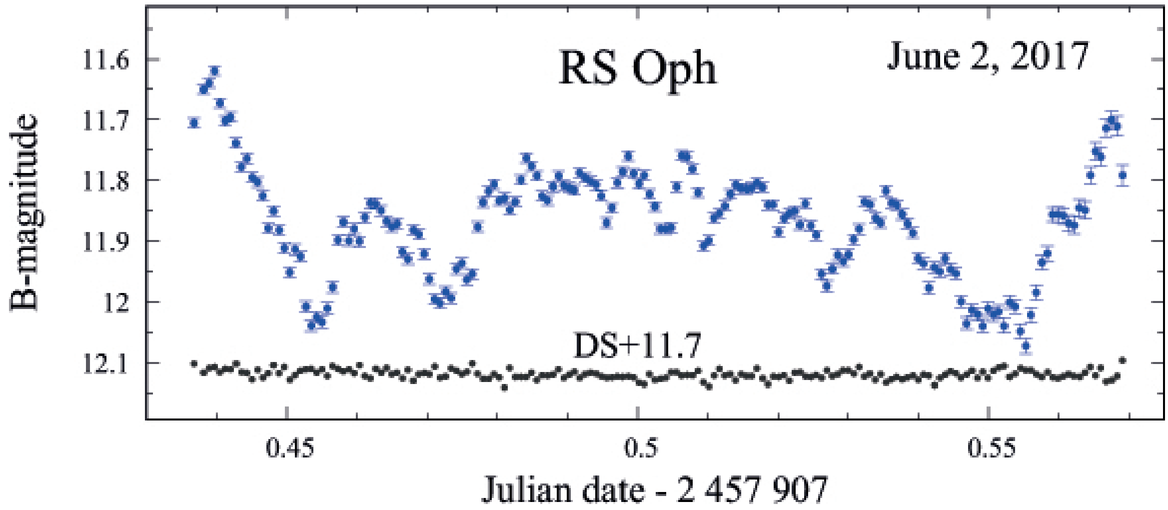


Figure 3. Example of rapid photometric variability of RS Oph in B band (blue points). The stars HD162215 and UCAC4-416-072918 were used as comparison and check star (ΔS is their difference). Adapted according to Sekeráš et al. 2019, CoSka, 49, 19-66).

