Eruptive stars spectroscopy
Cataclysmics, Symbiotics, Novae

Eruptive Stars
Information Letter n° 45 #2020-01 27-06-2020
Observations of Jan. - Mar. 2020

Contents

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F. Teyssier, D. Boyd, F. Sims, S. Shore, C. Boussin, J. Guarro, J. Michelet, P. Dubovsky, L. Franco, T. Lester, F. Boubault, L. Socha, P. Cazzato, U. Sollecchia, C. Kreider, I. Diarrassouba, J. Foster, O. Garde, S. Charbonnel, T. Ventura,

“We acknowledge with thanks the variable star observations from the AAVSO International Database contributed by observers worldwide and used in this letter.”
Kafka, S., 2019, Observations from the AAVSO International Database, http://www.aavso.org

Astronomical Ring for Access to Spectroscopy
ARAS

Eruptive stars spectroscopy
Cataclysmics, Symbiotics, Novae

Eruptive Stars
Information Letter n° 45 #2020-01 15-05-2020
Observations of Jan. - Mar. 2019

Spectroscopic observations of symbiotic stars in 2020-Q1

Authors:
F. Teyssier, D. Boyd, F. Sims, C. Boussin, J. Guarro, J. Michelet, P. Dubovsky, L. Franco, T. Lester, F. Boubault, L. Socha, P. Cazzato, U. Sollecchia, C. Kreider, I. Diarrassouba, J. Foster, O. Garde, T. Ventura,

Stars:
AG Dra, AX Per, BD Cam, BX Mon, CQ Dra, EG And, NQ Gem, omi Cet, R Aqr, RS Oph, stHa 32, StHa 55, SU Lyn, T CrB, TX CVn, UV Aur, V1261 Ori, V471 Per, V694 Mon, Z And, ZZ CMi

Abstract:
175 spectra of 21 symbiotic stars were obtained during 2020-Q1. The low resolution spectra of AX Per during the decline of its outburst show the reappearence of [Fe VII] which had vanished during the 2019 outburst. Intensive monitoring of V694 Mon during 2020-Q1 (88 spectra).

Request for collaborative observations

Target	Request	Objective	Notes	Status
CH Cyg	Independently A. Skopal M. Karovska	Long term monitoring of a complex and highly variable object	The most spectra as possible especially at R = 5000 to 15000	Ongoing
AG Dra	R. Gàlis J. Merc L. Leedjarv	Study of outbursts and orbital variability	He II / Hβ Raman OVI	One spectrum a month
AX Per	R. Gàlis J. Merc	Ongoing outburst, declining	One spectrum per week (low and high resolution)	Ongoing
SU Lyn	K. Ilkiewitz	Study of the orbital variations of a newly discovered symbiotic	One spectrum per week Res: 5000 to 15000 Hα and [O III] 5007	
V694 Mon	A. Lucy J. Sokolovski M. Karovska	Detection of active phases	Balmer and Fe II lines	New season
R Aqr	M. Karovska	Studying ongoing eclipse	Hα [O III]	Ongoing
RS Oph	N. Shagatova A. Skopal	See Information letter 2019-Q2	More spectra needed in 2020	Continuing until nova event (2026 ?)
T CrB	B. Schaefer	Monitoring before expected nova outburst	One spectrum per week (low and high resolution)	Continuing until nova event (2023 ?)
Suspected	A. Lucy J. Solovski	Spectroscopic identification of new symbiotics in Southern sky	2 new symbiotics already identified by ARAS observers	Ongoing

64 stars
5357 spectra

#	Name	AD (2000)	DE (2000)	Nb.	First	Last
1	EG And	0 44 37.1	40 40 45.7	145	12/08/2010	06/02/2020
2	AX Per	1 36 22.7	54 15 2.5	329	04/10/2011	08/04/2020
3	V471 Per	1 58 49.7	52 53 48.4	38	06/08/2013	24/03/2020
4	Omi Cet	2 19 20.7	-2 58 39.5	37	28/11/2015	17/01/2020
5	BD Cam	03 42 9.3	63 13 0.5	51	08/11/2011	29/01/2020
6	StHa 32	04 37 45.6	-01 19 11.8	8	02/03/2018	13/01/2020
7	UV Aur	05 21 48.8	32 30 43.1	88	24/02/2011	30/03/2020
8	V1261 Ori	05 22 18.6	-8 39 58	20	22/10/2011	21/01/2020
9	StHA 55	05 46 42	6 43 48	12	17/01/2016	05/01/2020
10	SU Lyn	06 42 55.1	+55 28 27.2	191	02/05/2016	09/05/2020
11	ZZ CMi	07 24 13.9	8 53 51.7	65	29/09/2011	13/04/2020
12	BX Mon	07 25 24	-3 36 0	68	04/04/2011	16/03/2020
13	V694 Mon	07 25 51.2	-7 44 8	424	03/03/2011	15/04/2020
14	NQ Gem	07 31 54.5	24 30 12.5	85	01/04/2013	25/04/2020
15	GH Gem	07 4 4.9	12 2 12	9	10/03/2016	15/02/2019
17	CQ Dra	12 30 06	69 12 04	44	11/06/2015	20/05/2020
18	RT Cru	12 34 53.7	-64 33 56.0	1	28/07/2019	28/07/2019
19	TX CVn	12 44 42	36 45 50.6	72	10/04/2011	21/05/2020
20	RW Hya	13 34 18	- 25 22 48.9	22	28/06/2017	22/05/2020
21	IV Vir	14 16 34.3	-21 45 50	14	28/02/2015	19/05/2020
22	T CrB	15 59 30.1	25 55 12.6	396	01/04/2012	14/06/2020
23	AG Dra	16 01 40.5	66 48 9.5	681	03/04/2013	14/06/2020
24	AS 210	16 51 20.4	-26 00 26.7	4	14/06/2018	06/07/2019
25	V503 Her	17 36 46	23 18 18	8	05/06/2013	06/07/2019
26	RS Oph	17 50 13.2	-6 42 28.4	86	23/03/2011	14/06/2020
27	V934 Her	17 06 34.5	+23 58 18.5	32	09/08/2013	01/06/2020
28	Hen 3-1341	17 08 36.5	-17 26 30.4	2	04/07/2019	07/07/2019
29	Hen 3-1342	17 08 55.0	-23 23 26.5	1	07/07/2019	07/07/2019
30	RT Ser	17 39 52.0	-11 56 38.8	3	26/06/2012	03/07/2019
31	AS 245	17 51 00.9	-22 19 35.1	1	15/07/2018	15/07/2018
32	AS 270	18 05 33.7	-20 20 38	7	01/08/2013	13/07/2019
33	AS 289	18 12 22.1	-11 40 07	3	26/06/2012	15/06/2018
34	YY Her	18 14 34.3	20 59 20	34	25/05/2011	20/05/2020
35	FG Ser	18 15 06.2	0 18 57.6	10	26/06/2012	12/07/2019
36	StHa 149	18 18 55.9	27 26 12	8	05/08/2013	31/08/2019
37	V443 Her	18 22 08.4	23 27 20	75	18/05/2011	01/06/2020
39	AS 323	18 48 35.7	-06 41 10.4	2	02/07/2019	13/07/2019
40	FN Sgr	18 53 52.9	-18 59 42	9	10/08/2013	15/07/2018
41	V919 Sgr	19 03 46.0	-16 59 53.9	9	10/08/2013	11/07/2019
42	V1413 Aql	19 03 51.6	16 28 31.7	15	10/08/2013	06/07/2019
43	V335 Vul	19 23 14	+24 27 39.7	12	14/08/2016	25/07/2019
44	BF Cyg	19 23 53.4	29 40 25.1	178	01/05/2011	29/05/2020
45	CH Cyg	19 24 33	50 14 29.1	804	21/04/2011	13/06/2020
46	HM Sge	19 41 57.1	16 44 39.9	14	20/07/2013	26/10/2019
47	QW Sge	19 45 49.6	18 36 50	12	14/08/2016	25/07/2019
48	Hen 3-1768	19 49 48.4	-82 52 37.5	2	16/05/2018	27/05/2018
49	CI Cyg	19 50 11.8	35 41 3.2	231	25/08/2010	27/05/2020
50	StHa 169	19 51 28.9	46 23 6	7	12/05/2016	30/08/2019
51	EF Aql	19 51 51.7	-05 48 16.7	1	11/11/2018	11/11/2018
52	HbHa 1704-05	19 54 42.9	+17 22 12.7	82	09/08/2018	20/05/2020
53	V1016 Cyg	19 57 4.9	39 49 33.9	25	15/04/2015	15/09/2019
54	RR Tel	20 04 18.5	-55 43 33.2	4	08/09/2017	06/09/2019
55	PU Vul	20 21 12	21 34 41.9	26	20/07/2013	01/11/2019
56	LT Del	20 35 57.3	20 11 34	22	28/11/2015	26/10/2019
57	StHa 180	20 39 20.6	-05 17 16.3	2	03/07/2019	06/07/2019
58	Hen 2-468	20 41 19.0	34 44 52.3	2	01/07/2019	11/07/2019
59	ER Del	20 42 46.4	8 40 56.4	14	02/09/2011	30/08/2019
60	V1329 Cyg	20 51 1.1	35 34 51.2	27	08/08/2015	25/12/2019
61	V407 Cyg	21 2 13	45 46 30	12	14/03/2010	18/04/2010
62	StHa 190	21 41 44.8	2 43 54.4	24	31/08/2011	26/08/2019
63	AG Peg	21 51 1.9	12 37 29.4	274	06/12/2009	30/05/2020
64	V627 Cas	22 57 41.2	58 49 14.9	38	06/08/2013	18/11/2019
65	Z And	23 33 39.5	48 49 5.4	192	30/10/2010	16/02/2020
66	R Aqr	23 43 49.4	-15 17 4.2	232	20/11/2010	19/01/2020

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

Symbiotics observed in 2020-Q1 (1/2)

Id.	Observer	Date	Range		Res.
AG Dra	D. Boyd	19/01/2020	3901	7380	1119
AG Dra	C. Boussin	22/01/2020	3701	7571	504
AG Dra	C. Boussin	18/02/2020	3701	7571	504
AG Dra	D. Boyd	27/02/2020	3901	7380	1085
AG Dra	D. Boyd	16/03/2020	3901	7381	1082
AG Dra	P. Cazzato	17/03/2020	3801	7300	534
AG Dra	J. Michelet	18/03/2020	3775	7450	800
AG Dra	F. Sims	24/03/2020	3716	7305	1018
AG Dra	D. Boyd	27/03/2020	3900	7380	1076
AG Dra	T. Lester	28/03/2020	4031	7955	14000
AX Per	P. Dubovsky	01/01/2020	3800	7590	822
AX Per	F. Sims	03/01/2020	3716	7305	1024
AX Per	F. Sims	06/01/2020	3716	7305	1032
AX Per	D. Boyd	06/01/2020	3901	7380	1082
AX Per	F. Sims	11/01/2020	3716	7305	1033
AX Per	F. Sims	12/01/2020	3715	7305	1018
AX Per	D. Boyd	17/01/2020	3900	7381	1126
AX Per	C. Boussin	21/01/2020	3701	7571	504
AX Per	F. Sims	23/01/2020	3717	7305	1034
AX Per	F. Sims	27/01/2020	3716	7304	1021
AX Per	L. Socha	07/02/2020	4227	7066	
AX Per	L. Socha	08/02/2020	4244	7084	
AX Per	F. Sims	14/02/2020	3717	7305	1007
AX Per	F. Sims	20/02/2020	3716	7304	989
AX Per	C. Boussin	20/02/2020	3701	7571	508
AX Per	F. Sims	25/02/2020	3718	7305	974
AX Per	F. Sims	27/02/2020	3718	7304	1015
AX Per	D. Boyd	02/03/2020	3901	7380	1081
AX Per	D. Boyd	23/03/2020	3901	7380	1038
AX Per	C. Boussin	24/03/2020	3701	7571	503
BD Cam	P. Dubovsky	01/01/2020	3750	7590	889
BD Cam	J. Michelet	23/01/2020	3800	7400	800
BD Cam	J. Guarro	29/01/2020	3977	9009	9000
BX Mon	F. Sims	28/01/2020	3717	7305	1038
BX Mon	F. Sims	17/02/2020	3717	7304	1014
BX Mon	F. Sims	25/02/2020	3716	7305	1027
BX Mon	L. Franco	16/03/2020	3831	7235	543
CQ Dra	J. Guarro	13/03/2020	3985	9307	9000
EG And	P. Dubovsky	01/01/2020	3750	7590	835
EG And	F. Sims	02/01/2020	3720	7308	926
EG And	J. Guarro	17/01/2020	4133	7756	9000
EG And	F. Boubault	19/01/2020	4003	7497	1000
EG And	F. Teyssier	22/01/2020	4000	7200	11000
EG And	J. Michelet	23/01/2020	3800	7400	800
EG And	F. Sims	25/01/2020	3716	7305	1017
EG And	J. Michelet	06/02/2020	3801	7350	800
NQ Gem	C. Boussin	04/12/2019	3701	7571	506
NQ Gem	P. Dubovsky	02/01/2020	3800	7590	796
NQ Gem	C. Boussin	11/02/2020	3701	7571	505
NQ Gem	J. Guarro	19/02/2020	3977	8734	9000
NQ Gem	C. Boussin	02/03/2020	3701	7571	500
NQ Gem	J. Guarro	09/03/2020	4053	7763	9000
omi Cet	J. Guarro	17/01/2020	3980	9389	9000

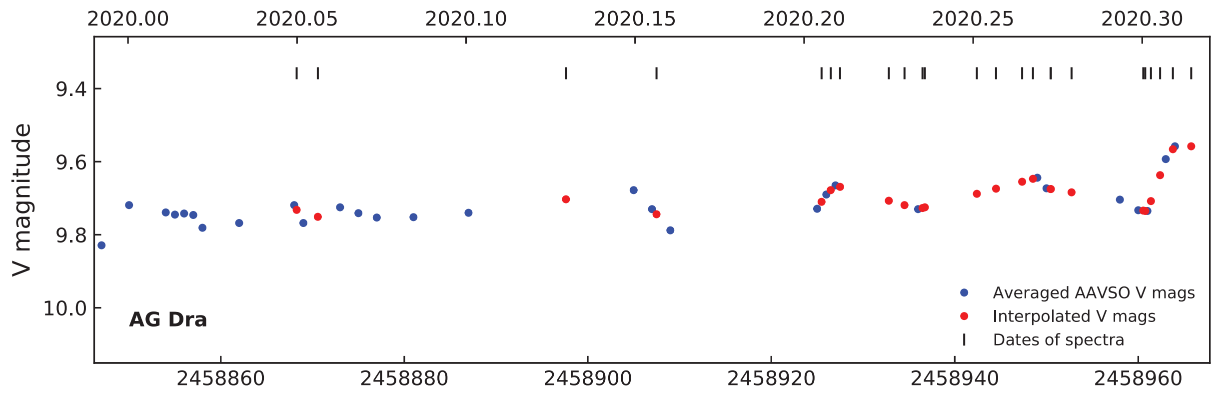
Id.	Observer	Date	Range		Res.
R Aqr	F. Sims	01/01/2020	3720	7306	871
R Aqr	F. Sims	05/01/2020	3716	7305	1031
R Aqr	C. Kreider	05/01/2020	6492	6639	8332
R Aqr	O. Garde	06/01/2020	4050	7587	11000
R Aqr	F. Sims	07/01/2020	3715	7304	990
R Aqr	F. Sims	12/01/2020	3716	7305	1024
R Aqr	F. Sims	13/01/2020	3715	7305	1021
R Aqr	J. Foster	13/01/2020	6486	6642	10877
R Aqr	F. Sims	14/01/2020	3716	7305	1010
R Aqr	F. Sims	19/01/2020	3716	7304	989
RS Oph	F. Sims	30/03/2020	3717	7305	1042
stHa 32	F. Sims	13/01/2020	3715	7305	1021
StHa 55	F. Sims	05/01/2020	3850	7270	1024
SU Lyn	P. Dubovsky	02/01/2020	3800	7590	808
SU Lyn	F. Teyssier	12/01/2020	4100	7200	11000
SU Lyn	F. Sims	25/01/2020	3718	7304	999
SU Lyn	F. Sims	29/01/2020	3718	7306	1034
SU Lyn	S. Charbonnel	05/02/2020	3915	7590	11000
SU Lyn	F. Teyssier	15/02/2020	4300	7199	9000
SU Lyn	F. Sims	17/02/2020	3717	7305	1043
SU Lyn	C. Boussin	12/03/2020	3701	7571	504
SU Lyn	F. Teyssier	14/03/2020	4300	7250	11000
SU Lyn	J. Michelet	15/03/2020	3750	7450	808
SU Lyn	C. Boussin	23/03/2020	3701	7571	506
SU Lyn	T. Lester	25/03/2020	4031	7955	14000
SU Lyn	F. Teyssier	26/03/2020	4000	7250	11000
SU Lyn	F. Sims	28/03/2020	3717	7306	1037
SU Lyn	I. Diarrassouba	31/03/2020	4195	6965	988
T CrB	P. Cazzato	18/03/2020	3802	7300	524
T CrB	F. Teyssier	24/03/2020	4500	7250	11000
T CrB	F. Sims	24/03/2020	3717	7305	1028
T CrB	F. Sims	30/03/2020	3717	7306	1041
TX CVn	T. Lester	25/03/2020	4031	7955	14000
UV Aur	C. Boussin	30/12/2019	3701	7571	508
UV Aur	P. Dubovsky	01/01/2020	3750	7590	810
UV Aur	C. Boussin	12/02/2020	3701	7571	502
UV Aur	J. Guarro	13/02/2020	4053	7763	9000
UV Aur	J. Guarro	23/02/2020	4053	7763	9000
V1261 Ori	F. Teyssier	21/01/2020	4200	7300	11000
V471 Per	F. Sims	12/01/2020	3715	7305	1026
V471 Per	D. Boyd	12/01/2020	3901	7381	1107
V471 Per	D. Boyd	20/01/2020	3900	7380	1067
V471 Per	D. Boyd	24/03/2020	3901	7380	1069
V694 Mon		Page 2/2			
Z And	P. Dubovsky	01/01/2020	3750	7590	834
Z And	D. Boyd	12/01/2020	3900	7381	1092
Z And	F. Teyssier	21/01/2020	4200	7200	11000
Z And	F. Sims	16/02/2020	3716	7304	990
ZZ CMi	L. Franco	16/03/2020	3831	7235	539
ZZ CMi	D. Boyd	26/03/2020	3900	7381	1033

Id.	Observer	Date	Range		Res.
V694 Mon	F. Sims	12/01/2020	3716	7305	999
V694 Mon	J. Guarro	15/01/2020	4053	9180	9000
V694 Mon	J. Guarro	17/01/2020	3980	9248	9000
V694 Mon	F. Sims	18/01/2020	3715	7305	1031
V694 Mon	F. Boubault	19/01/2020	4001	7497	1000
V694 Mon	F. Teyssier	21/01/2020	4200	7300	11000
V694 Mon	U. Sollecchia	22/01/2020	5551	7032	1939
V694 Mon	F. Sims	23/01/2020	3715	7305	1044
V694 Mon	F. Sims	25/01/2020	3716	7305	1042
V694 Mon	F. Sims	26/01/2020	3717	7305	1045
V694 Mon	F. Sims	28/01/2020	3716	7305	1031
V694 Mon	F. Sims	29/01/2020	3716	7305	1044
V694 Mon	J. Guarro	29/01/2020	3977	9011	9000
V694 Mon	F. Teyssier	01/02/2020	3904	7356	11000
V694 Mon	F. Teyssier	05/02/2020	4200	7200	9000
V694 Mon	C. Boussin	06/02/2020	3701	7571	502
V694 Mon	C. Boussin	11/02/2020	3701	7571	503
V694 Mon	J. Guarro	13/02/2020	4053	7763	9000
V694 Mon	F. Sims	14/02/2020	3715	7304	1038
V694 Mon	F. Sims	14/02/2020	3716	7304	1039
V694 Mon	U. Sollecchia	15/02/2020	6450	6681	14191
V694 Mon	L. Franco	15/02/2020	3831	7236	542
V694 Mon	F. Teyssier	15/02/2020	4300	7199	9000
V694 Mon	F. Sims	16/02/2020	3717	7305	1040
V694 Mon	F. Sims	17/02/2020	3717	7305	1010
V694 Mon	C. Boussin	17/02/2020	3701	7571	504
V694 Mon	J. Guarro	19/02/2020	4053	7763	9000
V694 Mon	J. Michelet	20/02/2020	3750	7450	800
V694 Mon	F. Sims	20/02/2020	3717	7305	1023
V694 Mon	T. Ventura	20/02/2020	4145	7032	680
V694 Mon	C. Boussin	20/02/2020	3701	7571	505
V694 Mon	F. Boubault	22/02/2020	4002	7499	1000
V694 Mon	J. Guarro	22/02/2020	4053	7763	9000
V694 Mon	J. Guarro	23/02/2020	4053	7763	9000
V694 Mon	J. Michelet	24/02/2020	3800	7450	800
V694 Mon	J. Michelet	24/02/2020	3800	7450	800
V694 Mon	F. Sims	24/02/2020	3716	7305	1020
V694 Mon	F. Sims	25/02/2020	3716	7304	1003
V694 Mon	F. Sims	26/02/2020	3717	7305	1038
V694 Mon	F. Sims	27/02/2020	3717	7305	1041
V694 Mon	F. Sims	02/03/2020	3716	7304	967
V694 Mon	C. Boussin	02/03/2020	3701	7571	502
V694 Mon	F. Sims	05/03/2020	3717	7305	1008
V694 Mon	J. Guarro	08/03/2020	4053	7763	9000
V694 Mon	F. Teyssier	09/03/2020	4060	7250	9000
V694 Mon	F. Teyssier	11/03/2020	4400	7250	9000
V694 Mon	C. Boussin	12/03/2020	3701	7571	504
V694 Mon	J. Guarro	13/03/2020	4802	7813	9000
V694 Mon	J. Michelet	14/03/2020	3800	7450	800
V694 Mon	J. Guarro	14/03/2020	3905	9098	9000
V694 Mon	J. Michelet	15/03/2020	3750	7450	800
V694 Mon	C. Boussin	15/03/2020	3701	7571	501
V694 Mon	F. Sims	16/03/2020	3719	7304	907
V694 Mon	L. Franco	16/03/2020	3831	7235	543

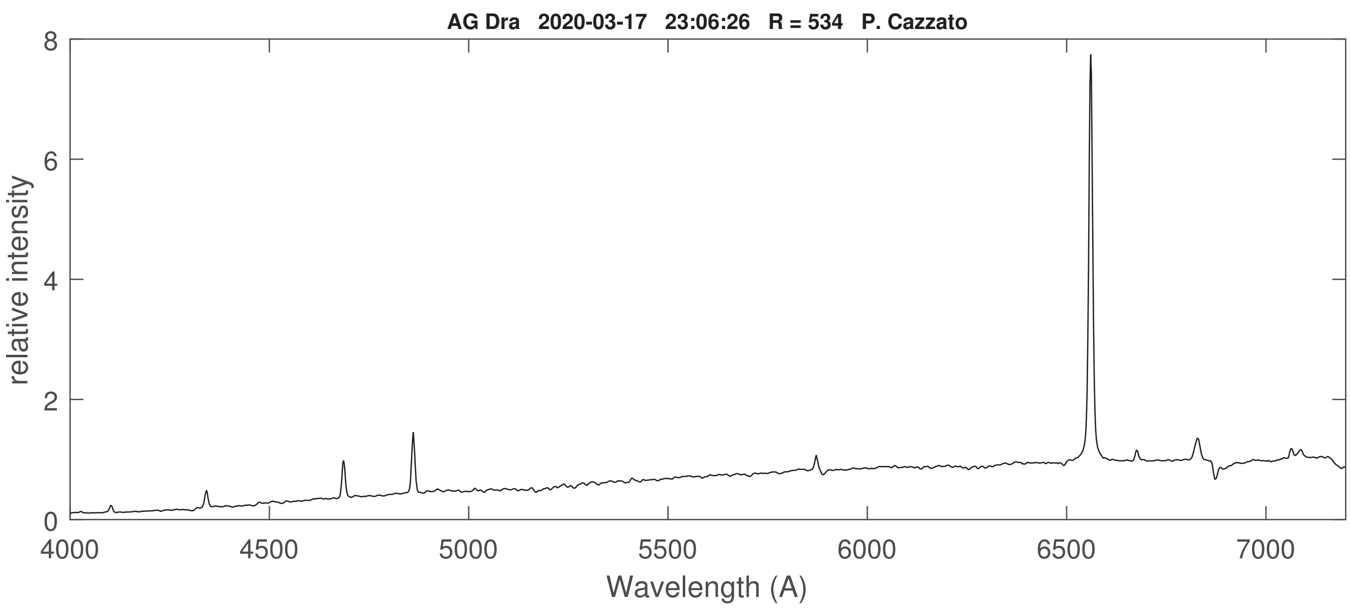
Id.	Observer	Date	Range		Res.
V694 Mon	J. Michelet	18/03/2020	3760	7450	800
V694 Mon	F. Sims	18/03/2020	3718	7305	951
V694 Mon	F. Teyssier	18/03/2020	6494	6695	11000
V694 Mon	F. Sims	22/03/2020	3718	7304	954
V694 Mon	F. Teyssier	23/03/2020	4200	7290	11000
V694 Mon	C. Boussin	23/03/2020	3701	7571	500
V694 Mon	F. Sims	24/03/2020	3718	7304	915
V694 Mon	F. Teyssier	24/03/2020	4120	7290	11000
V694 Mon	C. Boussin	24/03/2020	3701	7571	503
V694 Mon	F. Teyssier	25/03/2020	4000	7250	11000
V694 Mon	F. Sims	27/03/2020	3717	7305	990
V694 Mon	F. Teyssier	27/03/2020	4300	7250	11000
V694 Mon	T. Lester	28/03/2020	4031	7955	14000
V694 Mon	F. Sims	28/03/2020	3716	7304	999
V694 Mon	F. Teyssier	29/03/2020	4120	7250	11000
V694 Mon	F. Sims	30/03/2020	3718	7304	910
V694 Mon	F. Teyssier	31/03/2020	4200	7200	11000
V694 Mon	F. Teyssier	03/04/2020	4200	7100	11000