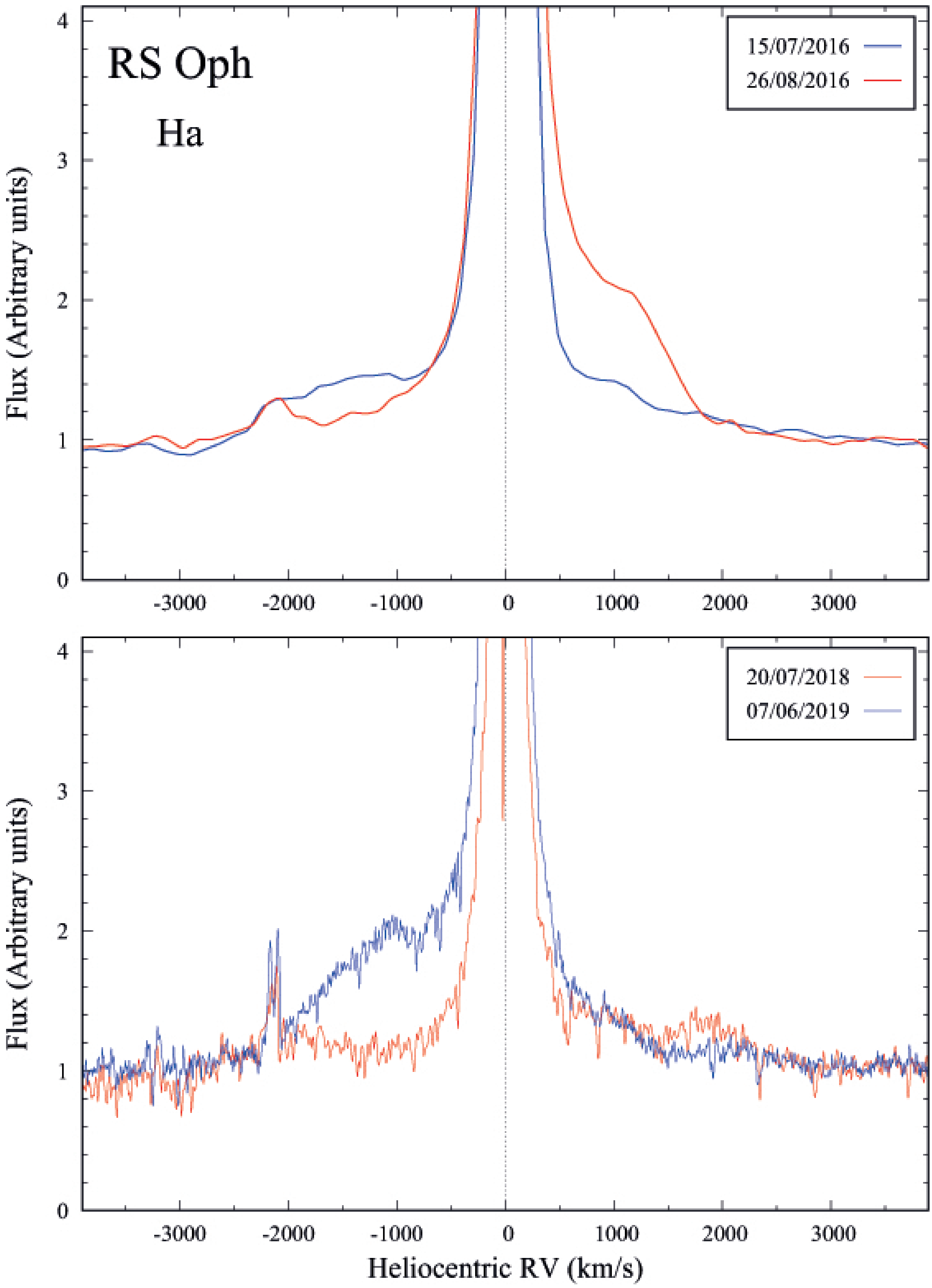


Figure 4. Strong variability in the broad wings of the Hα line. Top: low-resolution spectra (R~1037) carried out by J. Guarro. Bottom: middle-resolution spectra (R~12000 – 14000) taken by T. Lester.

Recent publications: Symbiotics

Wind Roche lobe overflow as a way to make Type Ia supernovae from the widest symbiotic systems

Iłkiewicz, Krystian Mikołajewska, Joanna Belczyński, Krzysztof Wiktorowicz, Grzegorz Karczmarek, Paulina

Monthly Notices of the Royal Astronomical Society, 485, 2019

Symbiotic stars are interacting binaries with one of the longest known orbital periods. Because they can contain a massive white dwarf with a high accretion rate they are considered possible Type Ia supernova (SN Ia) progenitors. Among symbiotic binaries there are systems containing a Mira donor, which can have orbital periods of a few tens of years or more. This subclass of symbiotic stars has not usually been considered to provide promising SN Ia progenitors owing to their very large separation. We analyse the evolution of a well-studied symbiotic star with a Mira donor, V407 Cyg, and show that the standard evolution model predicts that the system will not become a SN Ia. However, with the addition of wind Roche lobe overflow as one of the mass-transfer modes, we predict that the white dwarf in V407 Cyg will reach the Chandrasekhar limit in 40-200 Myr.

arXiv:1812.02602

S econd Outburst of the Yellow Symbiotic Star LT Delphini

Ikonnikova, N. P. Komissarova, G. V. Arkhipova, V. P.

Astronomy Letters, 45, 2019

We present the results of our photoelectric UBV observations of the yellow symbiotic star LT Del over 2010-2018. The binary system LT Del, which consists of a bright K giant and a compact hot star with a temperature of 100 000 K, has an orbital period of 476 days. In 2017 the variable experienced a second low-amplitude (Δ V 0^ṃ7) outburst in the history of its studies whose maximum occurred at an orbital phase of 0.15±0.05. The outburst duration was 60 days. The B-V and U-B colors in the outburst became noticeably bluer. A difference in the photometric behavior of the star in the 1994 and 2017 outburst has been detected. In the orbital cycle preceding the 2017 outburst a secondary minimum with a depth of 0^ṃ7 and 0^ṃ20 appeared in the B and V light curves, respectively, whose cause is discussed. The phase light and color curves are presented and explained; the position of the star on the color-color diagram is interpreted. We have estimated the parameters of the cool and hot components of the system based on the distance determination from Gaia DR2.

arXiv:1906.10985

VizieR Online Data Catalog: Symbiotic stars with 2MASS, WISE & Gaia data (Akras+, 2019)

Akras, S. Guzman-Ramirez, L. Leal-Ferreira, M. L. Ramos-Larios, G.   h

https://ui.adsabs.harvard.edu/abs/2019yCat..22400021A

We present a new census of Galactic and extragalactic symbiotic stars (SySts). This compilation contains 323 known and 87 candidate SySts. Of the confirmed SySts, 257 are Galactic and 66 extragalactic. The spectral energy distributions (SEDs) of 348 sources have been constructed using 2MASS and AllWISE data. Regarding the Galactic SySts, 74 are S types, 13 D, and 3.5 D'. S types show an SED peak between 0.8 and 1.7µm, whereas D types show a peak at longer wavelengths between 2 and 4µm. D' types, on the other hand, display a nearly flat profile. Gaia distances and effective temperatures are also presented. According to their Gaia distances, S types are found to be members of both thin and thick Galactic disk populations, while S+IR and D types are mainly thin disk sources. Gaia temperatures show a reasonable agreement with the temperatures derived from SEDs within their uncertainties. A new census of the OVIλ6830 Raman-scattered line in SySts is also presented. From a sample of 298 SySts with available optical spectra, 55 are found to emit the line. No significant preference is found among the different types. The report of the OVIλ6830 Raman-scattered line in non-SySts is also discussed as well as the correlation between the Raman-scattered OVI line and X-ray emission. We conclude that the presence of the OVI Raman-scattered line still provides a strong criterion for identifying a source as a SySt.

Wind-accreting symbiotic X-ray binaries

Yungelson, Lev R. Kuranov, Alexandre G. Postnov, Konstantin A.

Monthly Notices of the Royal Astronomical Society, 485, 2019

https://ui.adsabs.harvard.edu/abs/2019MNRAS.485..851Y

We present a new model of the population of symbiotic X-ray binaries (SyXBs) that takes into account the non-stationary character of quasi- spherical sub-sonic accretion of the red giant's stellar wind on to slowly rotating neutron stars (NSs). Updates of the earlier models are given, which include more strict criteria of slow NS rotation for plasma entry into the NS magnetosphere via the Rayleigh-Taylor instability, as well as more strict conditions for settling accretion for slow stellar winds, with an account of variations in the specific angular momentum of captured stellar wind in eccentric binaries. These modifications enabled a more adequate description of the distributions of observed systems over binary orbital periods, NS spin periods, and their X-ray luminosity in the˜10³²-10³⁶ erg s⁻¹ range and brought their model Galactic number into reasonable agreement with the observed one. Reconciliation of the model and observed orbital periods of SyXBs requires a low efficiency of matter expulsion from common envelopes during the evolution that results in the formation of NS components of symbiotic X-ray systems.

Recent publications: Symbiotics

New Online Database of Symbiotic Variables
Merc, J. Gàlis, R. Wolf, M.
Eruptive Stars Information Letter, 41, 2019
https://ui.adsabs.harvard.edu/abs/2019ESIL...41...78M
We have decided to prepare a new, online database of the galactic and extragalactic symbiotic. In addition to the catalog of data for all known symbiotic systems with consistent references, we created a web- portal for easy access tothis information.

Spectroscopic observations of symbiotic stars in 2019-Q1
Teyssier, F. Boyd, D. Guarro, J. Sims, F. Campos, F. Lester, T. Sollecchia, U. Boussin, C. Charbonnel, S. Garde, O. Somogyi, P. Buil, C. Berardi, P. Marik, V. Martineau, G. Buchet, Y. Diarrassouba, I. Michelet, J. (ARAS)
Eruptive Stars Information Letter, 41, 2019
https://ui.adsabs.harvard.edu/abs/2019ESIL...41....2T
198 spectra of 23 symbiotic stars at resolution from 500 to 15000 were obtained during 2019-Q1 by 18 observers. AG Dra is monitored before the expected outburst in 2019. At the current date (2019-05-18) no sign of outburst has been detected. From medium resolution spectra we have detected the appearence of an emission line in the red edge of He I 5016 during outbursts. The identification of the line is discussed. AX Per soon after the end of its eclipse has been detected in strong classical outburst, characterized by the weakening of high emission lines [Fe VII]. CH Cyg is in low luminosity, several spectra have been obtained during a short flare. V694 Mon, in high luminosity, has been monitored at high cadence during the season. The profiles of Balmer and Fe II lines is unusual, showing a classical P Cygni profile and the disappearance of the broad blue absorption lines.

First glance at the recently discovered symbiotic star HBHA 1704-05 during its current outburst
Skopal, A. Sekeráš, M. Kundra, E. Komžík, R. Shugarov, S. Yu. Buil, C. Berardi, P. Zubareva, A.
Contributions of the Astronomical Observatory Skalnate Pleso, 49, 2019
https://ui.adsabs.harvard.edu/abs/2019CoSka..49..424S
In this contribution we introduce our photometric and spectroscopic observations of the newly (August 9, 2018) discovered outburst of the emission-line star, HBHA 1704-05, whose photometric variability and the spectrum during the outburst are both characteristic for a symbiotic star.