Coordinates (2000.0)	
R.A.	16 01 41.0
Dec	+66 48 10.1
Mag V	9.6

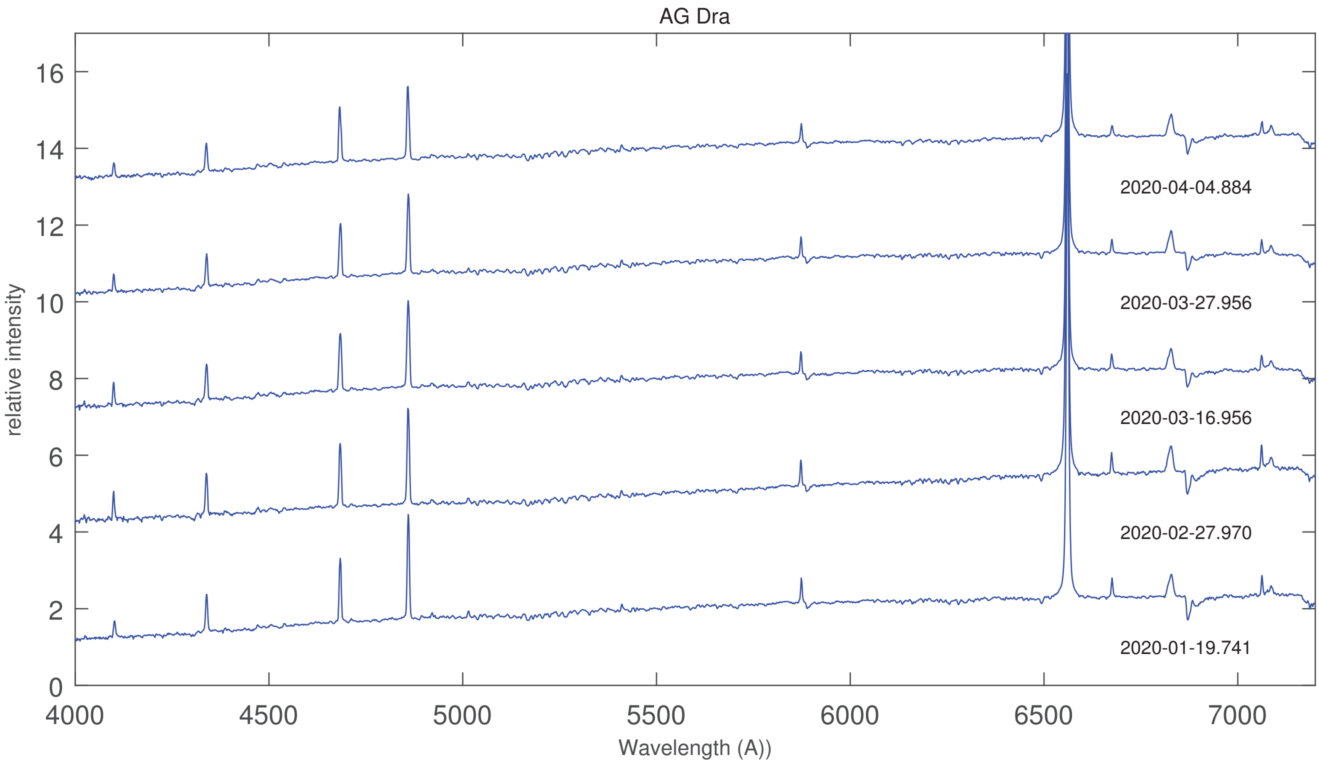
Continuous observations of AG Dra upon the request of J. Merc, R. Gàlis, L. Leedjarv. (see Information Letter n° 33 #2017-03). Monitoring continues in order to acquire reference spectra according to the orbital phase in low activity.
01/01/2020: orbital phase = 0.716
31/03/2020: orbital phase = 0.882
(Fekel & al., 2000)

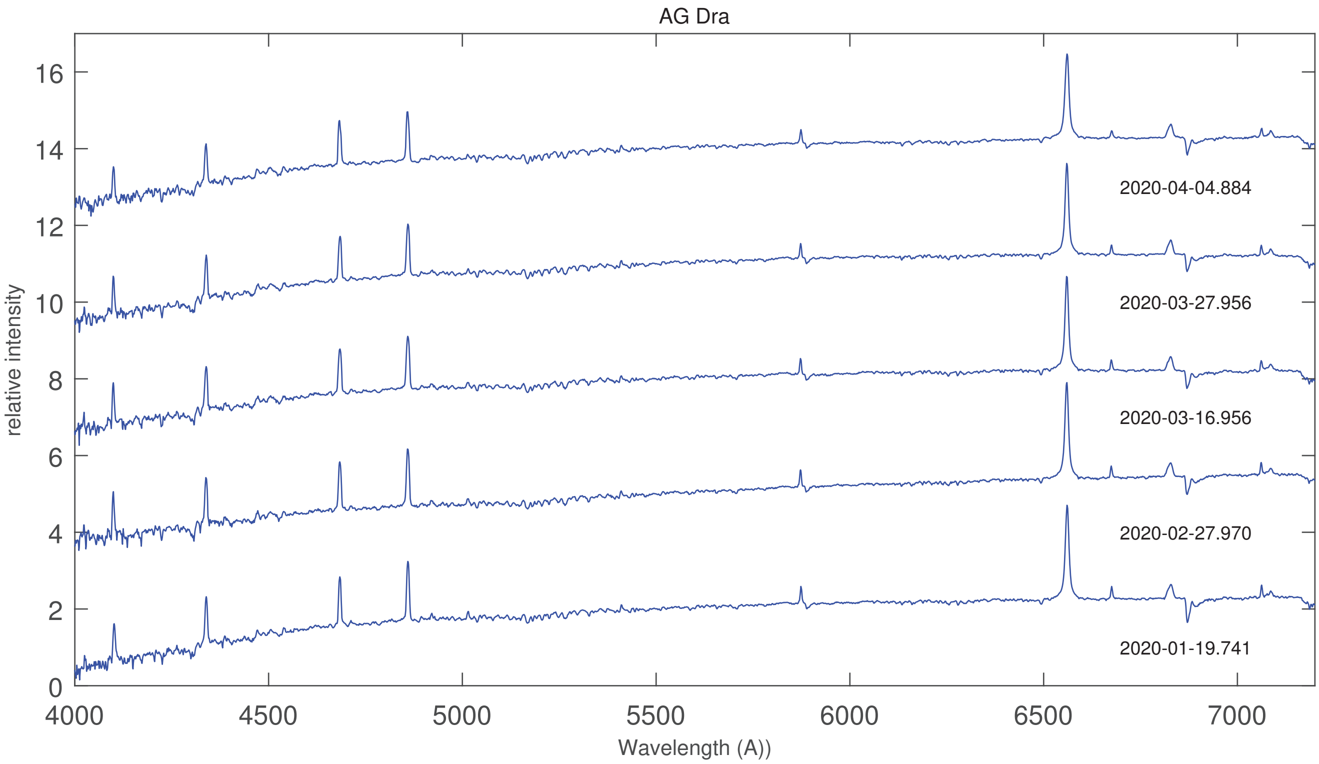


AAVSO lightcurve (selected and interpolated for the time of spectra) and ARAS spectra (2020)

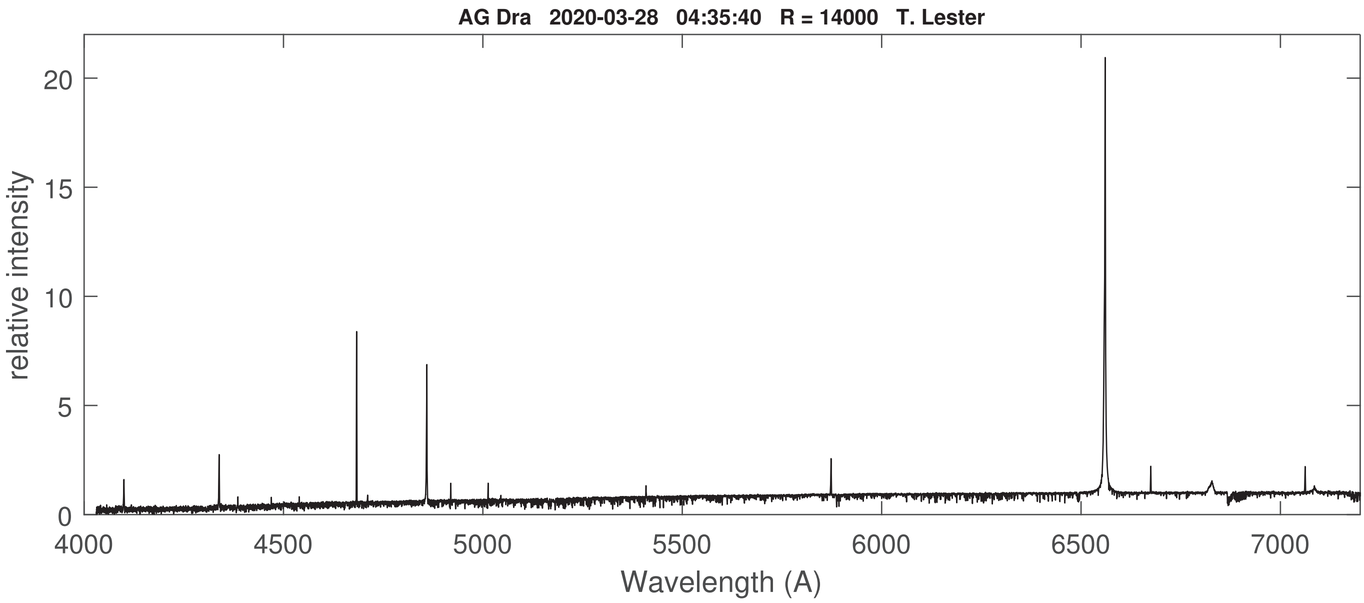


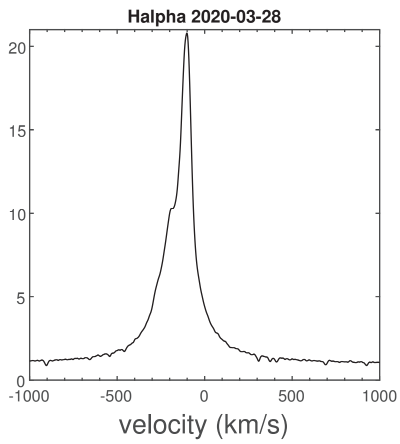
AG Dra during 2020 quarter 1 from LISA spectra (R = 1000) normalized at λ = 5500 Å obtained by David Boyd and Jacques Michelet.

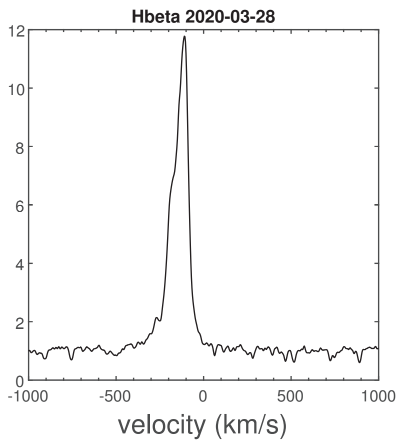


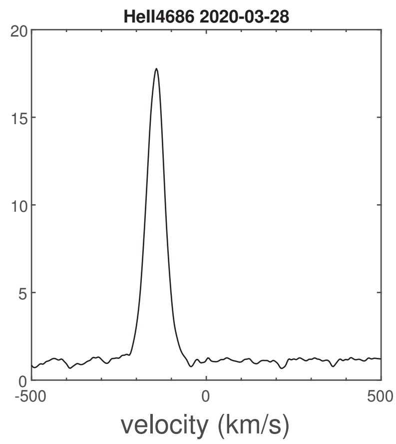


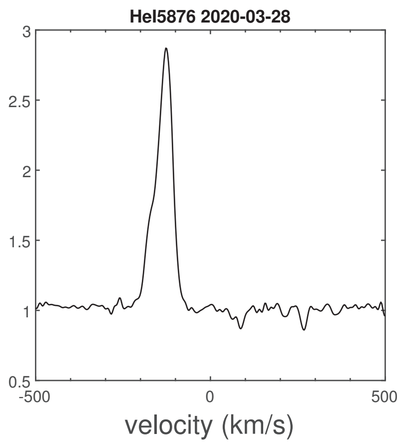
The same in logarithmic scale

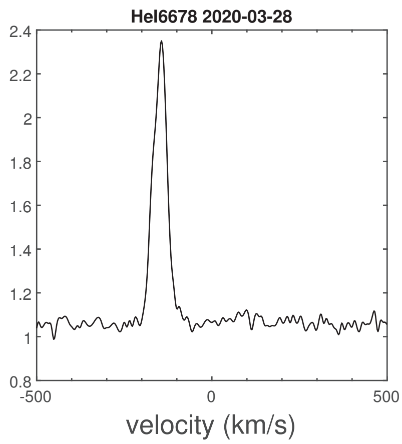

AG Dra 2020-03-28 04:35:40 R = 14000 T. Lester
relative intensity
Wavelength (A)

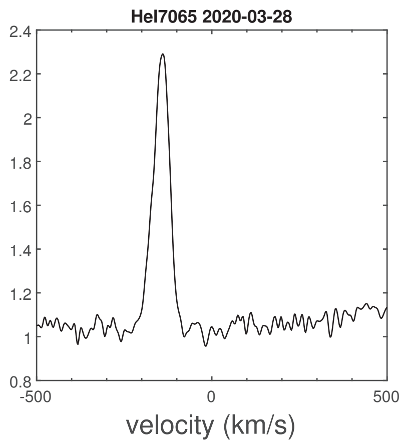

Halpha 2020-03-28
velocity (km/s)


Hbeta 2020-03-28
velocity (km/s)


HeII4686 2020-03-28
velocity (km/s)


HeI5876 2020-03-28
velocity (km/s)

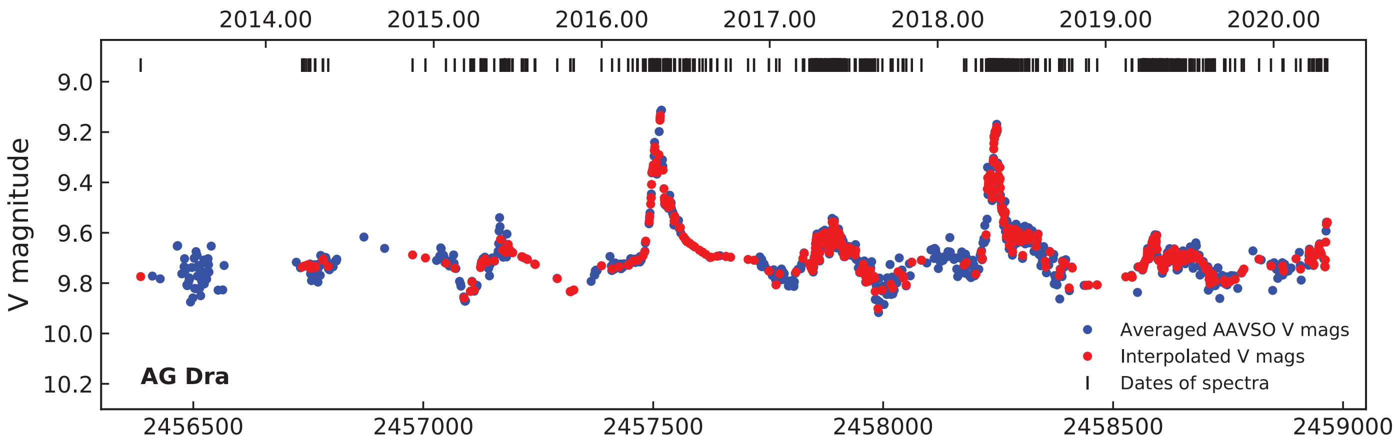

HeI6678 2020-03-28
velocity (km/s)

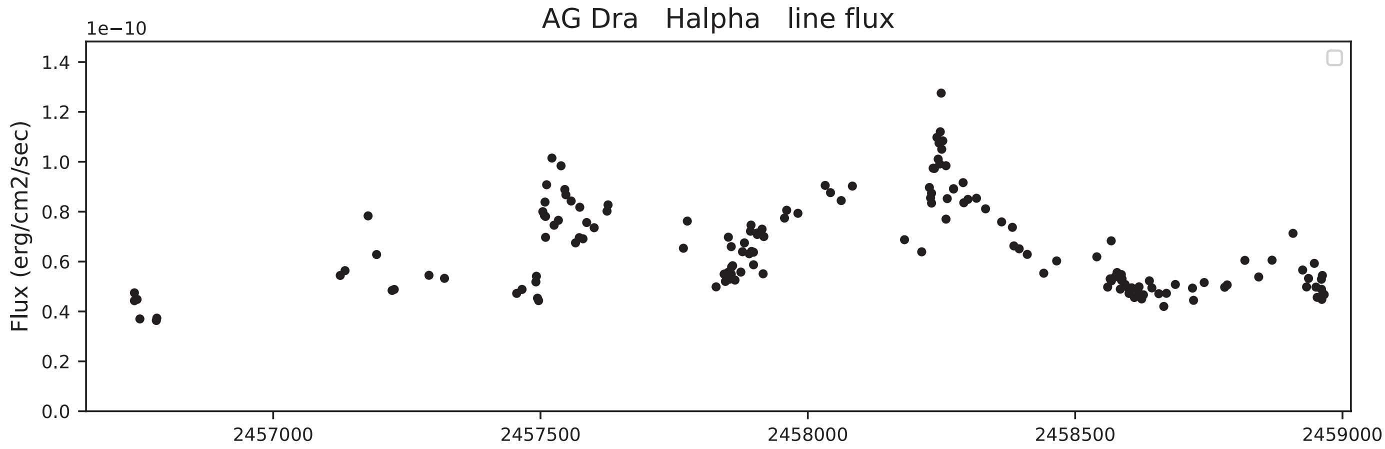

HeI7065 2020-03-28
velocity (km/s)

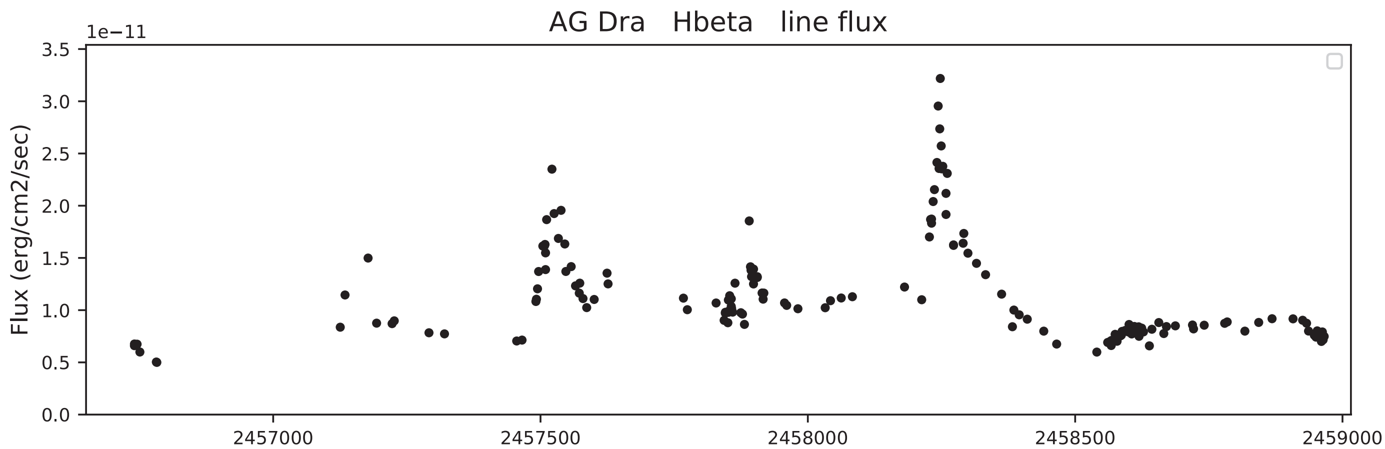
Note on analysing AG Dra flux calibrated spectra

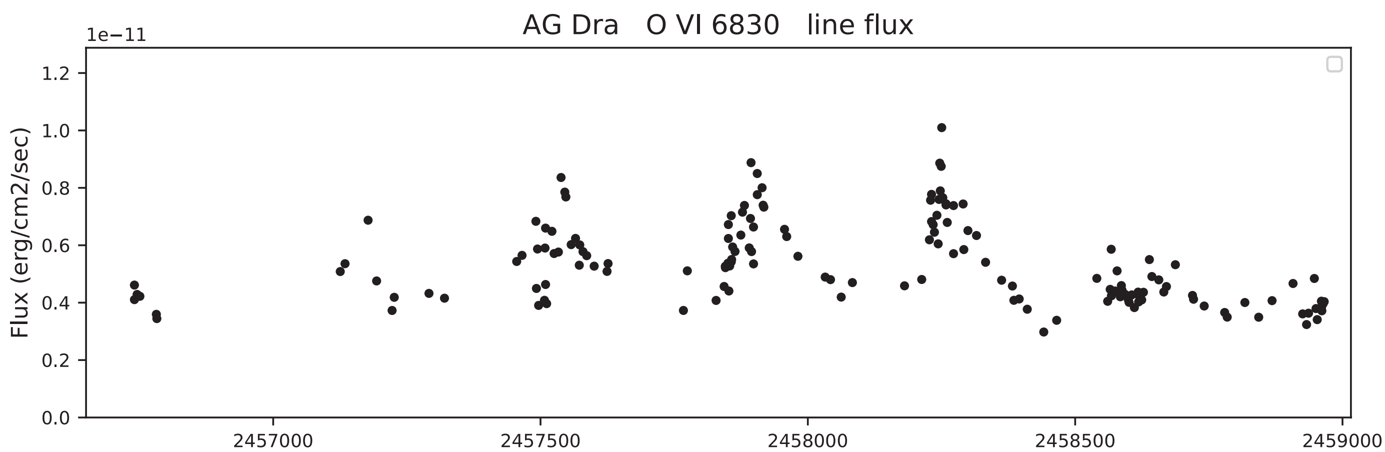
Daily averaged V magnitudes from the AAVSO database are interpolated to the observation times of spectra in the ARAS database. These interpolated V magnitudes are used to calibrate in absolute flux all spectra in the ARAS database which fully span the V filter passband. The total flux in selected emission lines in these spectra is then obtained by interpolating the continuum between the mean continuum on either side of the emission line and numerically integrating the flux in the line above this interpolated continuum. Each spectrum is assigned a quality index according to how well the correction for atmospheric and instrumental losses during the observation has been applied. This quality index is a measure of how consistent the slope of the continuum of this spectrum is with other spectra obtained at the same V magnitude. Only good quality spectra are included in the table and plots of line flux.