Mass-outflow from the active symbiotic binary BF Cyg during its 2015 and 2017 bursts
Shchurova, A. Skopal, A. Shugarov, S. Yu. Sekeráš, M. Komžík, R. Kundra, E. Shagatova, N.
Contributions of the Astronomical Observatory Skalnate Pleso, 49, 2019

In this contribution we present observations of the symbiotic star BF Cygni during its current active phase. Our photometric monitoring indicated 1-mag bursts during 2015 and 2017 on the time-scale of weeks with gradual fading to the pre-outburst level for more than 1 year. During these events, our spectra show signatures of a variable mass- outflow and formation of a highly-collimated bipolar mass ejection.

Hα orbital variations of the symbiotic star EG And from optical spectroscopy
Shagatova, N. Skopal, A. Sekeráš, M. Teyssier, F. Shugarov, S. Yu. Komžík, R. Garai, Z. Kundra, E. Vaňko, M.
Contributions of the Astronomical Observatory Skalnate Pleso, 49, 2019
In this contribution, we explore the orbital variability of the Hα-line emission and absorption components of the symbiotic system EG And. We have found that the equivalent width of the core emission is the largest at the orbital phase $\phi \approx 0.4$ and the smallest at $\phi \approx 0.2$. This probably reflects an asymmetric distribution of the cool giant wind at the orbital-plane area. Furthermore, the core emission equivalent width has a secondary maximum at $\phi \approx 0.1$. The strongest absorption in the profile is measured around the inferior conjunction of the white dwarf, φ &approx 0.4. This suggests that the ionized region is partially optically thick in the Hα line.

Study of long-term spectroscopic variability of symbiotic stars based on observations of the ARAS Group
Merc, J. Gális, R. Teyssier, F.
Contributions of the Astronomical Observatory Skalnate Pleso, 49, 2019
The importance of small-telescope observations is demonstrated by investigation of long-term outburst activity of the symbiotic systems AG Dra, Z And and AG Peg based on spectroscopic measurements obtained by amateur astronomers organized in the Astronomical Ring for Amateur Spectroscopy. Preliminary results of our ongoing spectroscopic campaign focused on AG Dra are presented. The temperature of the white dwarf is studied based on behaviour of the prominent emission lines, which are well detectable even in low-resolution spectra. The activity of AG Dra is compared to that of two other symbiotic systems - Z And and AG Peg, which have shown outbursts recently. Z And is a prototype of classical symbiotic stars which manifested the outburst at the turn of the years 2017 and 2018. AG Peg is the slowest symbiotic nova with the Z And-type outburst in 015, 165 years after its nova-like flare-up.

The current active stage of the symbiotic system AG Draconis

Gális, R. Merc, J. Leedjärv, L.

Contributions of the Astronomical Observatory Skalnate Pleso, 49, 2019

AG Dra is a strongly interacting binary system which manifests characteristic symbiotic activity of alternating quiescent and active stages. The latter ones consist of the series of individual outbursts repeating at about one-year interval. The current activity of AG Dra was initiated by a minor outburst in May 2015. The new stage of activity of this symbiotic system was confirmed by the following three outbursts in April 2016, May 2017 and in April 2018. The photometric and spectroscopic observations suggest that all these outbursts are of the hot type. Such behaviour is considered to be unusual in almost 130-year observation history of this object, because the major outbursts at the beginning of active stages are typically cool. In the present work, the current activity of the symbiotic binary AG Dra is described in detail.

Studying symbiotic stars and classical nova outbursts with small telescopes

Skopal, A.

Contributions of the Astronomical Observatory Skalnate Pleso, 49, 2019

https://ui.adsabs.harvard.edu/abs/2019CoSka..49..189S

Symbiotic stars are the widest interacting binaries, whose orbital periods are of the order of years, or even more, while cataclysmic variables are interacting binaries with periods of a few hours. Both systems comprise a white dwarf as the accretor, and undergo unpredictable outbursts. Using the multicolour photometry and optical spectroscopy obtained with small telescopes, I present examples of the white dwarf outburst in a cataclysmic variable, the classical nova V339 Del, and that in the symbiotic star AG Peg. In this way I highlight importance of observations of bright outbursts using small telescopes.