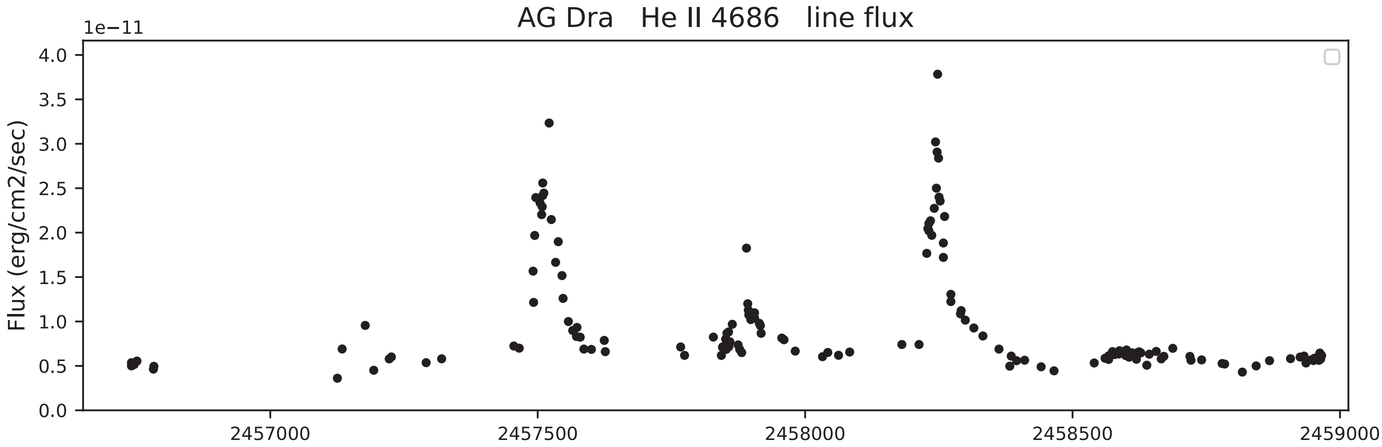
Download:
Flux calibrated spectra:
http://www.astrosurf.com/aras/Aras_DataBase/Flux/AGDra/AGDra_Flux.zip
Intensities of the main lines in units of erg.cm^{-2}.s^{-1}
http://www.astrosurf.com/aras/Aras_DataBase/Flux/AGDra/AGDra_Intensities.csv

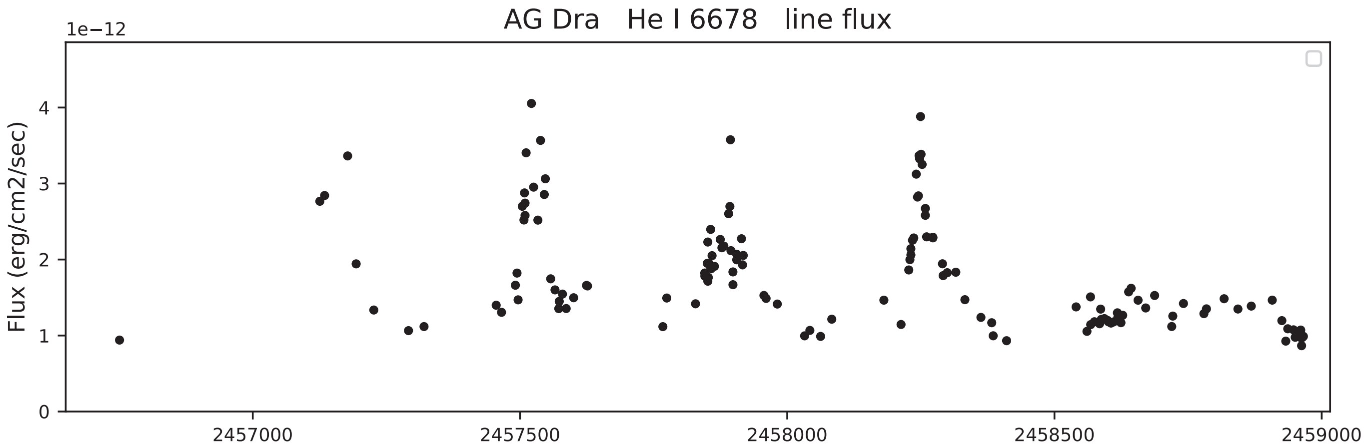


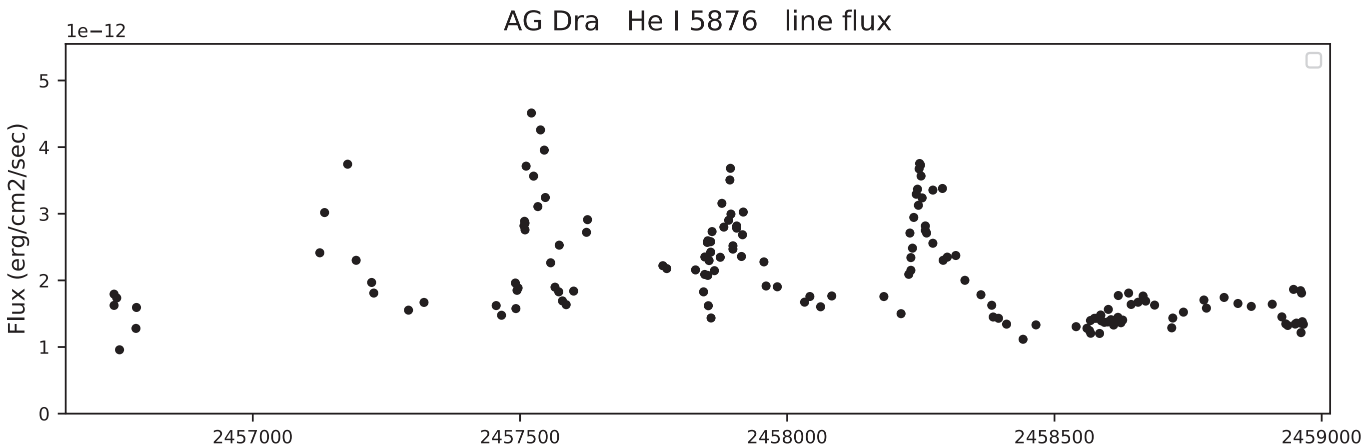

AG Dra Halpha line flux
1e−10
Flux (erg/cm2/sec)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
2457000
2457500
2458000
2458500
2459000


AG Dra Hbeta line flux
1e−11
Flux (erg/cm2/sec)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
2457000
2457500
2458000
2458500
2459000


AG Dra O VI 6830 line flux
1e−11
Flux (erg/cm2/sec)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
2457000
2457500
2458000
2458500
2459000


AG Dra He II 4686 line flux
1e−11
Flux (erg/cm2/sec)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
2457000
2457500
2458000
2458500
2459000


AG Dra He I 6678 line flux
1e−12
Flux (erg/cm2/sec)
0
1
2
3
4
2457000
2457500
2458000
2458500
2459000


AG Dra He I 5876 line flux
1e−12
Flux (erg/cm2/sec)
0
1
2
3
4
5
2457000
2457500
2458000
2458500
2459000

Extracting measures in 2020 as an example

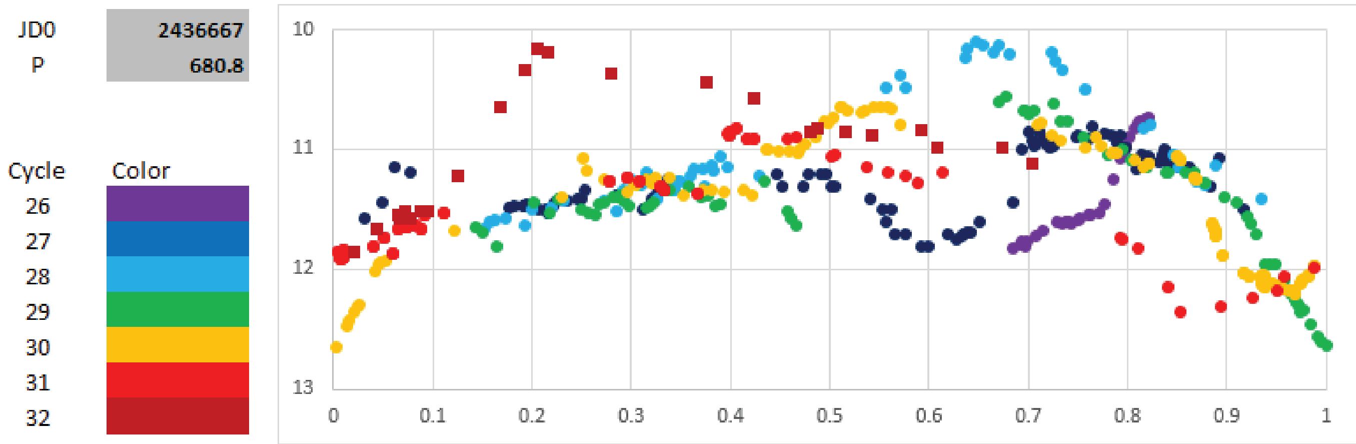
Date	JD	Hα	Hβ	He II 4686	He I 5876	He I 6678	O VI 6830	O VI 7088
22/01/2020	2458870.575	55.4	9.33	5.5	2.2	0.0	3.8	
18/02/2020	2458897.621	63.8	8.94	5.5	2.2	0.0	4.5	
27/02/2020	2458907.493	71.3	9.17	5.8	1.6	1.5	4.7	
16/03/2020	2458925.481	56.6	9.03	6.0	1.5	1.2	3.6	
17/03/2020	2458926.478	69.8	7.55	4.5	2.6	0.0	5.0	
18/03/2020	2458927.429	63.4	8.19	5.5	1.6	1.1	4.2	
24/03/2020	2458932.812	49.8	8.75	6.1	1.3	0.9	3.2	
26/03/2020	2458934.522	55.3	7.78	5.1	2.1	0.0	4.2	
27/03/2020	2458936.484	53.2	8.00	5.3	1.3	1.1	3.6	
28/03/2020	2458936.741	55.0	7.69	5.4	1.2	1.1	3.7	1.2
02/04/2020	2458942.410	55.1	7.71	5.3	2.0	0.0	3.9	
04/04/2020	2458944.387	55.7	7.48	5.5	1.4	1.0	3.8	
07/04/2020	2458947.343	59.3	7.60	5.7	1.9	1.1	4.8	
09/04/2020	2458948.524	52.2	7.53	5.5	2.3	0.0	4.3	
10/04/2020	2458950.444	53.2	7.93	5.6	2.1	0.0	4.2	
10/04/2020	2458950.479	49.8	7.42	5.6	1.3	1.0	3.8	
13/04/2020	2458952.731	45.6	8.02	5.9	1.4	0.0	3.4	
21/04/2020	2458960.548	52.9	7.00	5.8	1.8	1.0	4.1	
21/04/2020	2458960.762	48.9	7.13	5.6	1.4	1.1	3.8	
21/04/2020	2458961.383	44.8	7.46	6.0	1.2	1.0	3.7	
22/04/2020	2458962.382	54.4	7.91	6.4	1.8	0.9	3.9	1.6
24/04/2020	2458963.775	47.1	7.16	5.8	1.4	1.0	4.0	
26/04/2020	2458965.773	46.8	7.48	6.2	1.3	1.0	4.0	

Intensities of the main lines (2020) in units of 10^{-12} erg.cm^{-2}.s^{-1}

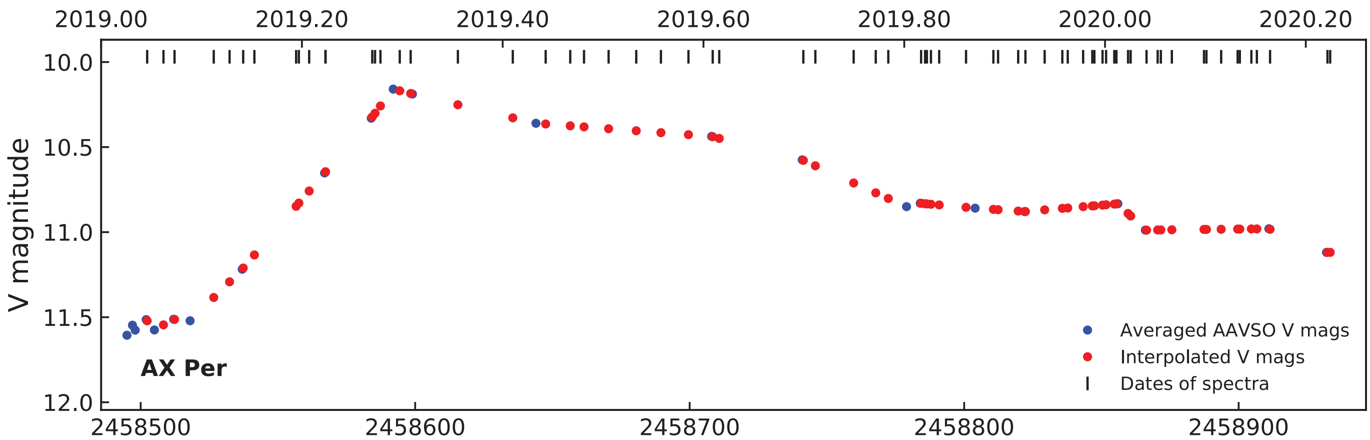
AX Per

Coordinates (2000.0)	
R.A.	01 36 22.7
Dec	+54 15 02.4
Mag	10.7 (2019-12)

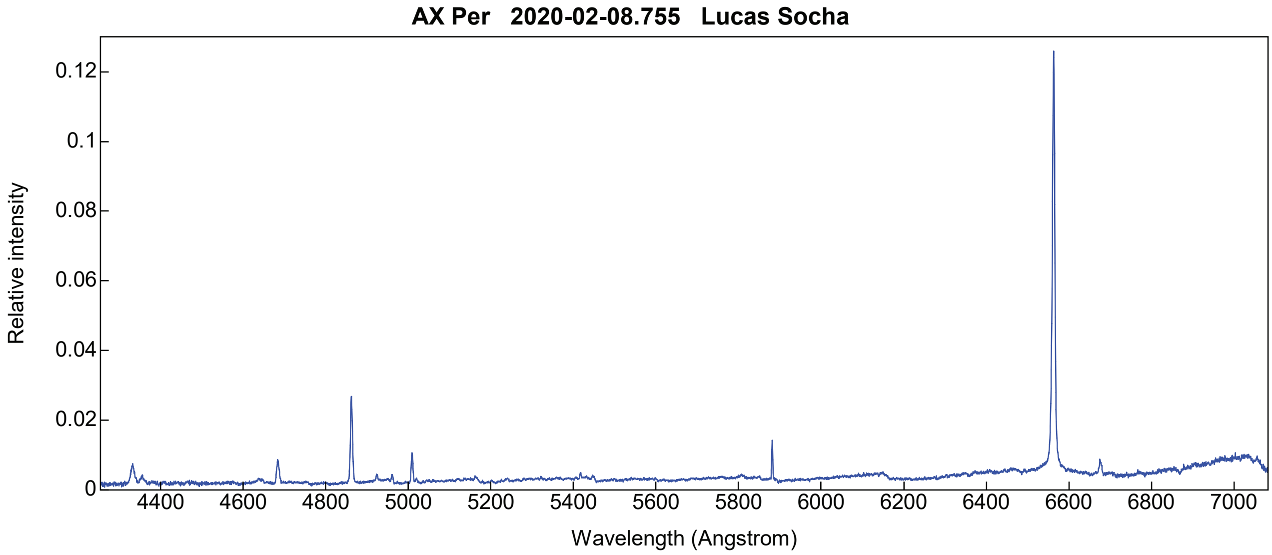
Still in declining outburst. The luminosity (V) is almost stabilized since phase 0.45.
The forbidden lines [Fe VII] reappears slowly.



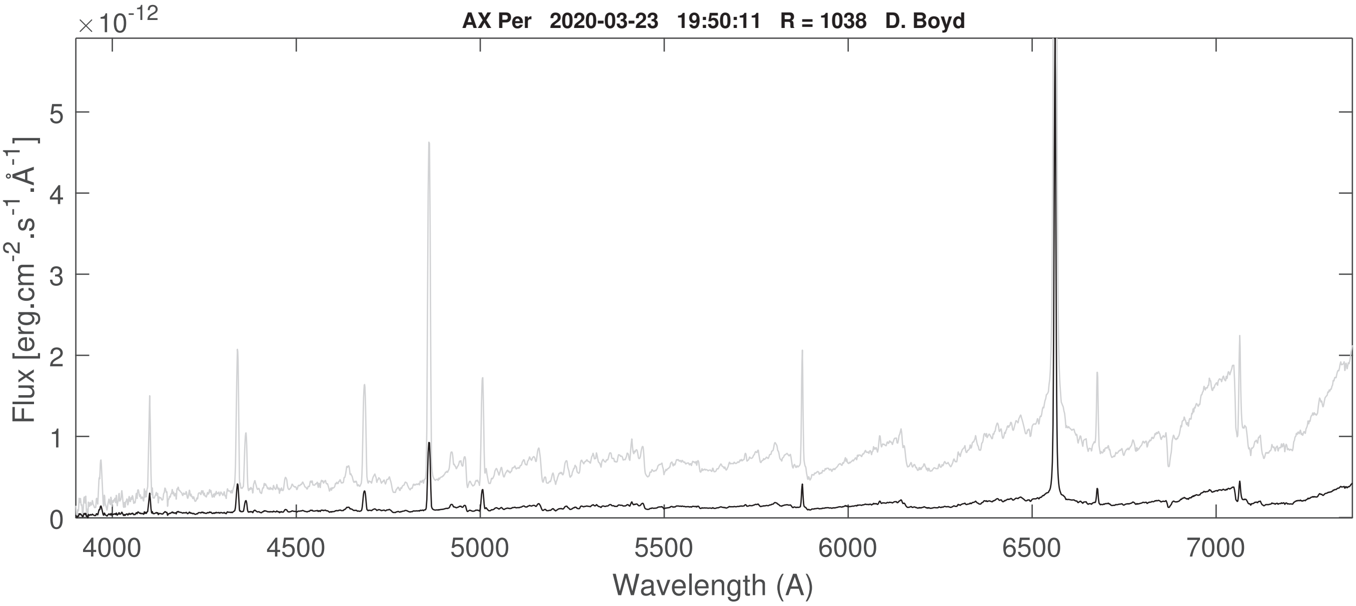
V band lightcurve according to phase (Fekel+,2000) - Current cycle: brown squares.



AAVSO lightcurve (daily averaged and interpolated for the times of spectra) and ARAS spectra (2020)

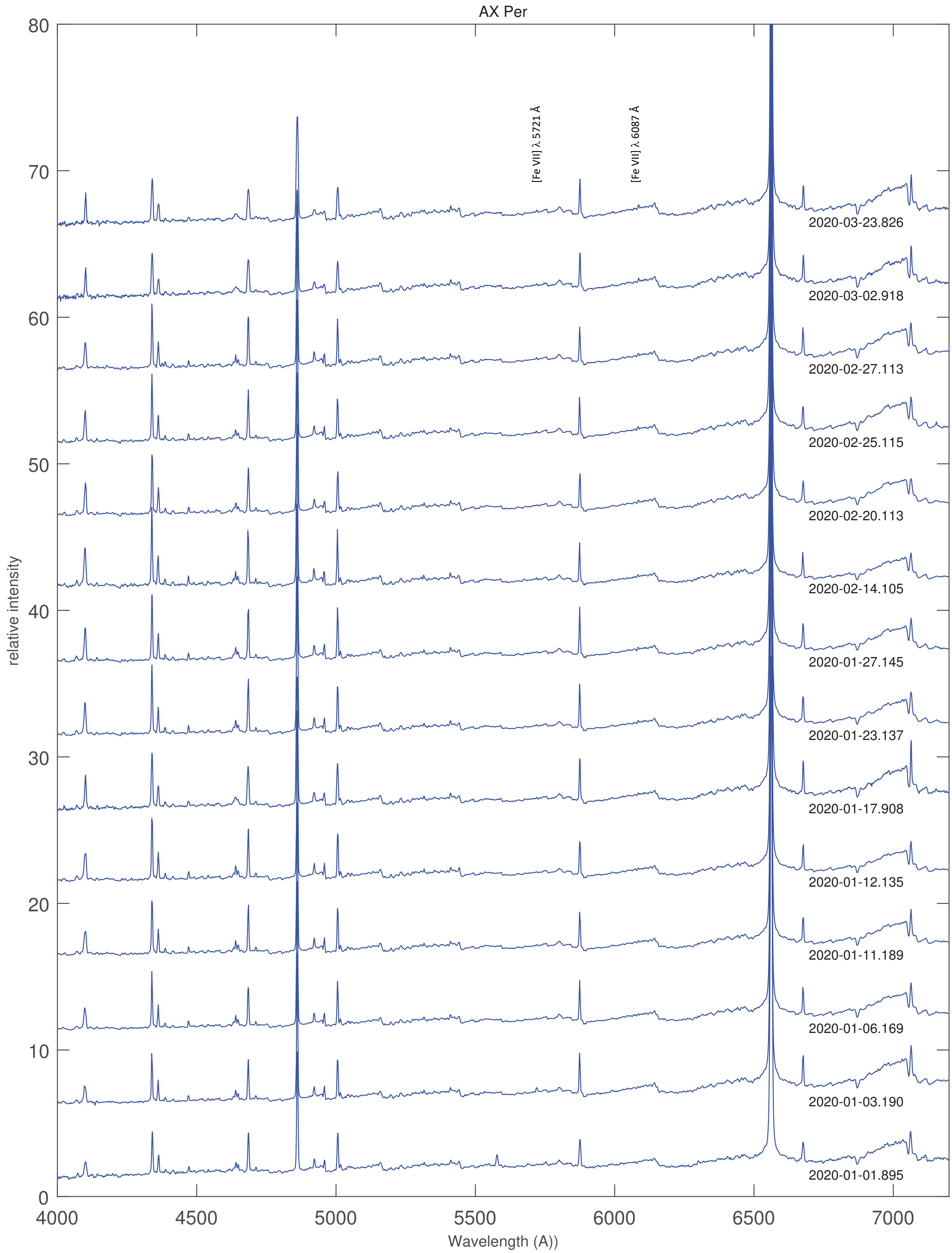


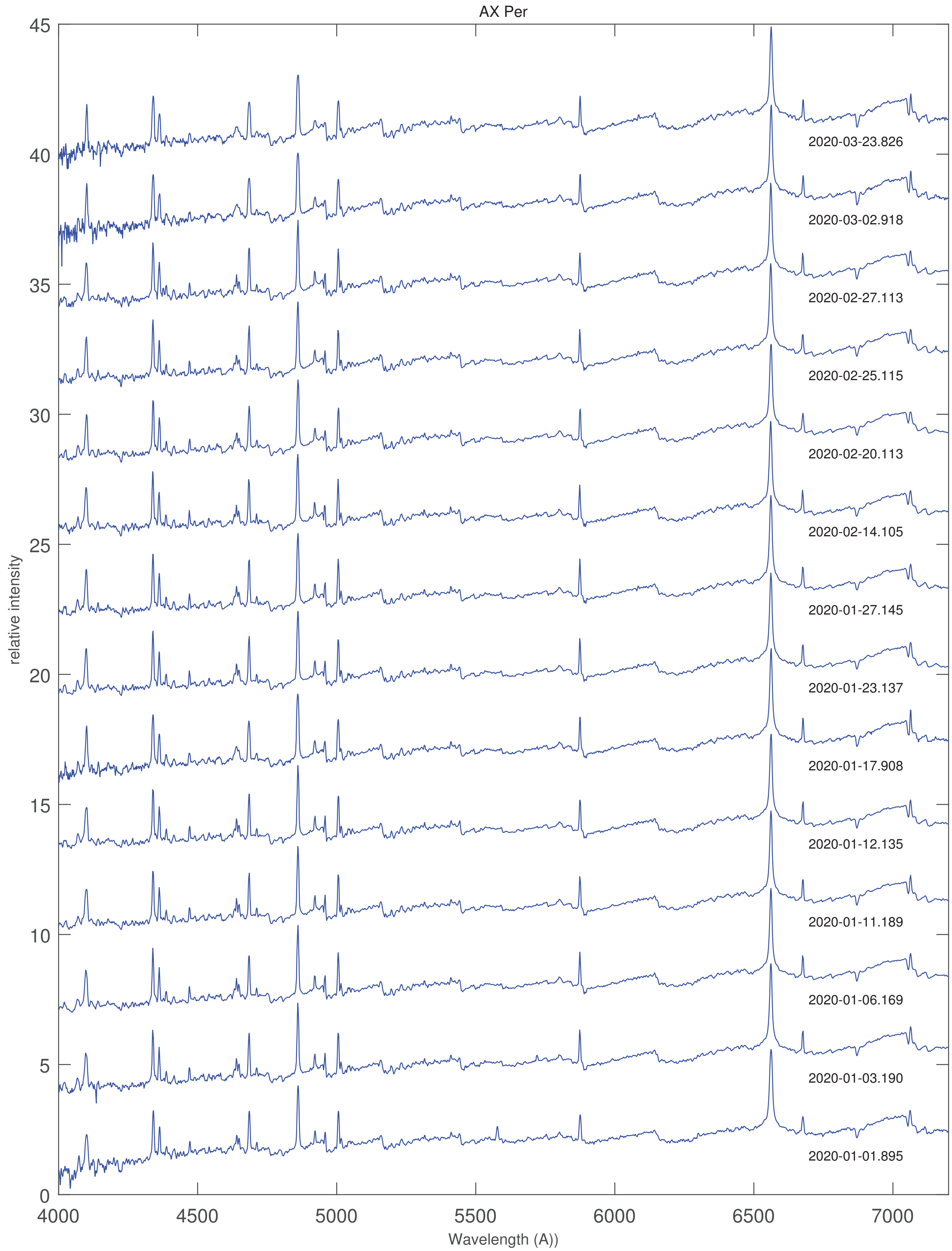
AX Per obtained by Luca Socha with an Alpy (R = 600)



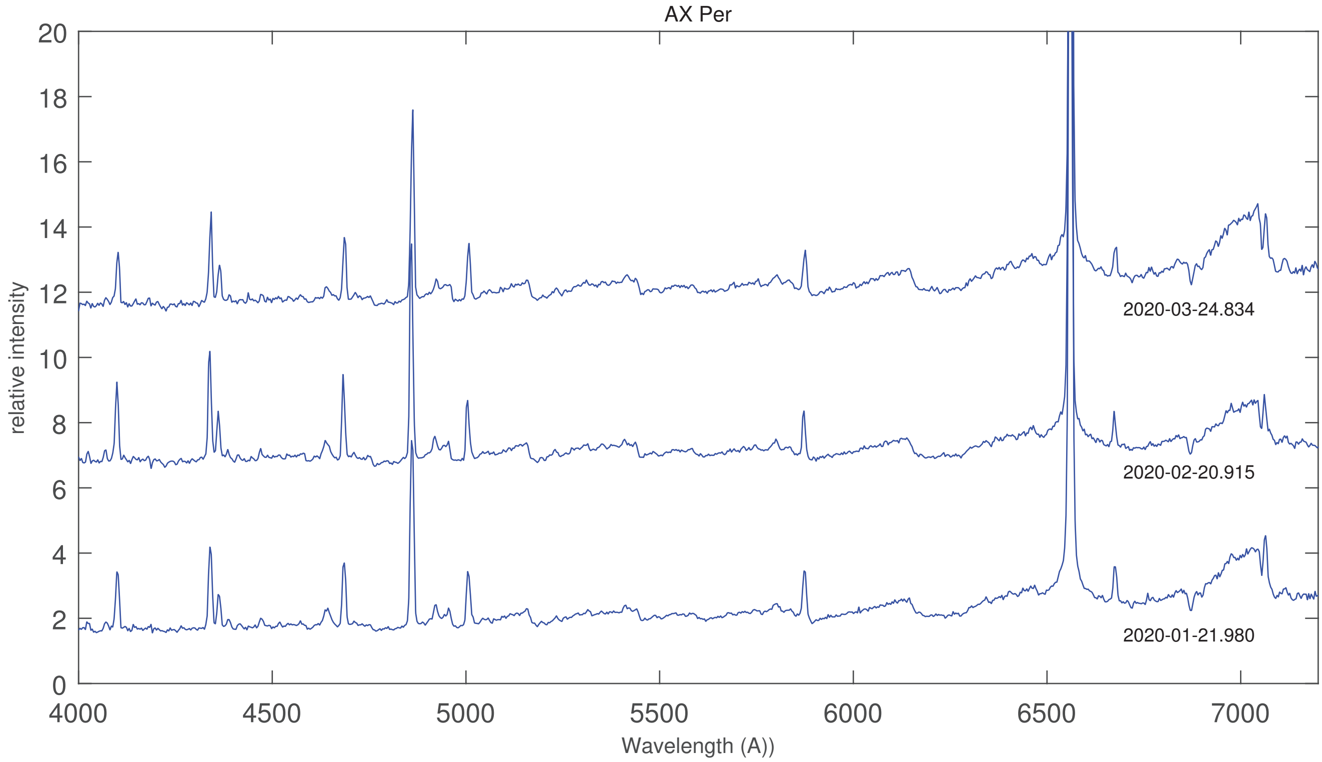
During the quarter 2020-01, [Fe VII] 6087 & 5721 Å lines reappears gently.
Spectrum obtained by David Boyd with a LISA (R = 1000)

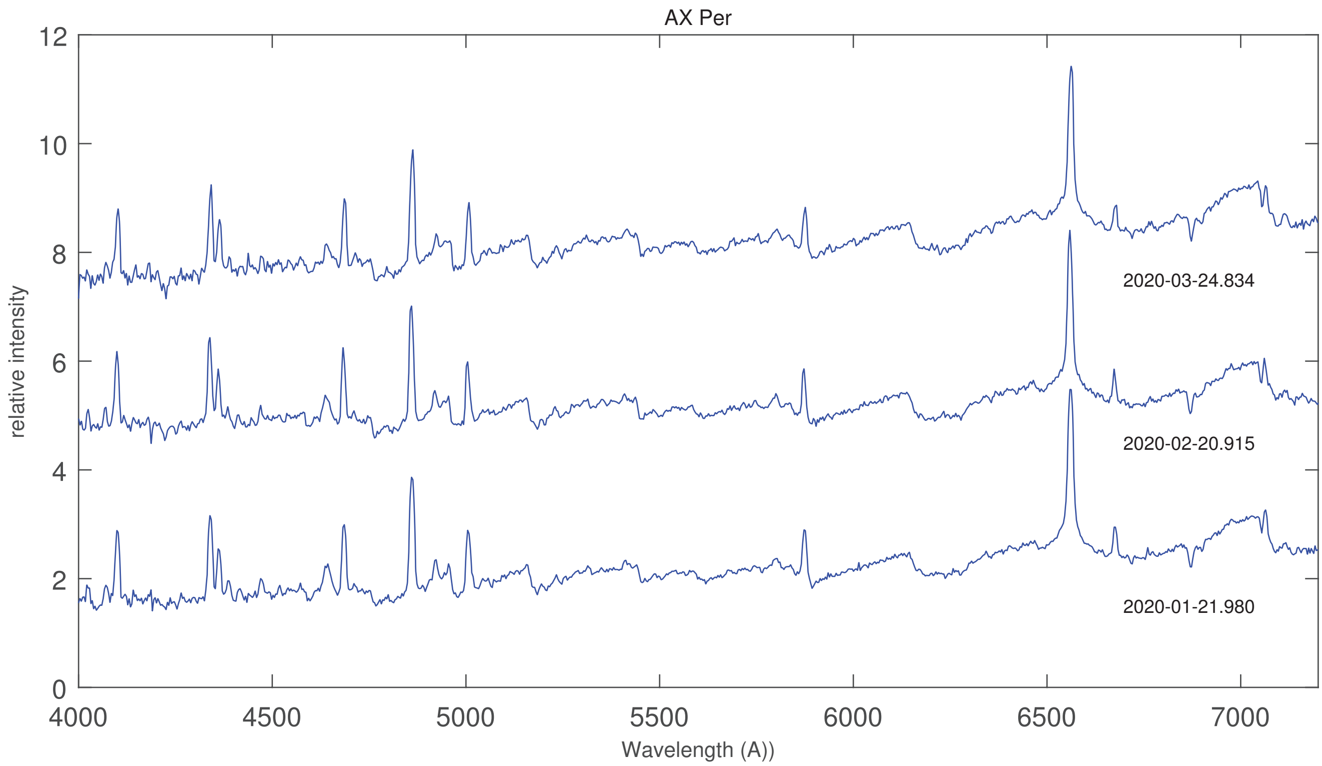
Spectra acquired by F. Sims, D. Boyd, P. Dubovsky with LISA (R = 1000) during the quarter.
Page 17: logarithmic scale
We note the very weak increase of [Fe VII] 6087 Å since mid-January.




AX Per
relative intensity
Wavelength (A))
2020-03-23.826
2020-03-02.918
2020-02-27.113
2020-02-25.115
2020-02-20.113
2020-02-14.105
2020-01-27.145
2020-01-23.137
2020-01-17.908
2020-01-12.135
2020-01-11.189
2020-01-06.169
2020-01-03.190
2020-01-01.895

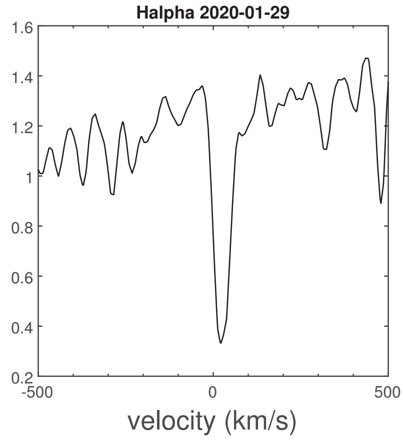
Spectra acquired by C. Boussin with an ALPY (R = 600) during the quarter.
Bottom: logarithmic scale

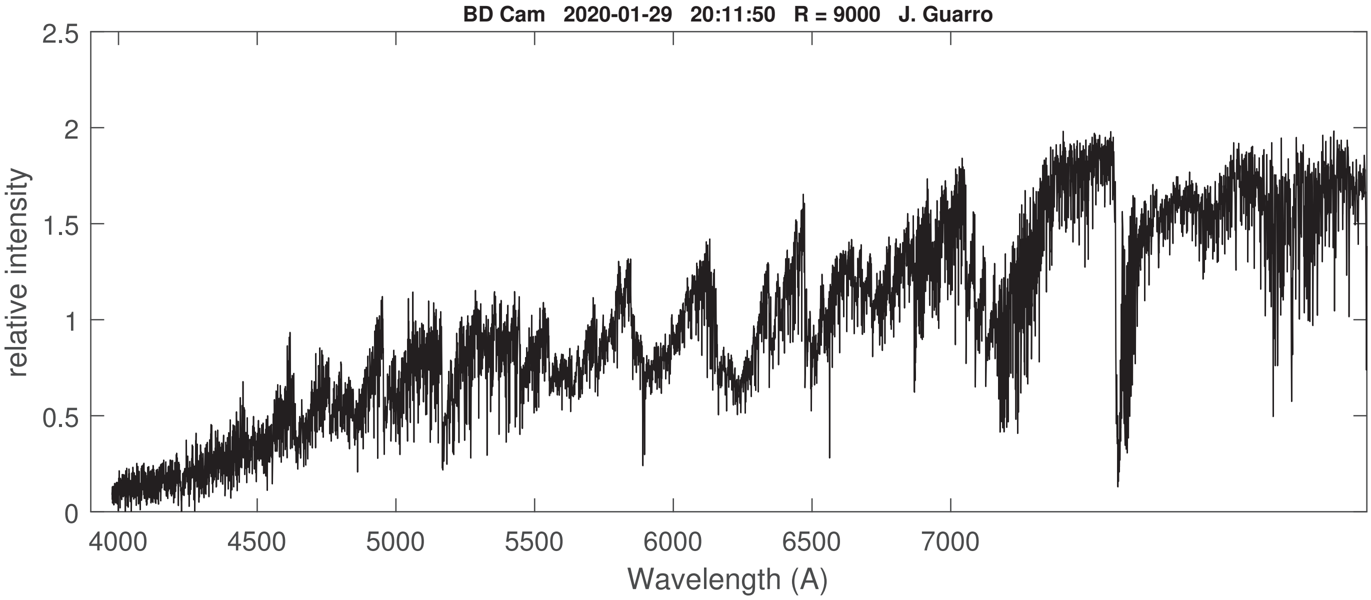


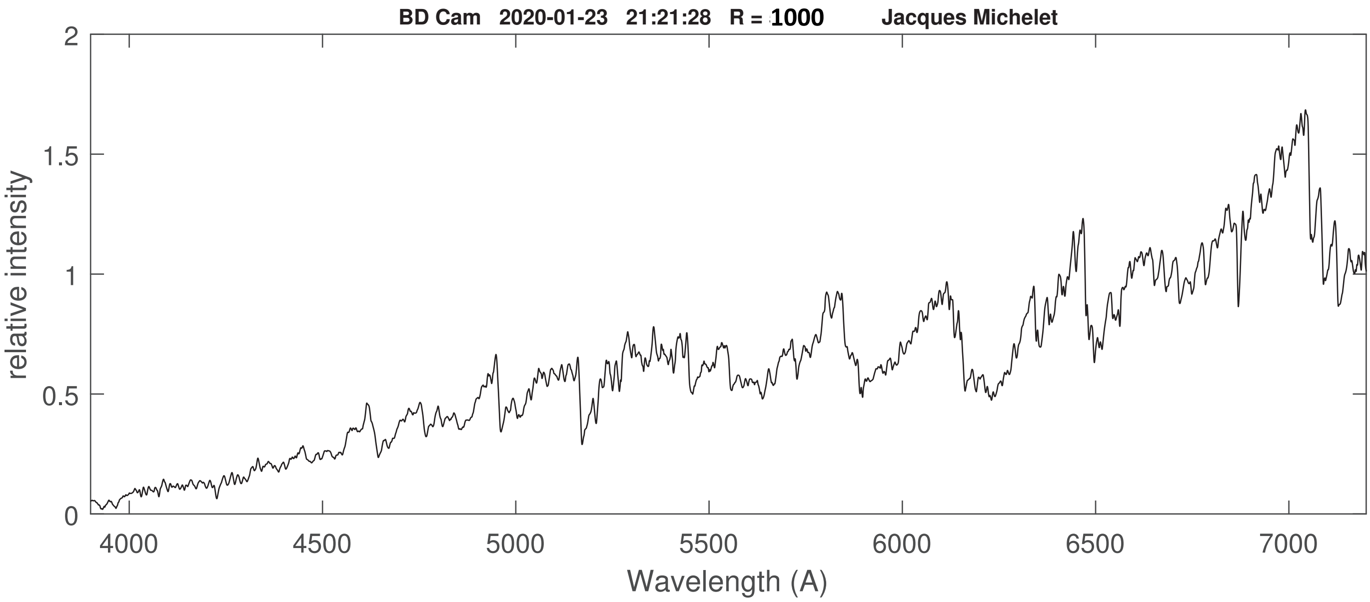


Coordinates (2000.0)	
R.A.	03 42 09.3
Dec	+63 13 00.4
Mag V	5.1

Echelle spectrum obtained by J. Guarro.
As usually no emission lines.

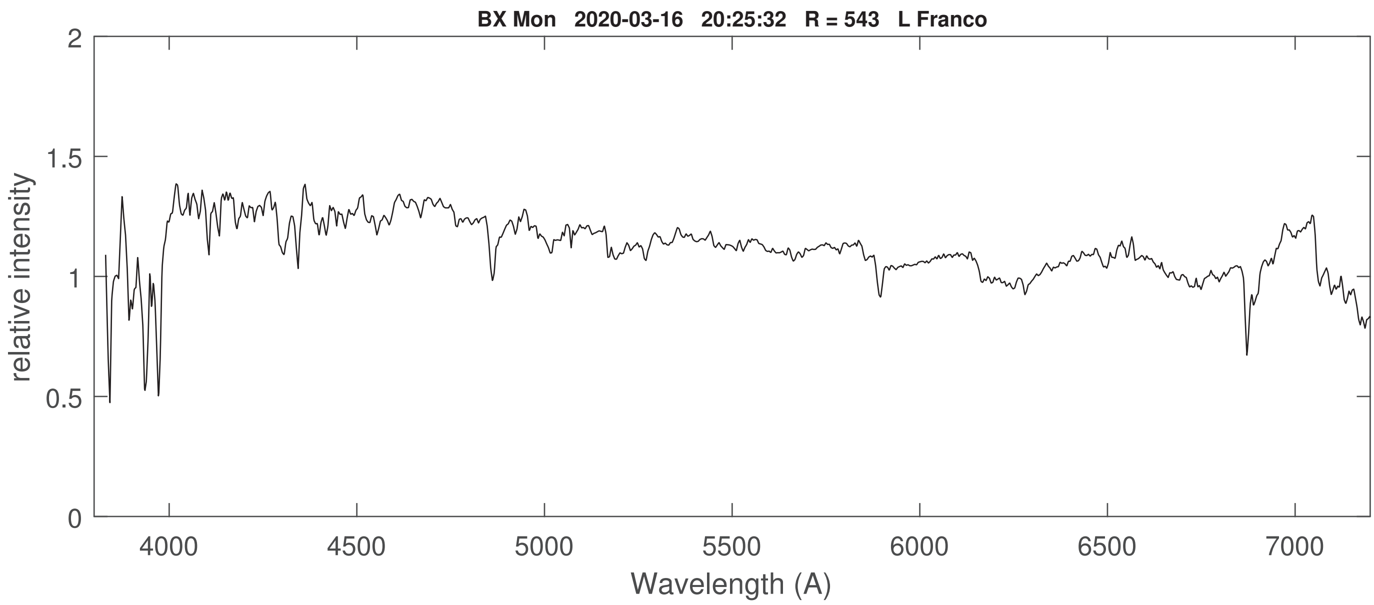


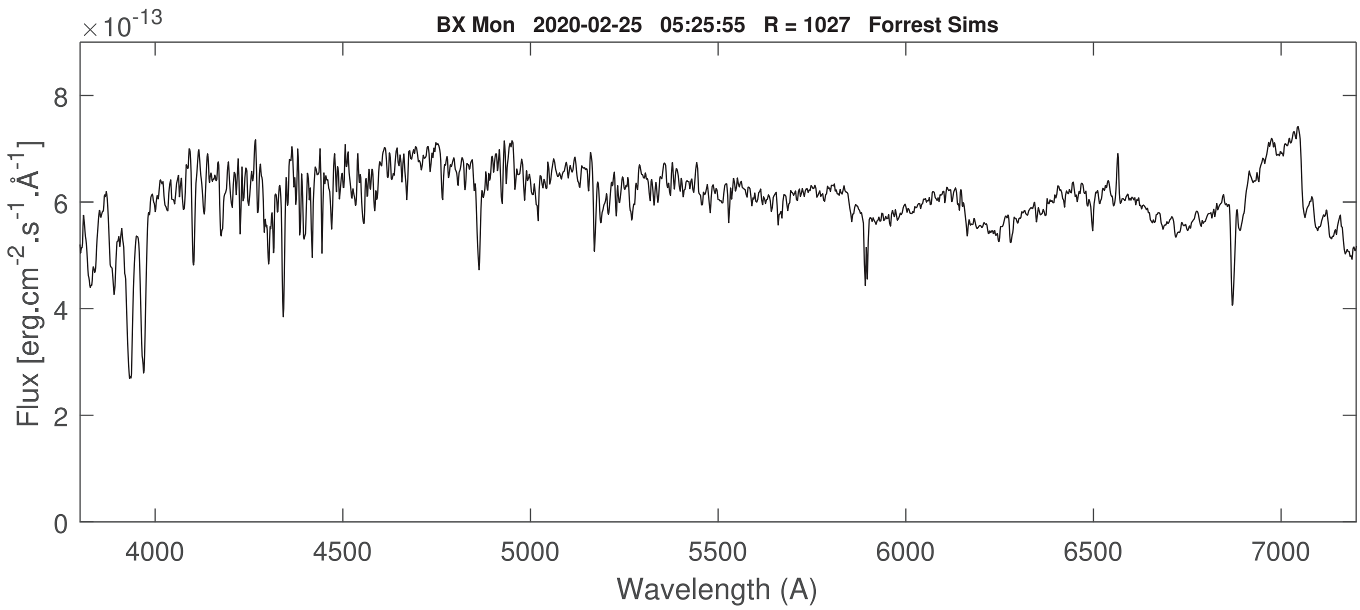




BX Mon

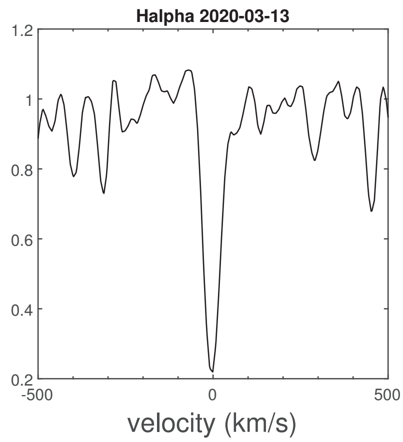
Coordinates (2000.0)	
R.A.	07 25 22.8
Dec	-03 35 50.6
Mag V	9.5

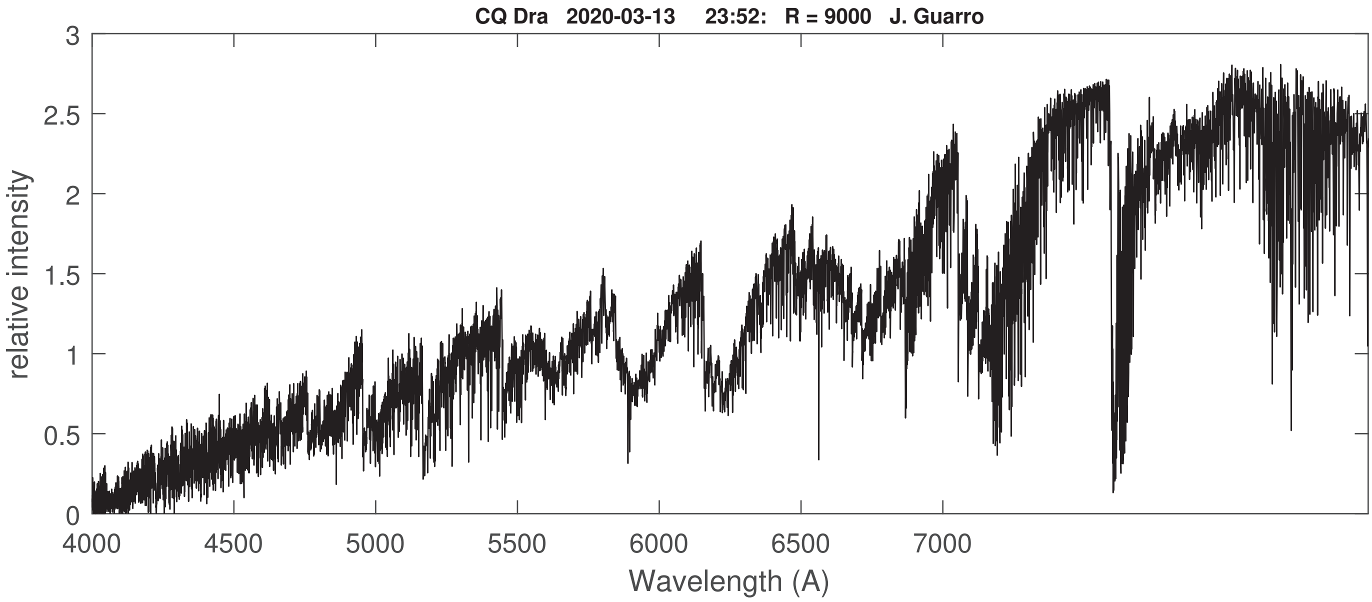




Coordinates (2000.0)	
R.A.	12 30 06.7
Dec	+69 12 04.0
Mag V	4.9

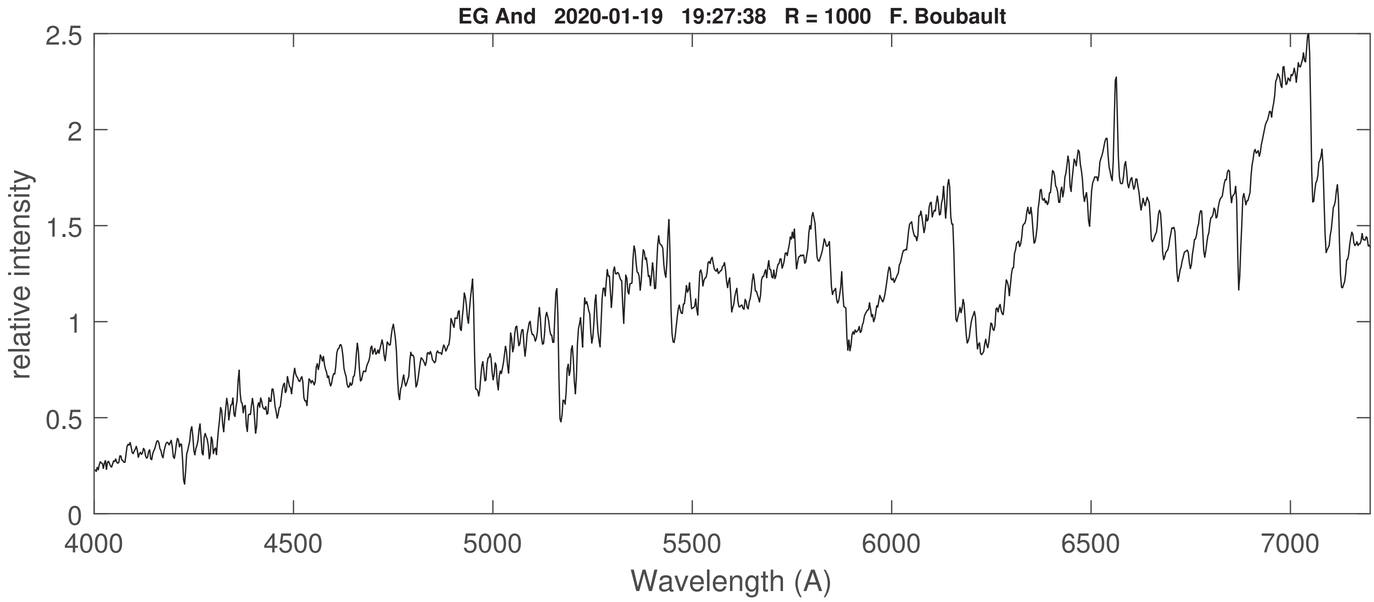
Echelle spectrum obtained by J. Guarro.
As usually no emission lines.