Regulation of accretion by its outflow in a symbiotic star: the 2016 outflow fast state of MWC 560

Lucy, Adrian B. Roy, Nirupam Kuin, N. Paul M. Rupen, Michael P. Knigge, Christian Darnley, M. J. Luna, G. J. M. Somogyi, Péter Valisa, P. Milani, A. Sollecchia, U. Weston, Jennifer H. S.

https://ui.adsabs.harvard.edu/abs/2019arXiv190502399L

The symbiotic binary MWC 560 (=V694 Mon) is a laboratory for the complex relationship between an accretion disk and its outflow. In 2016, at the peak of a slow rise in optical flux, the maximum velocity of the broad absorption line outflow abruptly doubled to at least 2500 km s^{-1}. The sudden onset of high-velocity Balmer absorption coincided with remarkable developments indicating an increase in outflow power: optically-thin thermal radio emission began rising by about 20 μJy/month, and soft X-ray flux increased by an order of magnitude. Comparison to historical data suggests that both high-velocity and low-velocity optical outflow components must be simultaneously present to yield a large soft X-ray flux, which may originate in a shock where these fast and slow absorbers collide. Balmer absorption and the enduring Fe II ultraviolet absorption curtain demonstrate that the absorption line-producing outflow was consistently fast and dense ($\gtrsim10^{6.5}$ cm^{-3}) throughout the 2016 outflow fast state, steadily feeding a lower-density ($\lesssim10^{5.5}$ cm^{-3}) region of radio-emitting gas. Persistent optical and near-ultraviolet flickering indicates that the accretion disk remained intact, and that the increase in optical brightness was due to an increase in the rate of accretion through the disk. The stability of all these properties in 2016 stands in marked contrast to dramatic variations during the 1990 optical brightening event of MWC 560, despite reaching a similar accretion luminosity. We propose that accretion state changes in MWC 560, such as evacuation of the inner disk, are sometimes prevented by the self-regulatory effect of the disk's outflow.

arXiv:1905.02399

The activity of the symbiotic binary Z Andromedae and its latest outburst

Merc, J. Gális, R. Wolf, M. Leedjärv, L. Teyssier, F.

Open European Journal on Variable Stars, 197, 2019

https://ui.adsabs.harvard.edu/abs/2019OEJV..197...23M

Z Andromedae is a prototype of classical symbiotic variable stars. It is characterized by alternating of quiescent and active stages, the later ones are accompanied by changes in both photometry and spectral characteristics of this object. The current activity of Z And began in 2000, and the last outburst was recorded at the turn of years 2017 and 2018. An important source of information about the behaviour of this symbiotic binary during the ongoing active stage is photometric and spectroscopic observations obtained with small telescopes by amateur astronomers. In this paper, we present the results of analysis of theseobservations, with an emphasis on the significant similarity of the last outburst of Z And with the previous ones, during which jets from this symbiotic system were observed. The presented results point to the importance of long-term monitoring of symbiotic binaries.

arXiv:1905.04251

The peculiar outburst activity of the symbiotic binary AG Draconis

Gális, R. Merc, J. Leedjärv, L. Vrašťák, M. Karpov, S.

Open European Journal on Variable Stars, 197 2019

https://ui.adsabs.harvard.edu/abs/2019OEJV..197...15G

AG Draconis is a strongly interacting binary system which manifests characteristic symbiotic activity of alternating quiescent and active stages. The latter ones consist of the series of individual outbursts repeating at about a one-year interval. After seven years of flat quiescence following the 2006-2008 major outbursts, in the late spring of 2015, the symbiotic system AG Dra started to become brighter again toward what appeared to be a new minor outburst. The current outburst activity of AG Dra was confirmed by the following three outbursts in April 2016, May 2017 and April 2018. The photometric and spectroscopic observations suggest that all these outbursts are of the hottype. Such behaviour is considerablypeculiar in almost 130-year history of observing of this object, because the major outbursts at the beginning of active stages are typically coolones. In the present work, the current peculiar activity of the symbiotic binary AG Dra is described in detail.

arXiv:1905.04253

Spectrum of the Yellow Symbiotic Star LT Delphini before, during, and after the 2017 Outburst

Ikonnikova, N. P. Burlak, M. A. Arkhipova, V. P. Esipov, V. F.

Astronomy Letters, 45, 2019

https://ui.adsabs.harvard.edu/abs/2019AstL...45..217I

LT Del is a yellow symbiotic system that consists of a bright K3-type giant and a hot subdwarf with a temperature˜10^5 K. We present the results of our spectroscopic observations of LT Del over the period 2010-2018. In 2017 the star experienced a second low-amplitude (Δ V˜ 0^ṃ7) outburst in the history of its studies. The emission spectrum of the star represented in the optical range by hydrogen, neutral and ionized helium lines underwent significant changes in the outburst. The fluxes in the HI and He I emission lines increased by a factor of 5-6, the He II λ4686 line grew by a factor of 10.