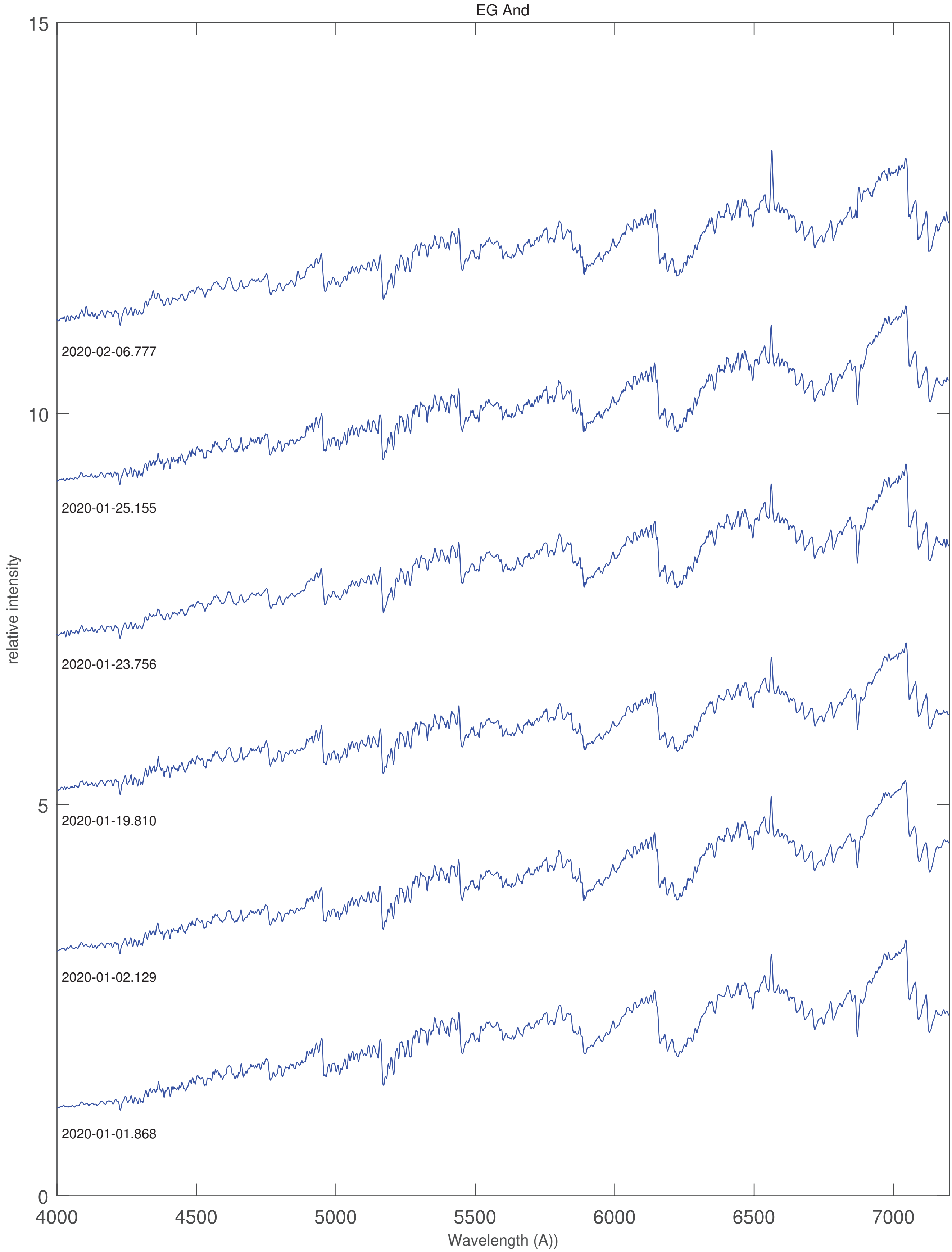
EG And

Coordinates (2000.0)	
R.A.	00 44 37.2
Dec	+40 40 45.7
Mag V	7.4

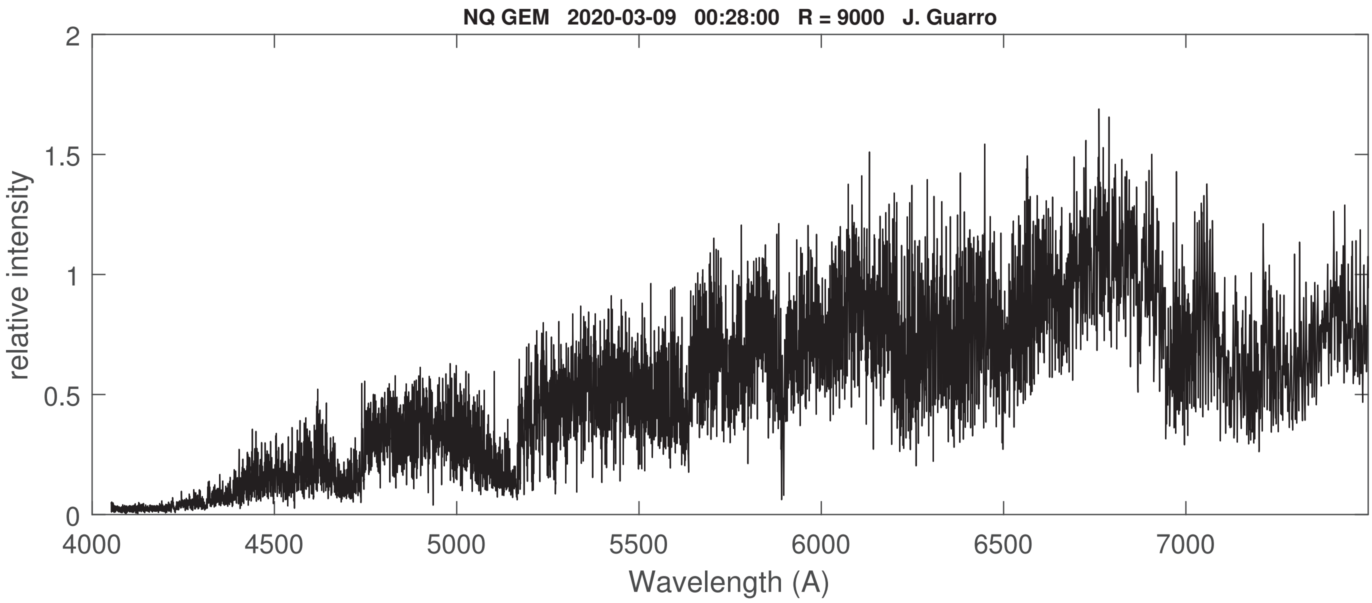


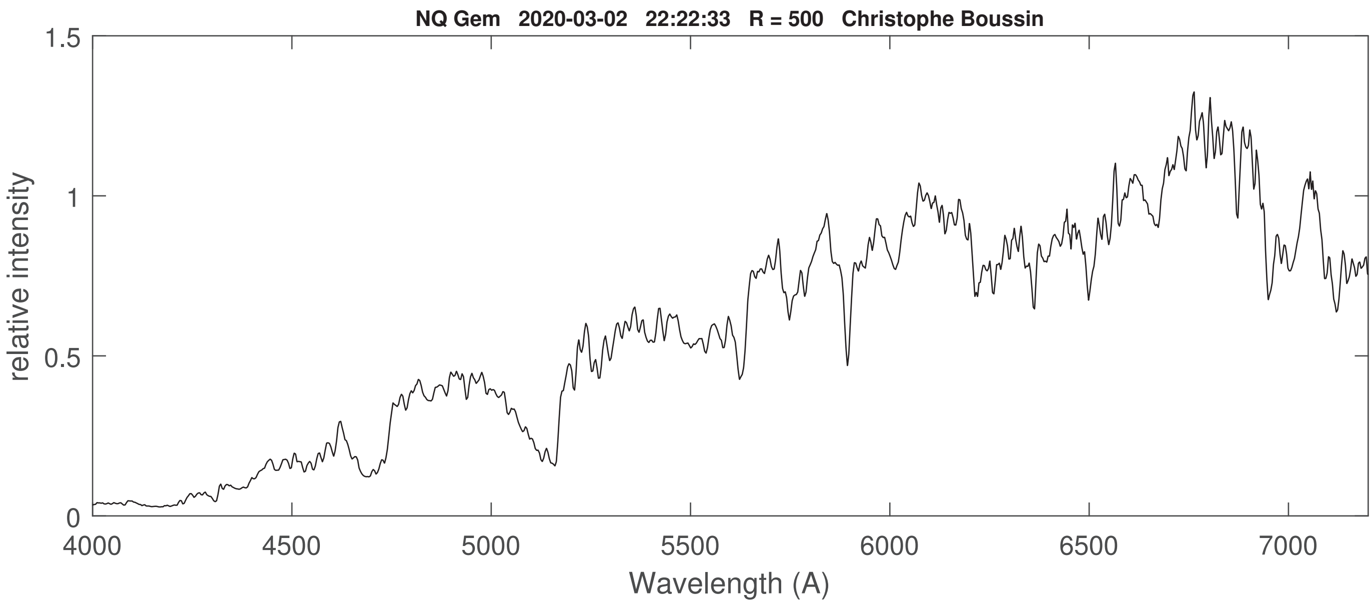
EG And

Series of spectra obtained by P.Dubovski, J. Michelet, F. Boubault and F. Sims with a LISA at R = 1000 during the quarter.



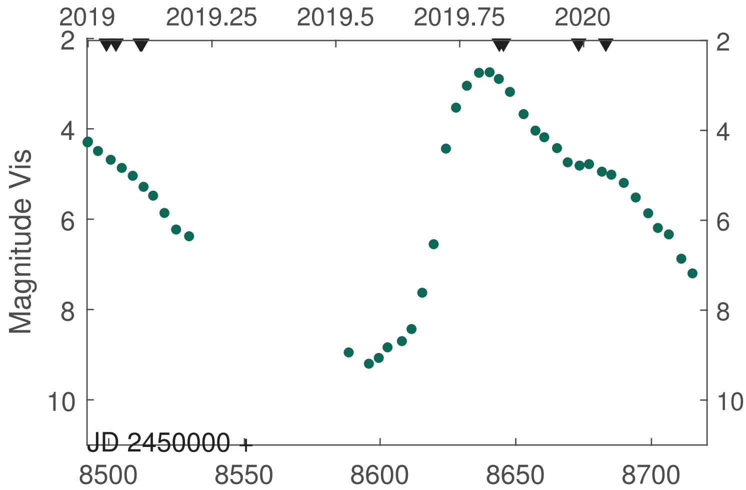
Coordinates (2000.0)	
R.A.	07 31 54.5
Dec	+24 30 12.5
Mag V	8.0



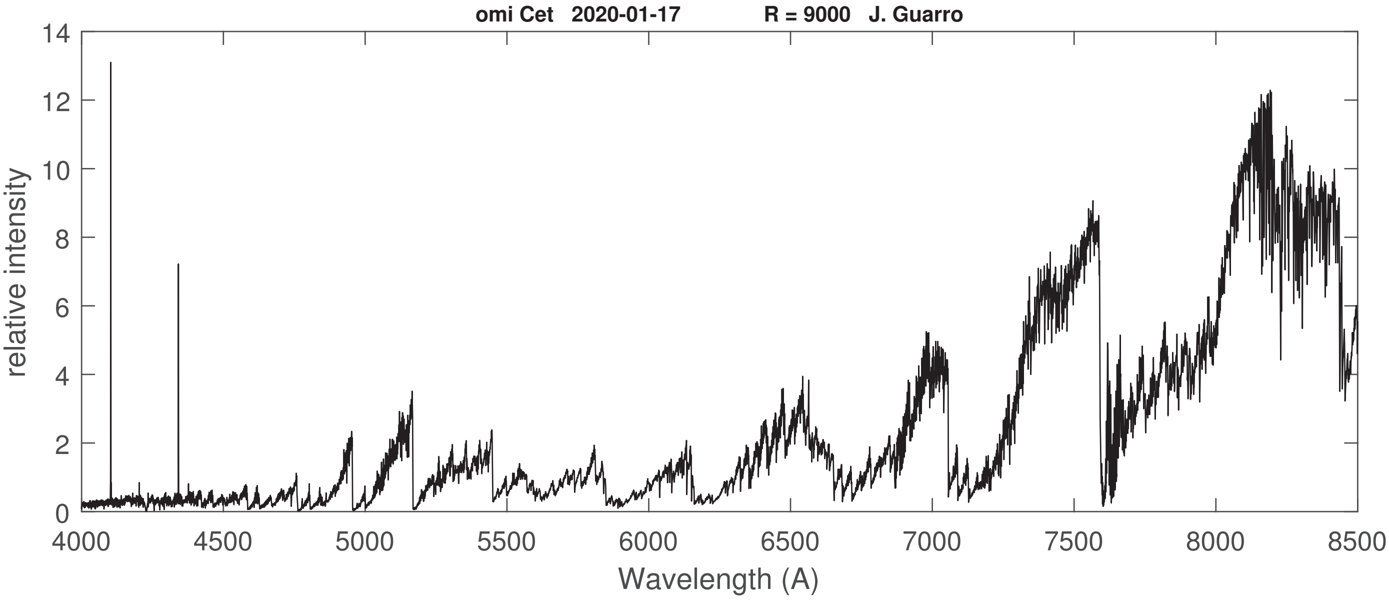


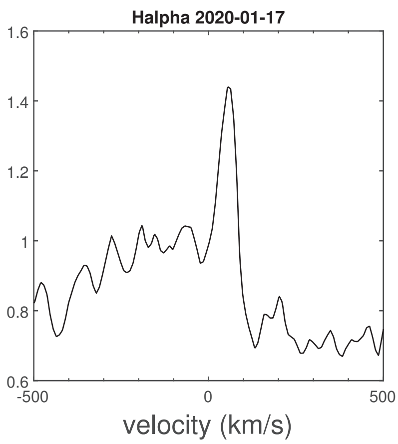
omi Cet

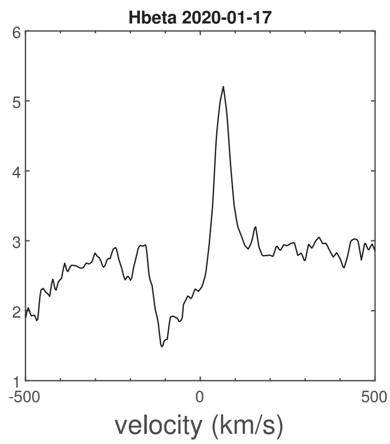
Coordinates (2000.0)	
R.A.	02 19 20.8
Dec	-02 58 39.4
Mag V	

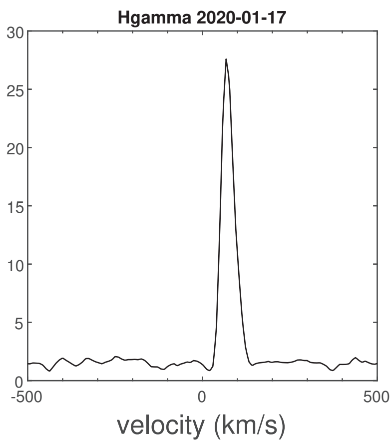


AAVSO visual lightcurve (8 days mean) and ARAS spectra in 2019-2020. Note the unusual plateau during the decline.



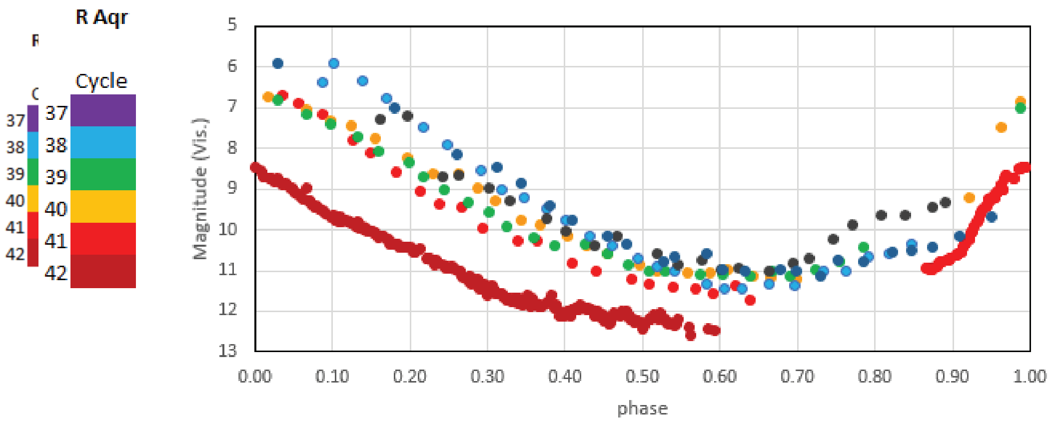






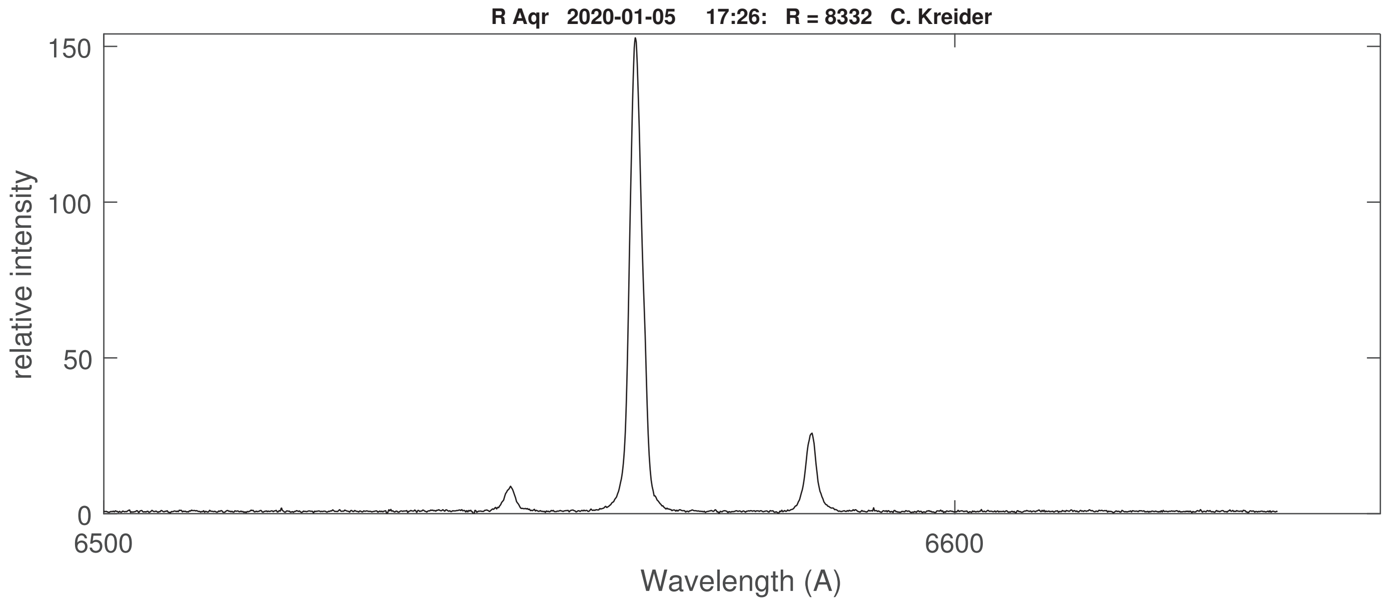
Coordinates (2000.0)	
R.A.	23 43 49.5
Dec	-15 17 04.2
Mag V	12 (2019-12)

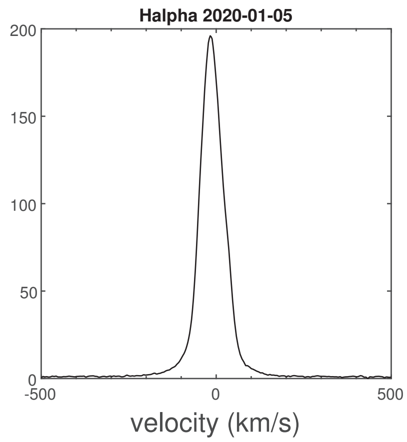
The symbiotic Mira R Aqr in the decline of the pulsation of the red giant. The luminosity of the target during the current pulsation cycle is very low in comparison to previous ones. It suggests an eclipse. Margarita Karovska called for observations of the phenomenon. HST and CHANDRA observations are scheduled on 13th and 14th January, 2020.

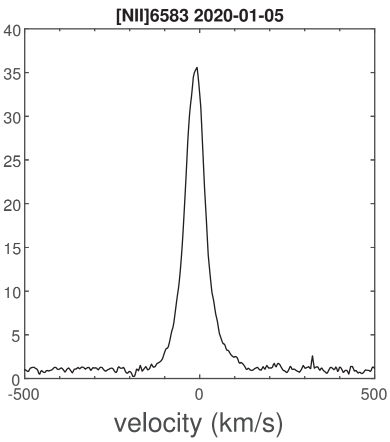


AAVSO Visual light curve (15 days mean) and V band (1 day mean) since phase 41.85 according to the pulsation phase of the Mira computed with Kholopov (1985) ephemeris: Max(V) = 2442398 + 386.96 x E - The pulsation period is slightly adapted (387.00 days) to avoid a shift. The luminosity during the current cycle (brown) is significantly weaker. The delta magnitude is about +2 magnitudes at phase 0.00 in comparison to the 3 previous cycles and +1.5 at phase 0.25.

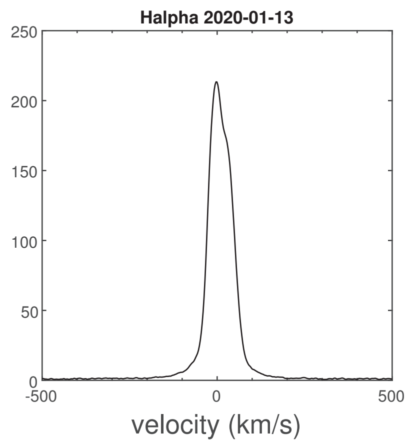
Since phase ~ 0.39, the luminosity oscillates (ΔV ~ 0.25) with a rough period of about two weeks.

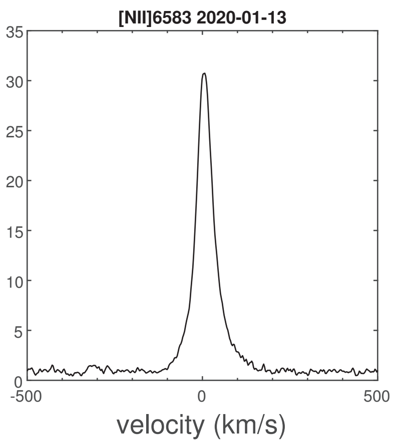






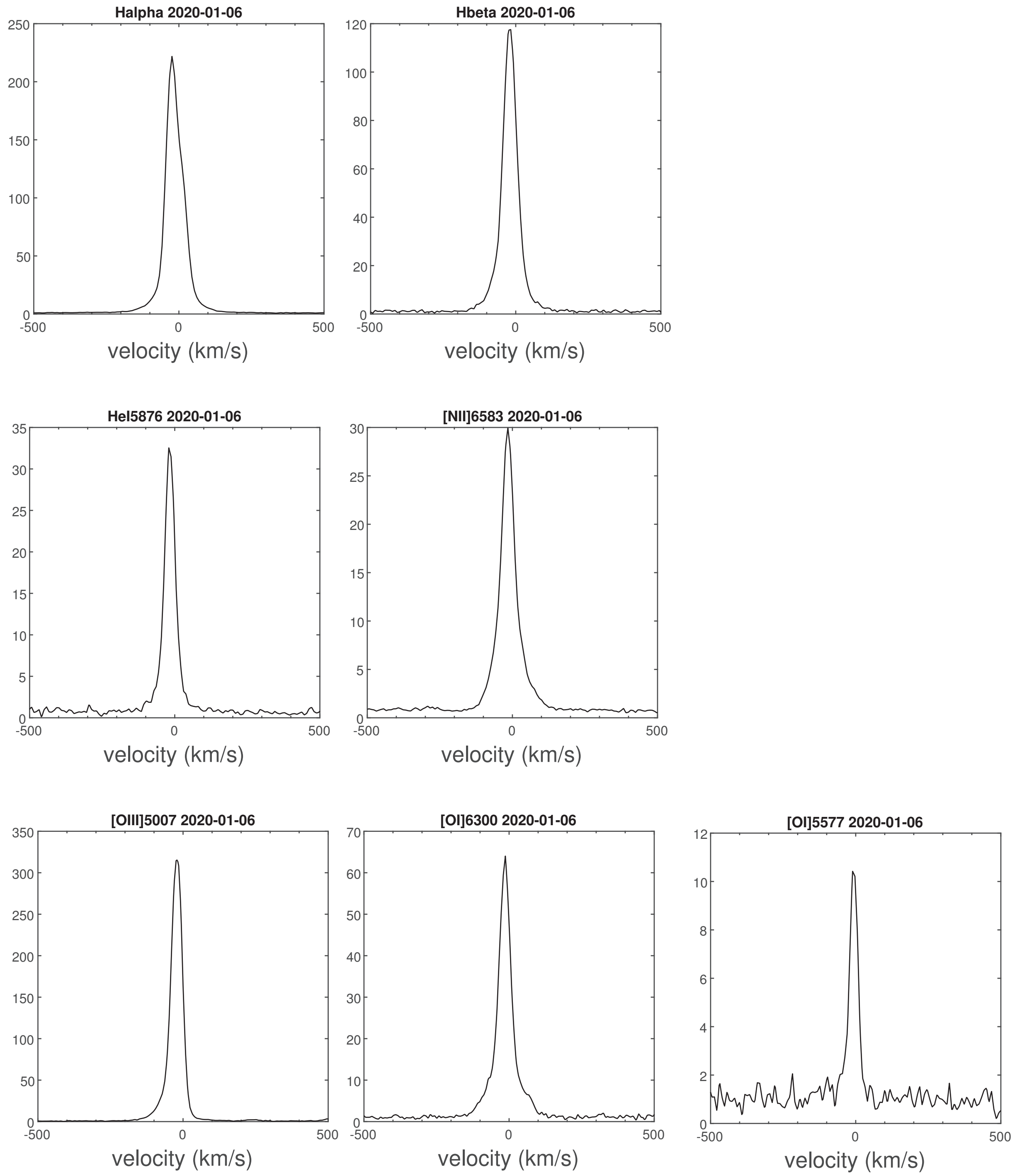
Hα range acquired by Christian Kreider with a Lhires III equiped with a 2400 l/mm gratings.
The FWHM of Hα and [NII] 5683 are respectively 59 and 64 km.s^{-1}.





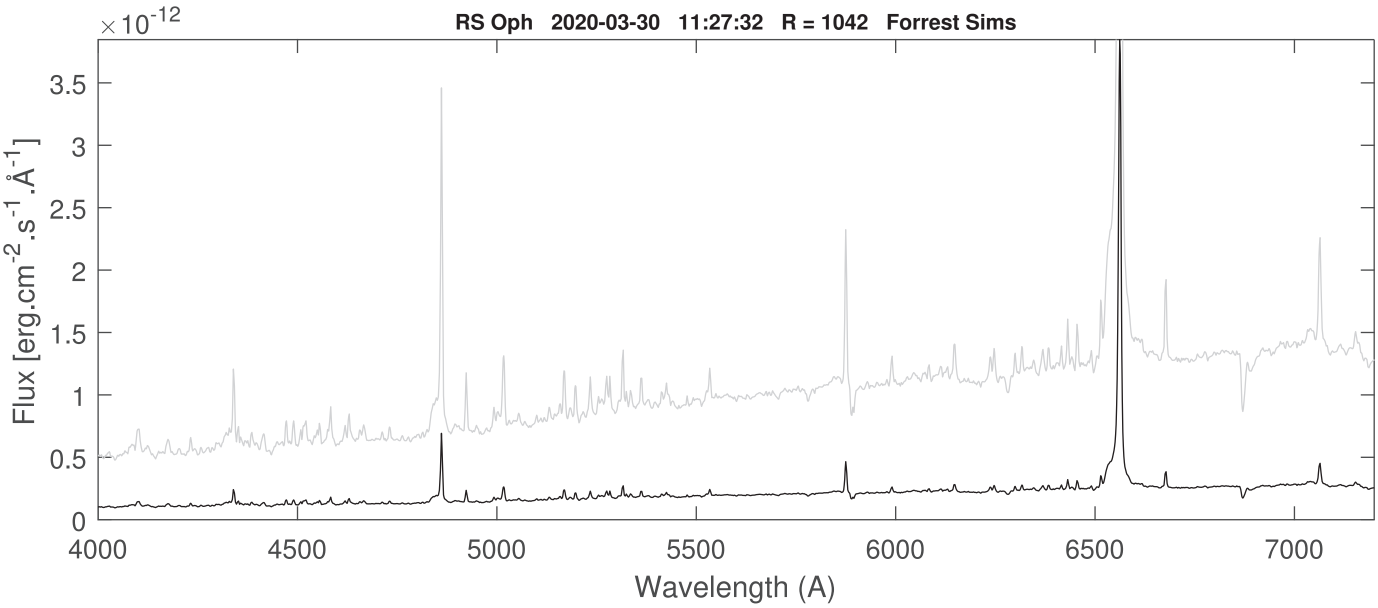
Hα range acquired by James Foster with a Lhires III equiped with a 2400 l/mm gratings.
The FWHM of Hα and [NII] 5683 are respectively 78 and 53 km.s^{-1}.
Note that differences in the Ha profile result from different positions of the target along the slit.
(see P. Berardi,
Some long-slit observations of the symbiotic star R Aquarii in Information letter n°36 2017-07.)

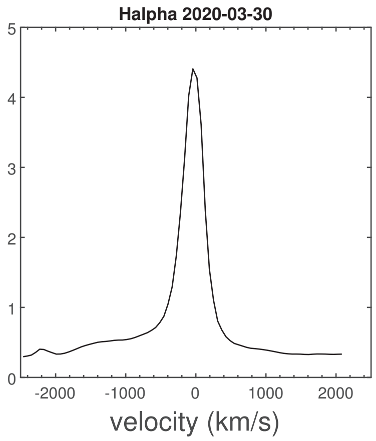
Profiles of the main emission lines from an Echelle spectrum (R = 11000) obtained by Olivier Garde on 2020-01-06.

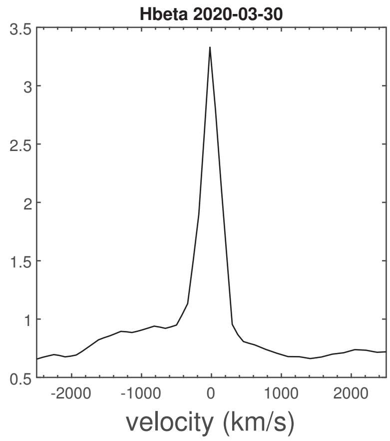


Coordinates (2000.0)	
R.A.	17 47 31.5
Dec	-06 41 39.5
Mag V	1

First spectrum of the new observing period, obtained by Forrest Sims with a LISA at R = 1000.
(see N. Shagatova & A. Skopal in ESIL 2019-Q2).

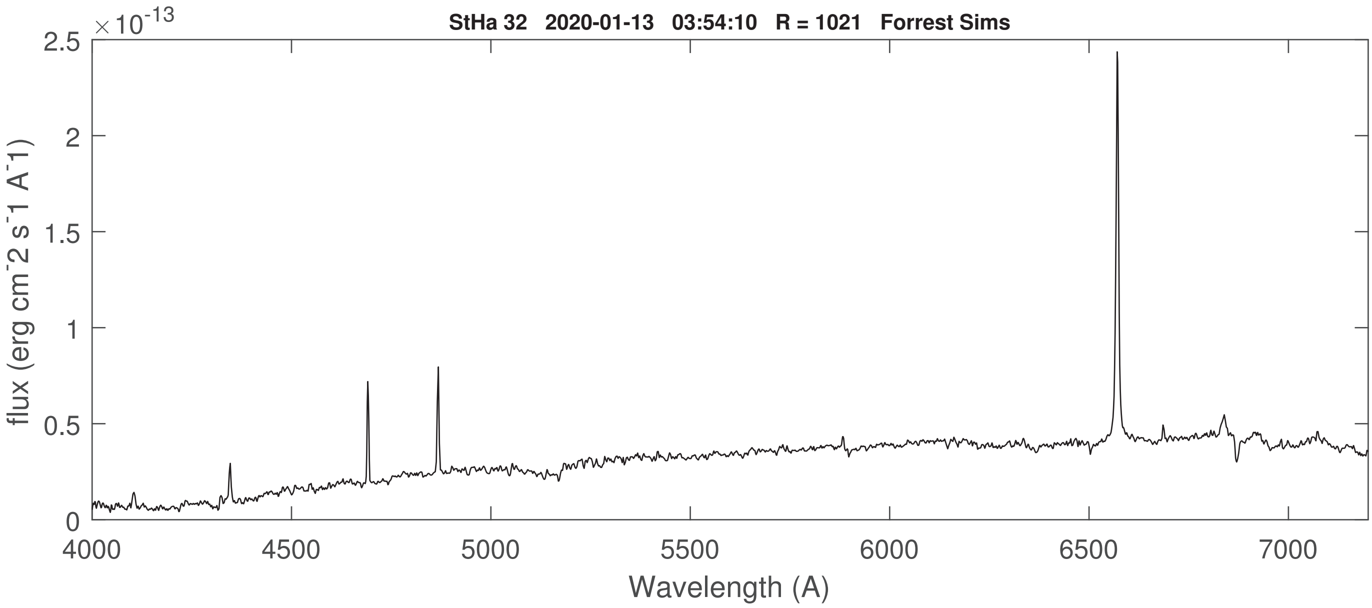






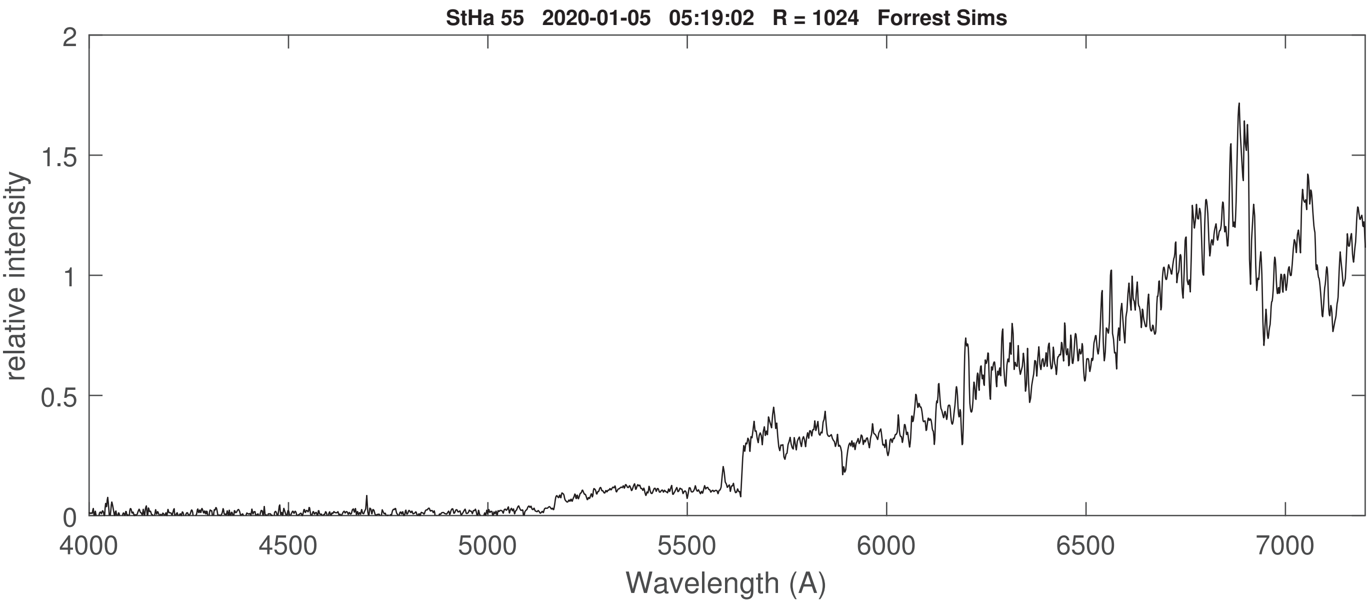
StHa 32

Coordinates (2000.0)	
R.A.	04 37 45.6
Dec	-01 19 11.9
Mag V	



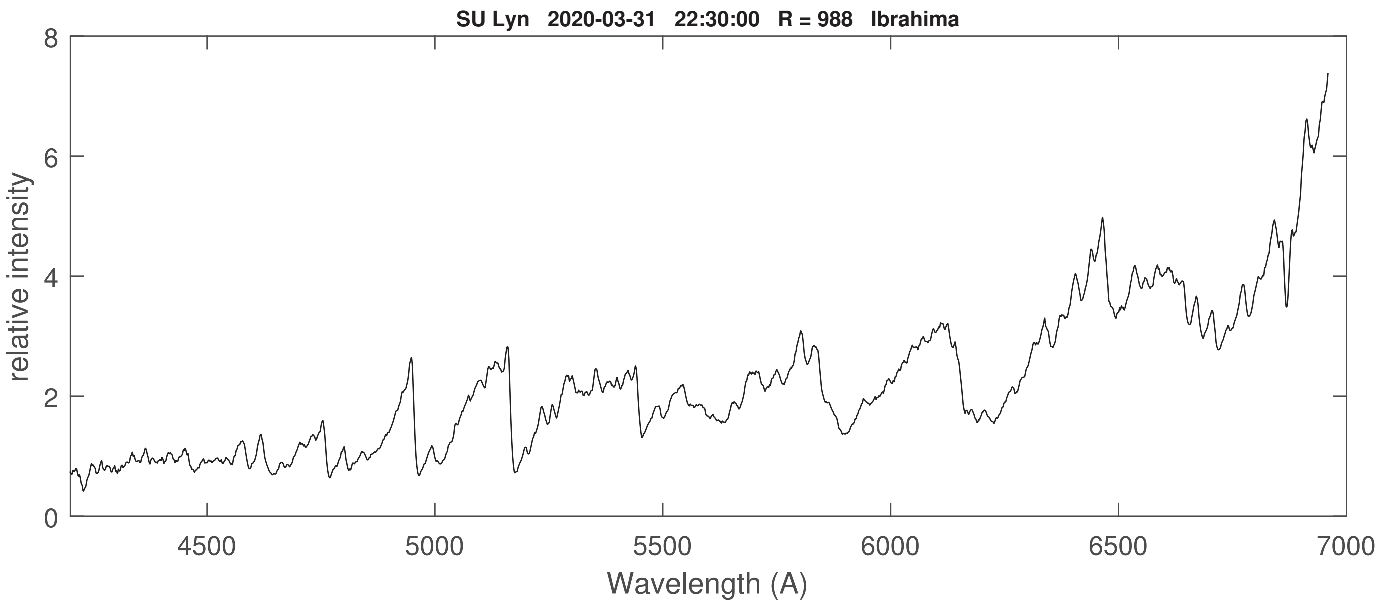
StHa 55

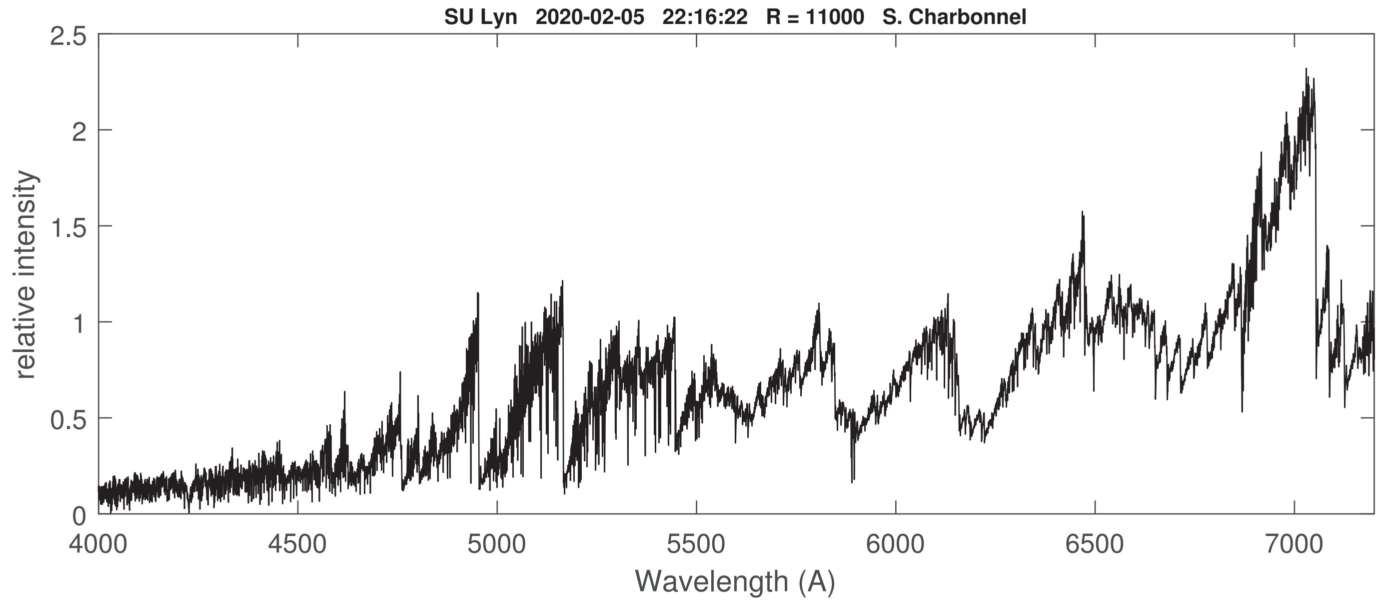
Coordinates (2000.0)	
R.A.	05 46 42.07
Dec	+06 43 47.07
Mag V	

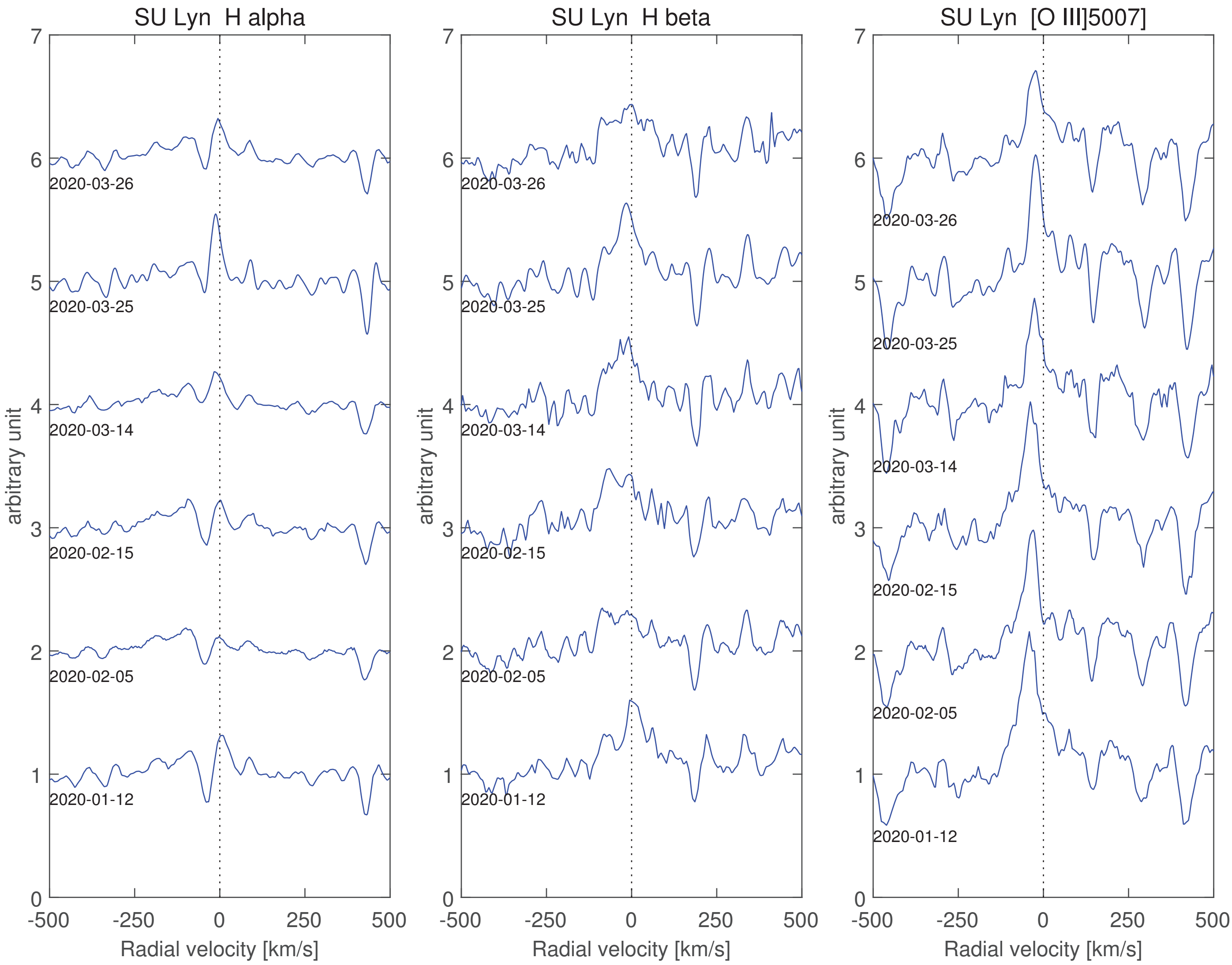


SU Lyn

Coordinates (2000.0)	
R.A.	06 38 45.7
Dec	+55 31 24.9
Mag V	



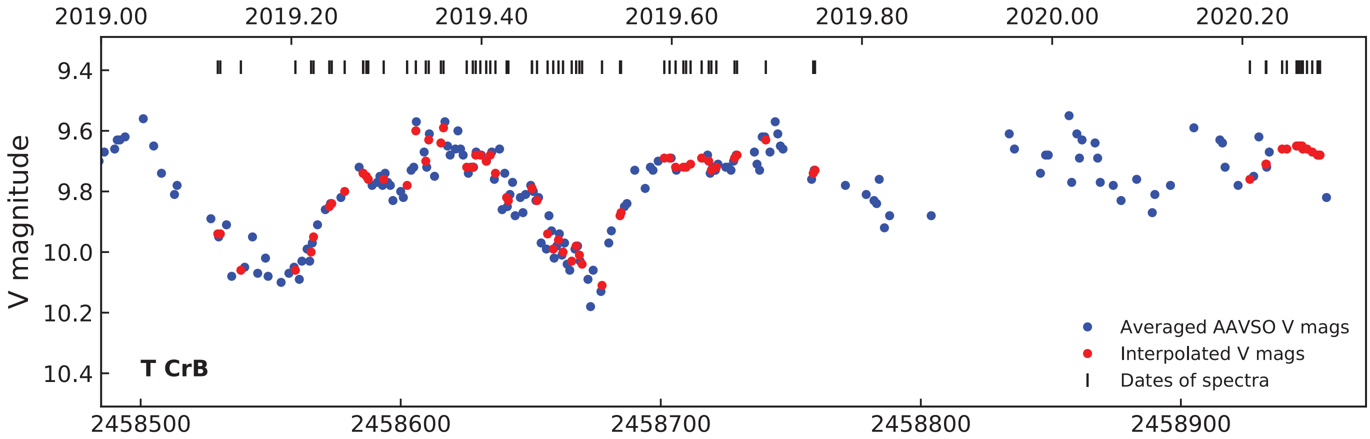




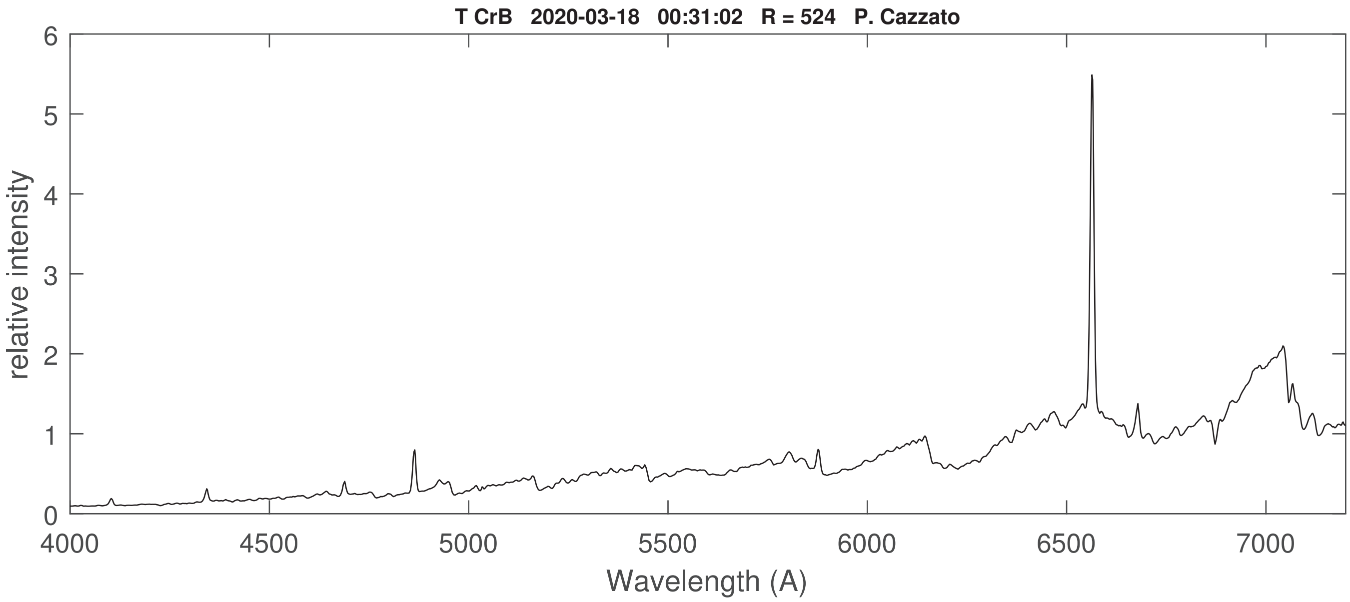
Main emission lines from spectra obtained with Echelle spectroscopes by S. Charbonnel, T. Lester and F. Teyssier