According to our estimates, in the 2017 outburst the temperature of the exciting star rose to T hot ~130 000 K, while during the first 1994 outburst the change in temperature was insignificant. This suggests cool and hot outbursts of LT Del by analogy with similar eventsof another yellow symbiotic star, AG Dra.

FUSE Spectroscopic Analysis of the Slowest Symbiotic Nova AG Peg During Quiescence

Sion, Edward M. Godon, Patrick Mikolajewska, Joanna Katynski, Marcus

The Astrophysical Journal, 874, 2019

We present a far-UV (FUV) spectroscopic analysis of the slowest known symbiotic nova AG Peg that underwent a nova explosion in 1850 followed by a very slow decline that did not end until �1996, marking the beginning of quiescence. In 2015 June, when AG Peg exhibited a Z And-type outburst with an optical amplitude of �1.5 mag. We used accretion disk and WD photosphere synthetic spectral modeling of a Far-Ultraviolet Spectroscopic Explorer (FUSE) spectrum obtained on 2003 June 5.618. Thespectrum is heavily affected by ISM absorption as well as strong emission lines. We dereddened the FUSE fluxes assuming E(B-V)=0.10, which is the maximum galactic reddening in the direction of AG Peg. We discuss our adoption of the pre-Gaia distance over the Gaia parallax. For a range of white dwarf surface gravities and surface temperatures, we find that the best-fitting photosphere is a hot WD with a temperature Twd = 150,000 K, and a low gravity log(g) � 6.0–6.5. For a distance of 800 pc, the scaled WD radius is Rwd< = 0.06 × R, giving log(g) = 6.67 for a 0.65 M _� WD mass. The Luminosity we obtain from this model is L = 1729 L _�. The hot photosphere models provide better fits than the accretion disk models, which have FUV flux deficits toward the shorter wavelengths of FUSE, down to the Lyman limit. Given the uncertainty of the nature of a true symbiotic accretion disk, and, while a very hot low gravity degenerate star dominates the FUV flux, the presence of a steady-state (standard) accretion disk cannot be summarily ruled out.

arXiv:1902.10002

Recent publications: Novae

High-resolution optical spectroscopy of Nova V392 Per

Stoyanov, K. A. Tomov, T. Stateva, I. Georgiev, S.

Here we analyze high-resolution spectra of the Nova V392 Per obtained during the 2018 outburst. The Haand Hb emission lines show a triple-peak structure with radial velocities of about -2000 km/s, -250 km/s and 1900 km/s respectively. The near infrared spectrum is dominated by the narrow and single-peaked Paschen lines of hydrogen and the OI λ 8446 and OI λ 7773 emission lines. Using DIBs and the KI line, we estimate the interstellar excess towards V392 Per. Based on AAVSO and ASAS-SN photometry data, we calculate that the t_2 and t_3 decline times are ~ 3 d and ~11 d respectively, which classifies V392 Per as a very fast nova. We also briefly discuss the similarity between V392 Per and other very fast novae and the possible future evolution of the system in terms of the hibernation model.

arXiv:1906.06055

Luminous Red Novae: Stellar Mergers or Giant Eruptions?

Pastorello, A. & al.

Astrophysics of Galaxies; Astrophysics - High Energy Astrophysical Phenomena

https://ui.adsabs.harvard.edu/abs/2019arXiv190600812P

We present extensive datasets for a class of intermediate-luminosity optical transients known as "luminous red novae" LRNe). They show double-peaked light curves, with an initial rapid luminosity rise to a blue peak (at -13 to -15 mag), which is followed by a longer-duration red peak that sometimes is attenuated, resembling a plateau. The progenitors of three of them (NGC4490-2011OT1, M101-2015OT1, and SNhunt248), likely relatively massive blue to yellow stars, were also observed in a pre-eruptive stage when their luminosity was slowly increasing. Early spectra obtained during the first peak show a blue continuum with superposed prominent narrow Balmer lines, with P Cygni profiles. Lines of Fe II are also clearly observed, mostly in emission. During the second peak, the spectral continuum becomes much redder, Halpha is barely detected, and a forest of narrow metal lines is observed in absorption. Very late-time spectra (~6 months after blue peak) show an extremely red spectral continuum, peaking in the infrared (IR) domain. Halpha is detected in pure emission at such late phases, along with broad absorption bands due to molecular overtones (such as TiO, VO). We discuss a few alternative scenarios for LRNe. Although major instabilities of single massive stars cannot be definitely ruled out, we favour a common envelope ejection in a close binary system, with possibly a final coalescence of the two stars. The similarity between LRNe and the outburst observed a few months before the explosion of the Type IIn SN 2011ht is also discussed.