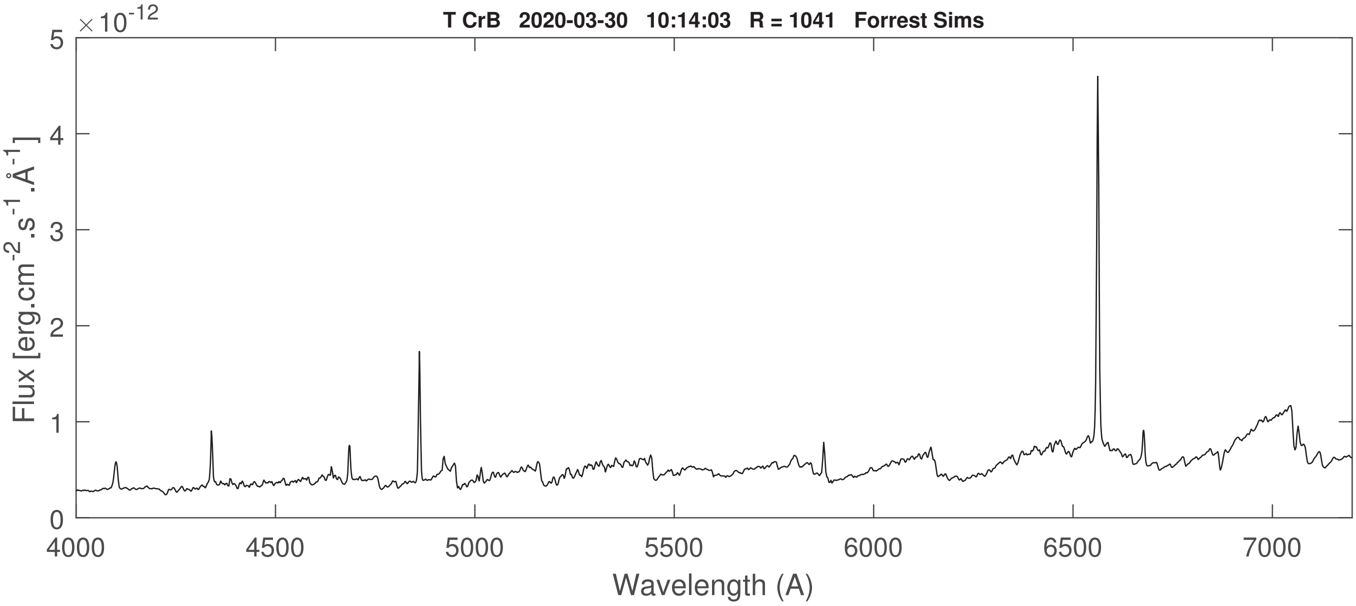
Coordinates (2000.0)	
R.A.	15 57 24.4
Dec	+26 03 38.8
Mag V	9.8

Main target until the next nova event.
See: B. Schaefer in Information Letter n° 44, p. 51.
First spectra obtained late March after the seasonal gap. The seasonal gap should be reduced for the next years.

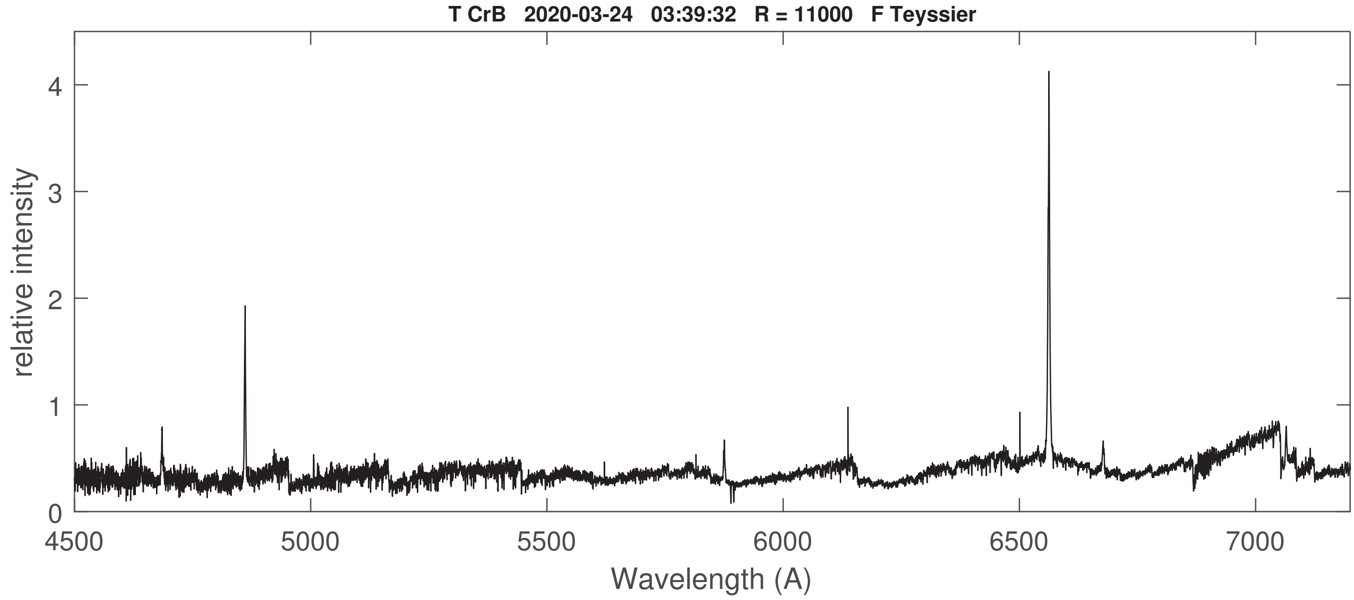


AAVSO lightcurve (daily averaged and interpolated for the times of spectra) and ARAS spectra (2019-2020)

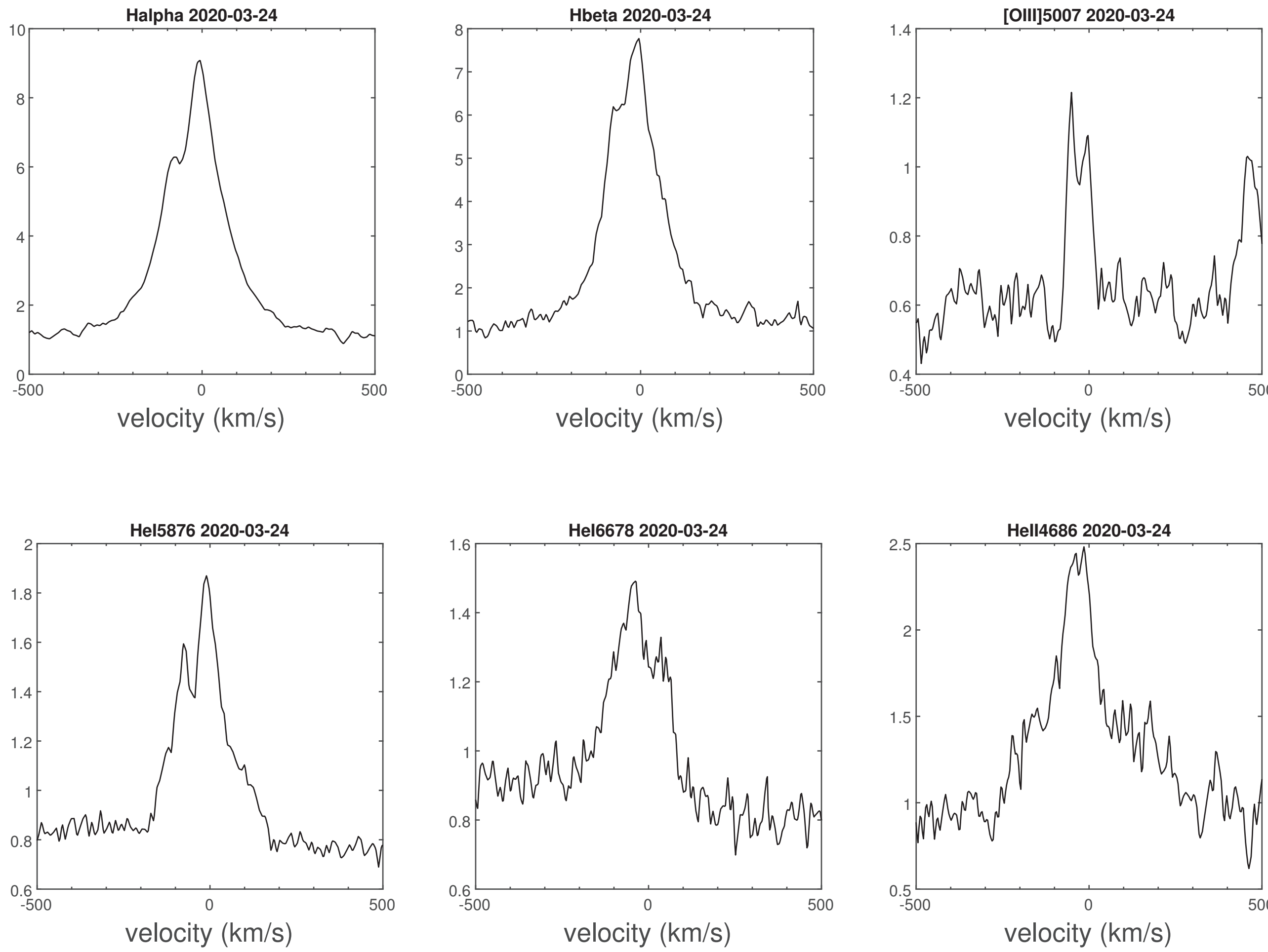




Low resolution spectra obtained late March by Paolo Cazzato with an ALPY600 and Forrest Sims with a LISA. One can note the significant differences between the two resolutions.



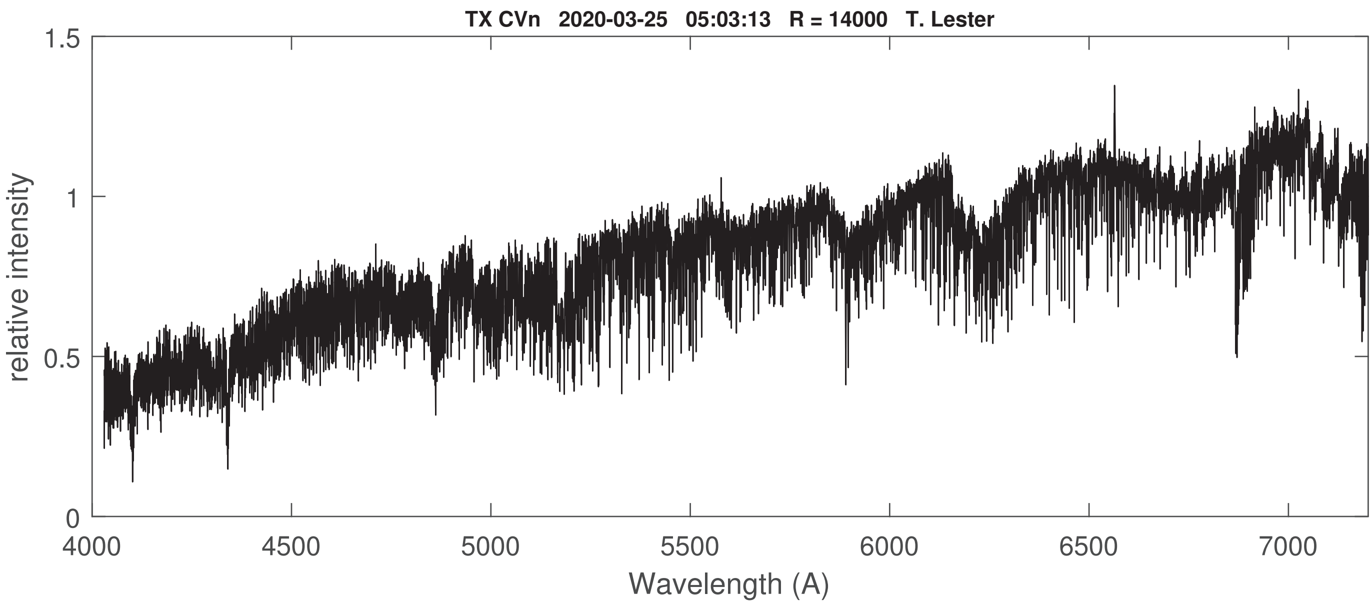
Echelle spectrum acquired late March by F. Teyssier at R = 11000

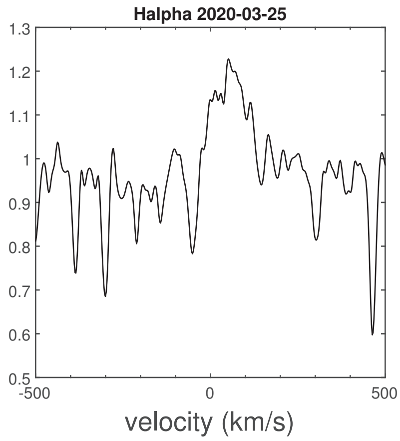


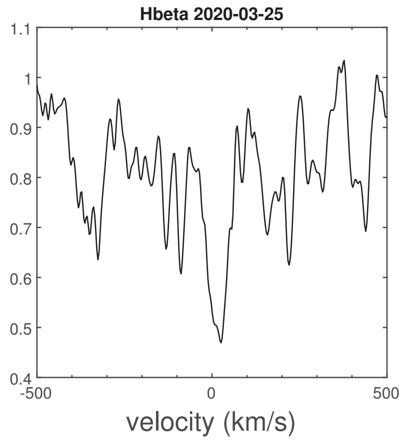
Main lines profiles. We note the significant difference between the profiles of He I triplets and singlet. [OIII] 5007 (FWHM = 72 km.s^{-1}) suggests a bipolar outflow separated by ~ 64 km.s^{-1}, 74 km.s^{-1} assuming an inclination of 60° (Belczinski& Mikolajewska, 1997).

TX CVn

Coordinates (2000.0)	
R.A.	12 44 42.1
Dec	+36 45 50.6
Mag V	10.15

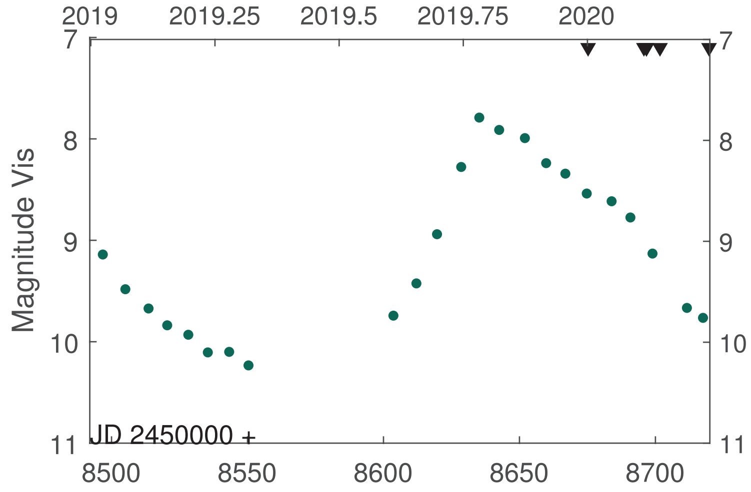




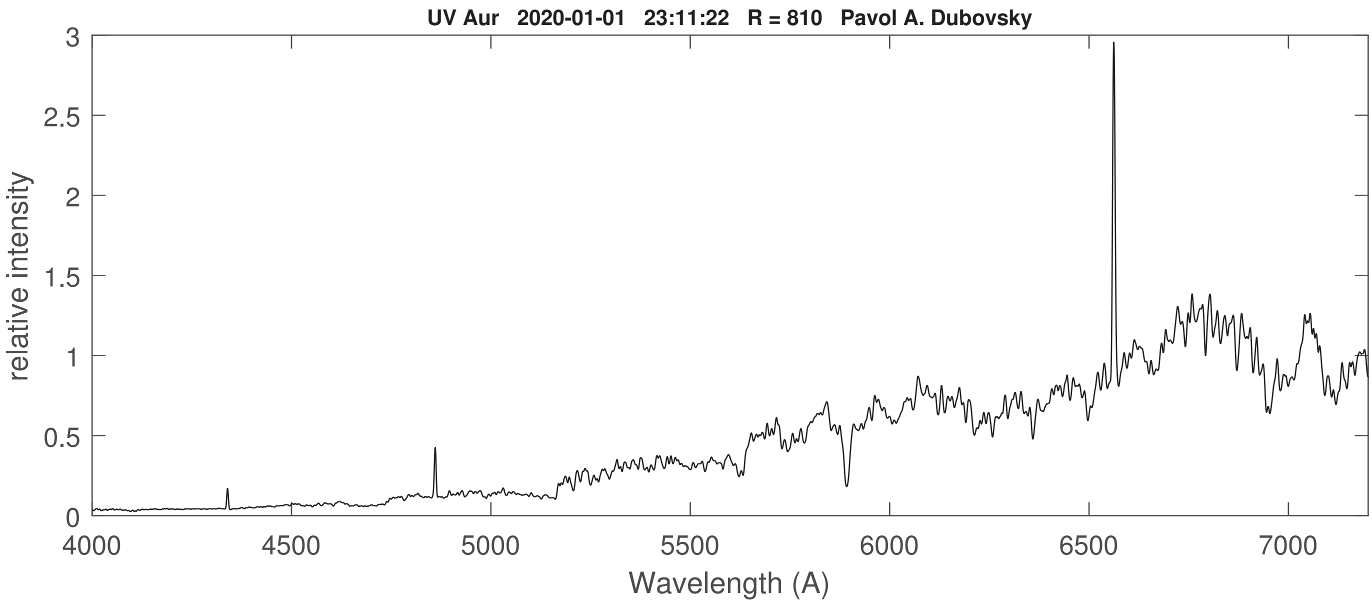


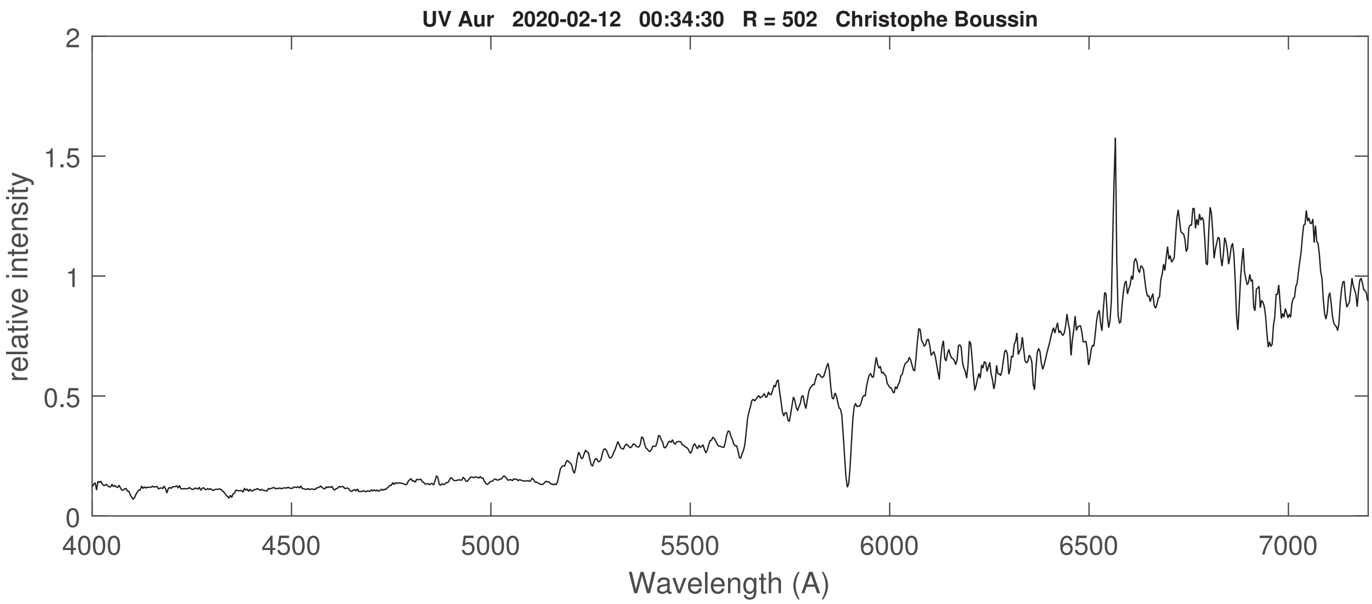
UV Aur

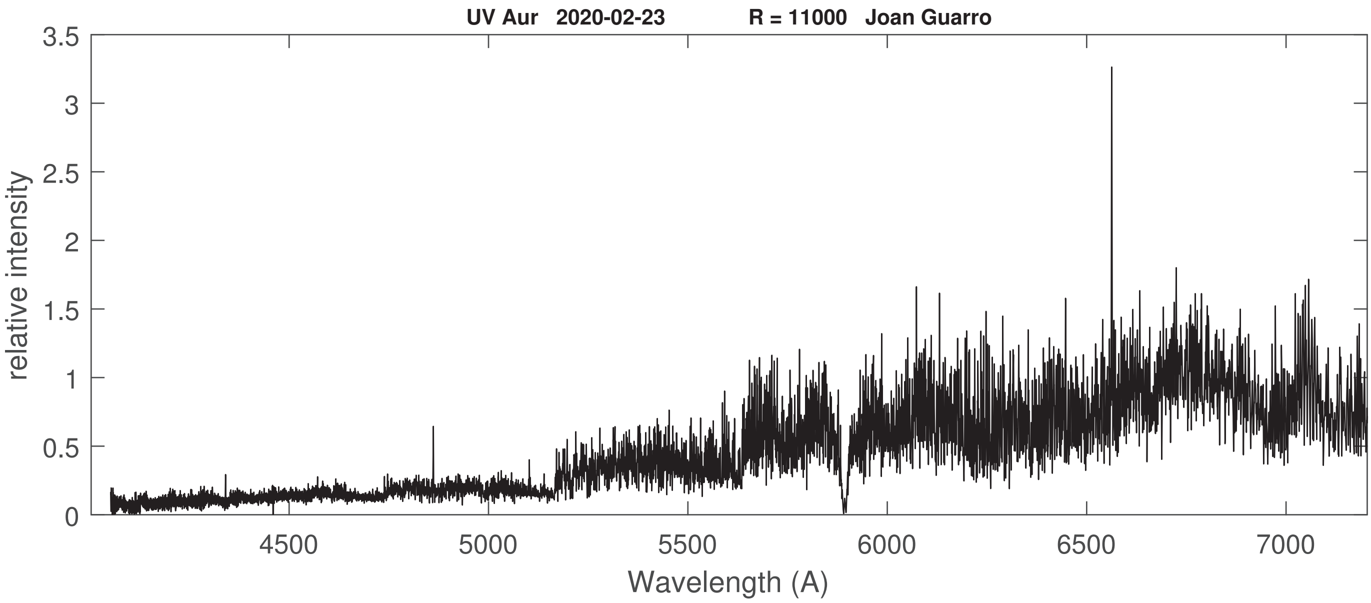
Coordinates (2000.0)	
R.A.	05 18 33.2
Dec	+32 27 47.1
Mag V	9.8 (2020-03)