arXiv:1906.00812

Light-curve Analysis of 32 Recent Galactic Novae: Distances and White Dwarf Masses

Hachisu, Izumi Kato, Mariko

The Astrophysical Journal Supplement Series, 242

2019

https://ui.adsabs.harvard.edu/abs/2019ApJS..242...18H

arXiv:1905.10655

Multiwavelength Modeling of the SED of Nova V339 Del: Stopping the Wind and Long-lasting Super-Eddington Luminosity with Dust Emission

Skopal, Augustin

The Astrophysical Journal, 878, 2019

https://ui.adsabs.harvard.edu/abs/2019ApJ...878...28S

During the classical nova outburst, the radiation generated by the nuclear burning of hydrogen in the surface layer of a white dwarf (WD) is reprocessed by the outer material into different forms at softer energies, whose distribution in the spectrum depends on the nova age.Using the method of multiwavelength modeling the spectral energy distribution (SED), we determined physical parameters of the stellar, nebular, and dust component of radiation isolated from the spectrum of the classical nova V339 Del from day 35 to day 636 after its explosion. The transition from the iron-curtain phase to the supersoft source phase (days 35–72), when the optical brightness dropped by 3–4 mag, the absorbing column density fell by its circumstellar component from □1 ×10²³ to □1 × 10²¹ cm^{−2}, and the emission measure decreased from □2 × 10⁶² to □8.5 × 10⁶⁰ cm^{−3}, was caused by stopping down the mass loss from the WD. The day 35 model SED indicated an oblate shape of the WD pseudophotosphere and the presence of the dust located in a slow equatorially concentrated outflow. The dust emission peaked around day 59. Its coexistence with the strong supersoft X-ray source in the day

100 model SED constrained the presence of the disk-like outflow, where the dust can spend a long time. Both the SED models revealed a super- Eddington luminosity of the burning WD at a level of (1–2) × 10³⁹ (d/4.5 kpc)² erg s^{−1}, lasting from
day 2 to at least day 100.
arXiv:1905.01867

Predictions for Upcoming Recurrent Novae Eruptions; T CrB in 2023.6±1.0, U Sco in 2020.0±0.7, RS Oph in 2021±6, and more
Schaefer, Bradley E.
American Astronomical Society Meeting Abstracts, 51, 2019

https://ui.adsabs.harvard.edu/abs/2019AAS...23412207S
The prediction of upcoming recurrent nova eruptions has good utility for promoting a frequent watch so that the usually-very-short eruptions are not missed and caught early, plus allowing for the pre-organization of intense observing campaigns. Such efforts are highlighted by my prediction of the 2010 eruption of U Sco, where spacecraft targets-of- opportunity programs were in place in advance and workers watched the target several times a day for over a year, then resulting in measured magnitudes averaging every three minutes for the entire eruption, plus daily and hourly spectra and UBVRIJHK photometry, plus X-ray, gamma-ray, far-IR, IR, and UV spacecraft observations, leading to the all-time best observed nova eruption and the discovery of two new phenomena. Recurrent novae are a particularly important subset of all novae, and they have the advantage that their eruptions can be predicted with useable accuracy. Inter-eruption times can be predicted from the brightness during quiescence, and by looking at the history of inter-eruption intervals. For T CrB, with eruptions in 1866 and 1946, a simple constancy of interval suggests the next eruption will be in 2026. But a better prediction is based on the pre-eruption-plateau with a rise to the plateau from 1936.0-1939.6 before the fast 1946.1 eruption, so with T CrB showing the same rise from 2014.2-2016.4 up to the current plateau, the next eruption will be in 2023.6±1.0. For the long history of intervals for U Sco (averaging 10.6 years), the next eruption should come in 2020.7±1.6. But U Sco was substantially bright in 2011-2012, with higher accretion, so it should accumulate the trigger mass substantially before 2020.7. Given that it has not erupted as of this writing, I predict a date of 2020.0±0.7. For RS Oph, based on its rather variable intervals, the next eruption should start in 2021±6. V394 CrA, CI Aql, V3890 Sgr, and V2487 Oph should go off any year now, but there is no high confidence for setting a date.

Magnetic wind-driven accretion in dwarf novae
Scepi, Nicolas Dubus, Guillaume Lesur, Geoffroy
Astronomy and Astrophysics, 626, 2019
https://ui.adsabs.harvard.edu/abs/2019A&A...626A.116S
Context. Dwarf novae (DNe) and X-ray binaries exhibit outbursts thought to be due to a thermal-viscous instability in the accretion disk. The disk instability model (DIM) assumes that accretion is driven by turbulent transport, customarily attributed to the magneto-rotational instability (MRI). However, recent results point out that MRI turbulence alone fails to reproduce the light curves of DNe.
arXiv:1812.02076

Journal Article
Imaging and Analysis of Neon Nova V382 Vel Shell
Takeda, Larissa Diaz, Marcos
Publications of the Astronomical Society of the Pacific, 131, 2019
https://ui.adsabs.harvard.edu/abs/2019PASP..131e4205T
arXiv:1909.02051

Optical spectroscopy of nova ASASSN-17hx at Bosscha Observatory
Adhyaqsa, A. Istiqomah, A. N. Ramadhan, D. G. Imaduddin, I. Malasan, H. L. Arai, A. Kawakita, H.
Journal of Physics Conference Series, 1231, 2019
https://ui.adsabs.harvard.edu/abs/2019JPhCS1231a2006A

Recent publications: Novae

Studying symbiotic stars and classical nova outbursts with small telescopes
Skopal, A.
Contributions of the Astronomical Observatory Skalnate Pleso %V 49 2019
https://ui.adsabs.harvard.edu/abs/2019CoSka..49..189S

Symbiotic stars are the widest interacting binaries, whose orbital periods are of the order of years, or even more, while cataclysmic variables are interacting binaries with periods of a few hours. Both systems comprise a white dwarf as the accretor, and undergo unpredictable outbursts. Using the multicolour photometry and optical spectroscopy obtained with small telescopes, I present examples of the white dwarf outburst in a cataclysmic variable, the classical nova V339 Del, and that in the symbiotic star AG Peg. In this way I highlight importance of observations of bright outbursts using small telescopes.

Optical photometry and spectroscopy of V612 Sct: slow classical nova with rebrightenings
Chochol, D. Shugarov, S. Hambálek, Ľ. Guarro, J. Krushevska, V.
Contributions of the Astronomical Observatory Skalnate Pleso, 49, 2019
https://ui.adsabs.harvard.edu/abs/2019CoSka..49..159C

A Shocking Shift in Paradigm for Classical Novae
Chomiuk, Laura +
Bulletin of the American Astronomical Society %V 51 2019
https://ui.adsabs.harvard.edu/abs/2019BAAS...51c.230C

Novae after the gamma-ray emission phase: X-ray studies of the continuing evolution of shocks in V959 Mon
Mukai, Koji +
AAS/High Energy Astrophysics Division, 2019
https://ui.adsabs.harvard.edu/abs/2019HEAD...1740306M

More than a dozen novae have been detected as GeV gamma-ray sources for several weeks around the time of visible light maximum. This requires particle acceleration in powerful shocks, whose thermal particles are expected to emit X-rays. Indeed, X-rays from such shocks are observed in many novae, usually weeks or months after the optical peak, and suggests a universal picture in which initial, slow ejecta collide with later, faster, outflows. Here we present Neil Gehrels Swift, Suzaku, and Chandra data on V959 Mon (Nova Mon 2012), which was discovered first asa transient Fermi/LAT source in 2012 June, while the object was too close to the Sun for optical or X-ray observations. The optical nova was discovered about two month later, when X-ray observations started. Our data are among the most comprehensive monitoring of X-rays from novae, along with those on V392 Vel (Nova Vel 1999). In V959 Mon, we observe a clear trend of decreasing N_H with time, which we model as due to the expansion of the unshocked slow ejecta ahead of the shock. Ouranalysis suggests that the slow ejecta did not start its secular expansion until about 30 days after the initial detection of the gamma- rays. The temperature and the emission measure of the X-ray emitting gas evolve in more subtle ways, roughly in line with what we expect in this complex situation involving the continuous addition of freshly shocked matter and relatively inefficient cooling of shocked gas. We suggest that both reverse and forward shock contributed to the observed Chandra grating spectra of V959 Mon. Finally, we discuss the implications for our understanding of the shock in the earliest days of the nova, duringits gamma-ray emission phase.

The UBV Color Evolution of Classical Novae. III. Time-stretched Color–Magnitude Diagram of Novae in Outburst
Hachisu, Izumi Kato, Mariko
The Astrophysical Journal Supplement Series %V 241 2019
https://ui.adsabs.harvard.edu/abs/2019ApJS..241....4H