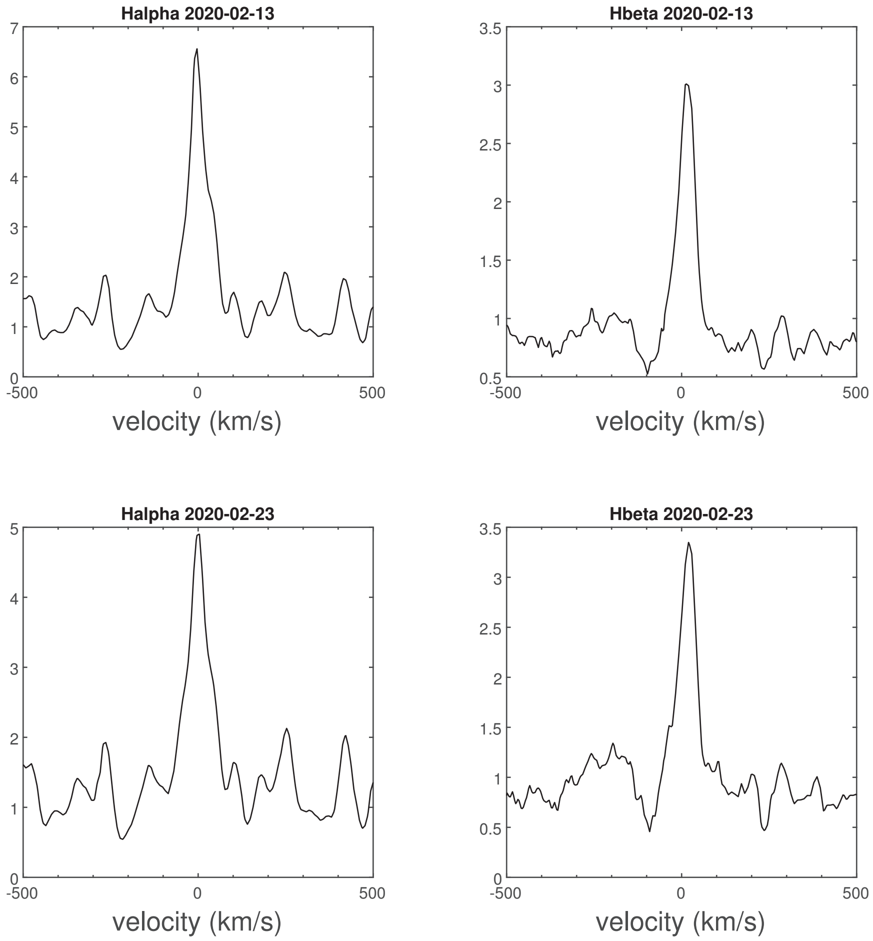


AAVSO lightcurve (Vis., 15 days mean)
and ARAS spectra (Triangles)






UV Aur 2020-02-23 R = 11000 Joan Guarro
relative intensity
Wavelength (A)
0
0.5
1
1.5
2
2.5
3
3.5
4500
5000
5500
6000
6500
7000

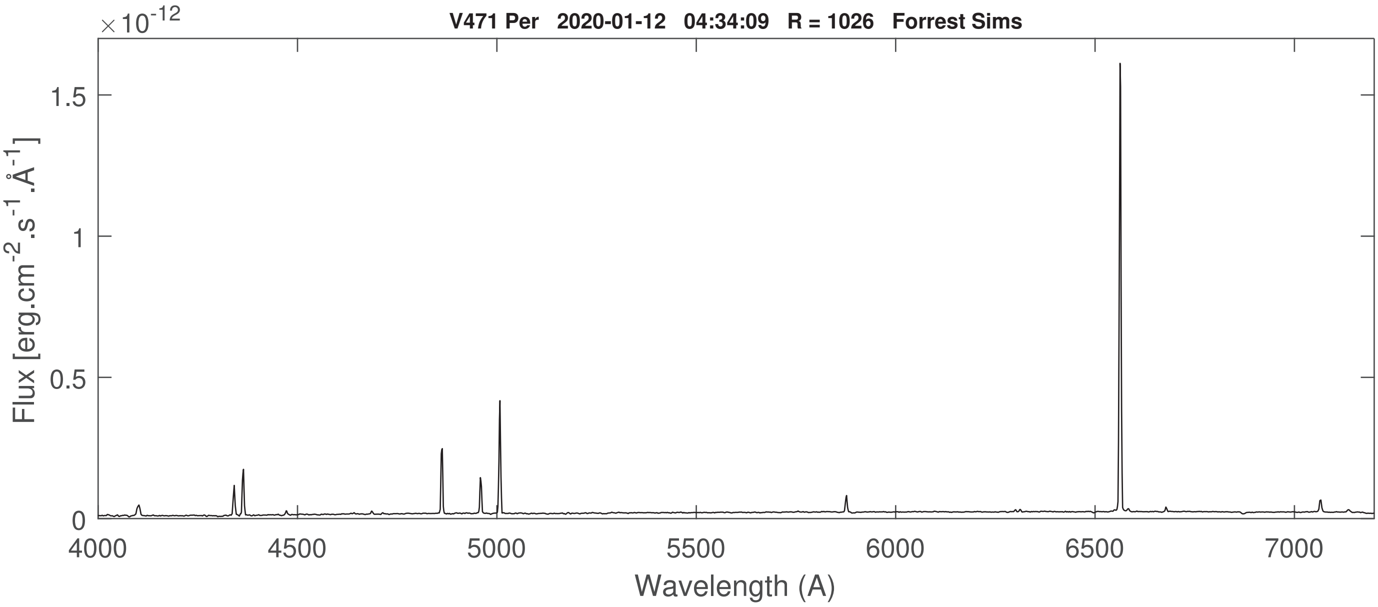

Halpha 2020-02-13
Hbeta 2020-02-13
Halpha 2020-02-23
Hbeta 2020-02-23
velocity (km/s)
-500
0
500

Coordinates (2000.0)	
R.A.	01 58 49.66
Dec	+52 53 48.46
Mag V	13.0

It would be of great value to have information on the possible variations in luminosity, spectrum, continuum, energy distribution, and strength of the emission lines relative to the continuum as a function of time. (O'Dell, 1966)

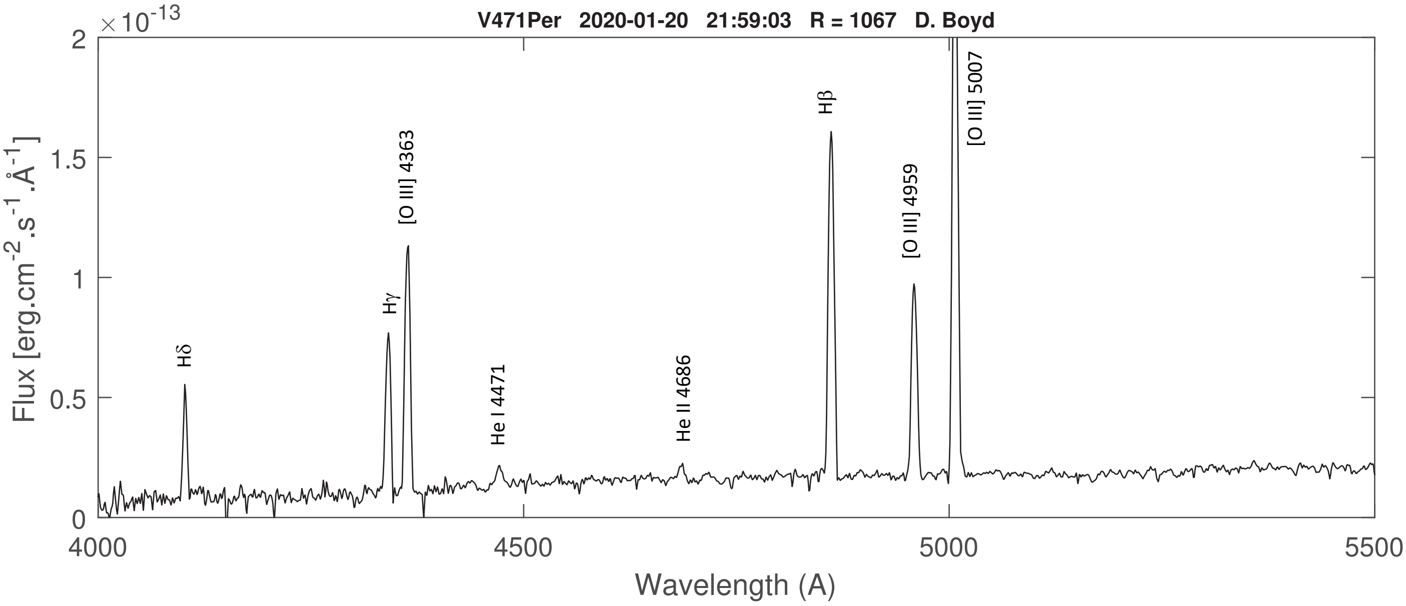
V471 Per (= M1-2, VV-8) was discovered by Minkowski as an emission line star. O' Dell (1966) suggested that the strong Balmer lines and high density deduced from the [OIII] lines ratio could be the result of an interaction between a hot component and the atmosphere of a G2 supergiant. But he concluded that it is not possible to decide in favor of a single star model or symbiotic star.

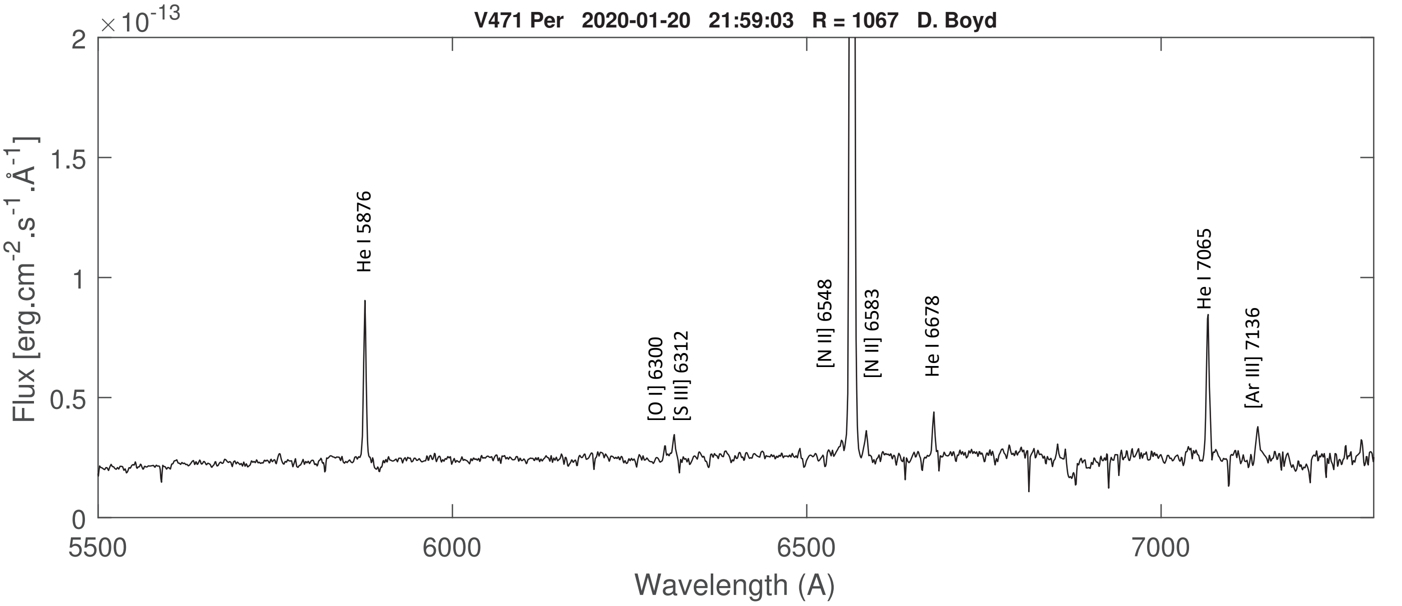
The object shares many properties of both yellow symbiotic binaries and of bona fide young and dense planetary nebulae with a binary nucleus, its true naturebeing still controversial in literature. Munari & al., 2012

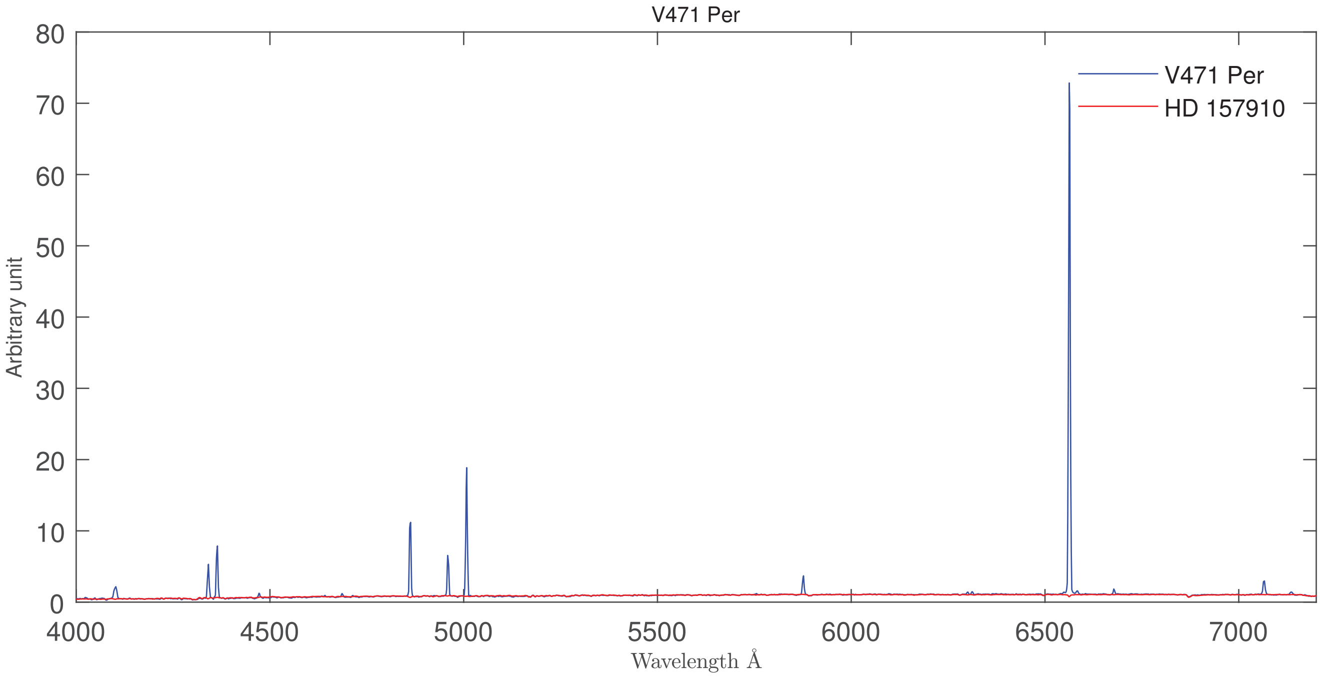


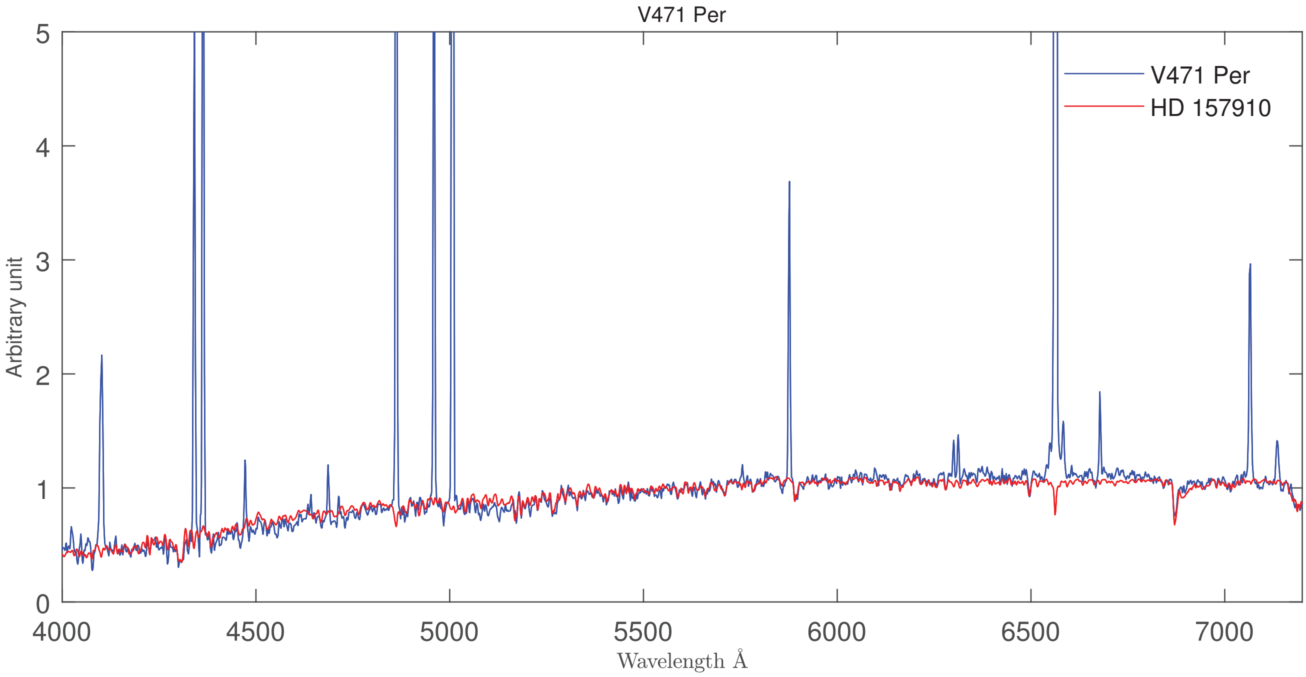
Some diagnostic ratios:
$H\beta/H\alpha = 6.7$
He II 4686 / Hβ ratio = 0.04
He I 5876 / He I 6678 = 4.2
He I 5876 / HeI 7065 = 1.0
$R_{[OIII]}$ = ([OIII] 5007 + [OIII] 4959)/[OIII] 4359 = 2.93

Lines identification in the spectrum obtained by David Boyd on January, 20th with a LISA (R = 1000)







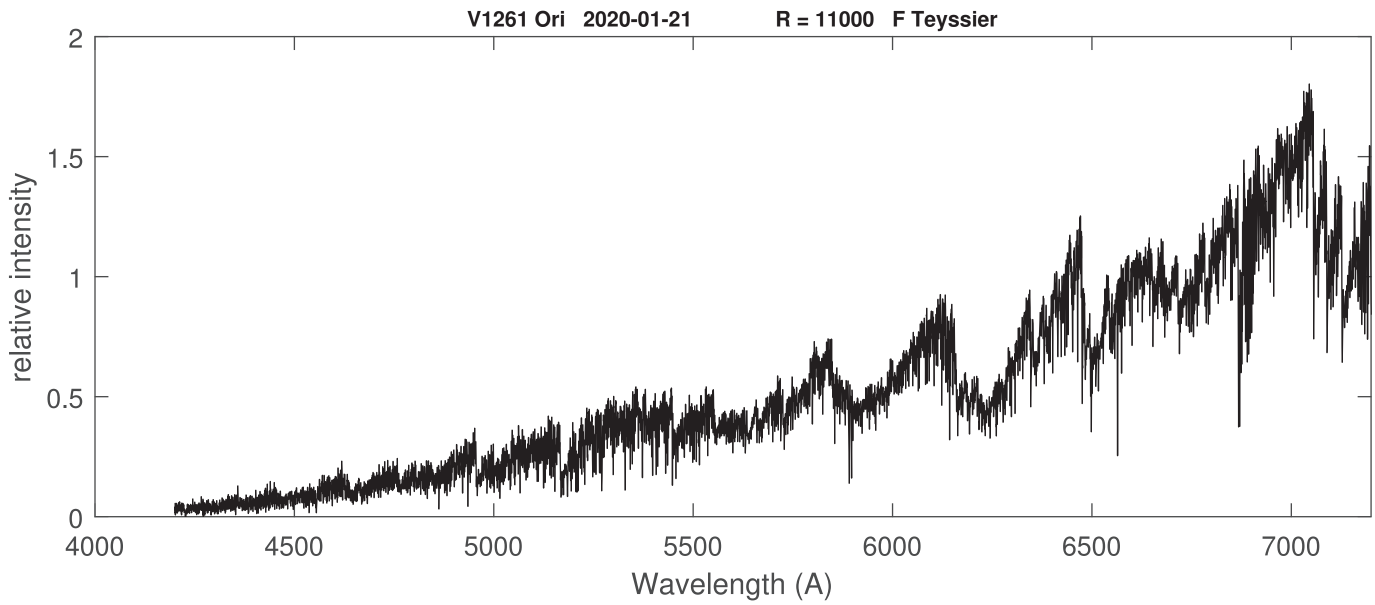


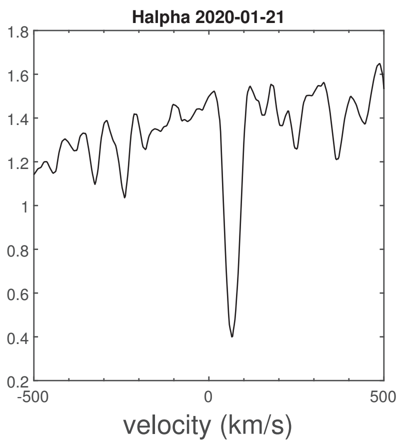
Comparison of V471 Per obtained by Woody Sims on 2020-01-12 with HD 157910, a yellow giant G5 III obtained by David Boyd on 2020-05-31, reddened (E_{B-V} = 0.38) to match V471 Per.

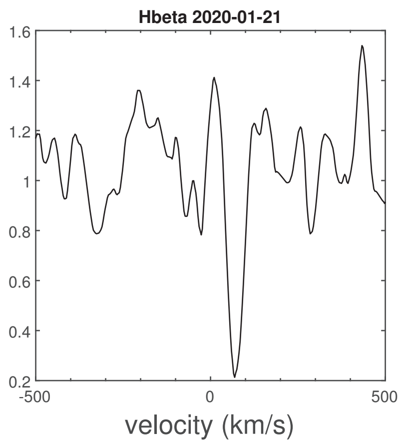
The continuums match very well. We do not detect any trace of recombination nor of a hot component in the visible range of the continuum of V471 Per.

V1261 Ori

Coordinates (2000.0)	
R.A.	05 22 18.6
Dec	-08 39 58.0
Mag V	6.8





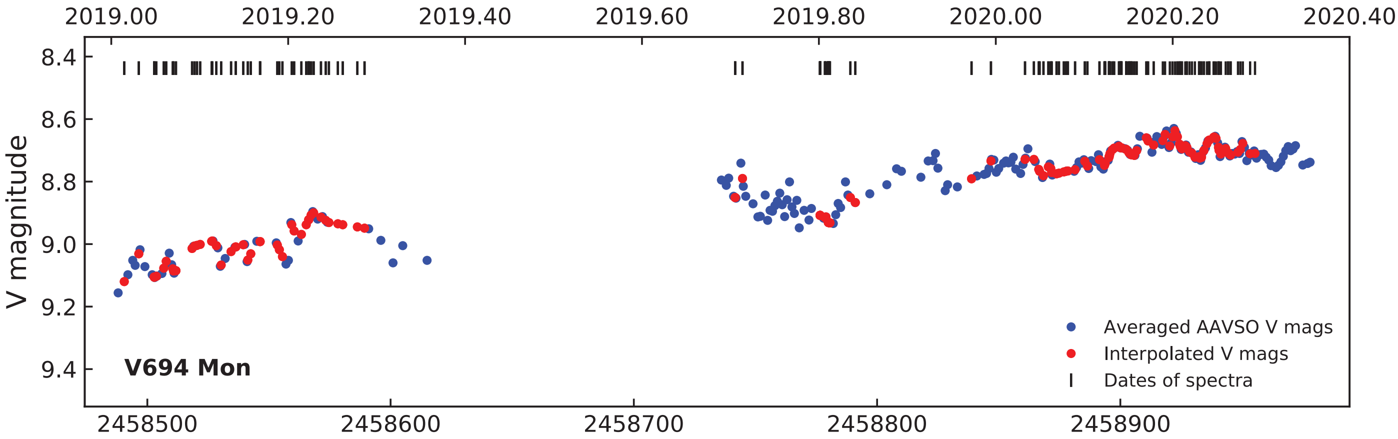


Coordinates (2000.0)	
R.A.	07 25 51.28
Dec	-07 44 08.07
Mag	8.7 (2019-12)

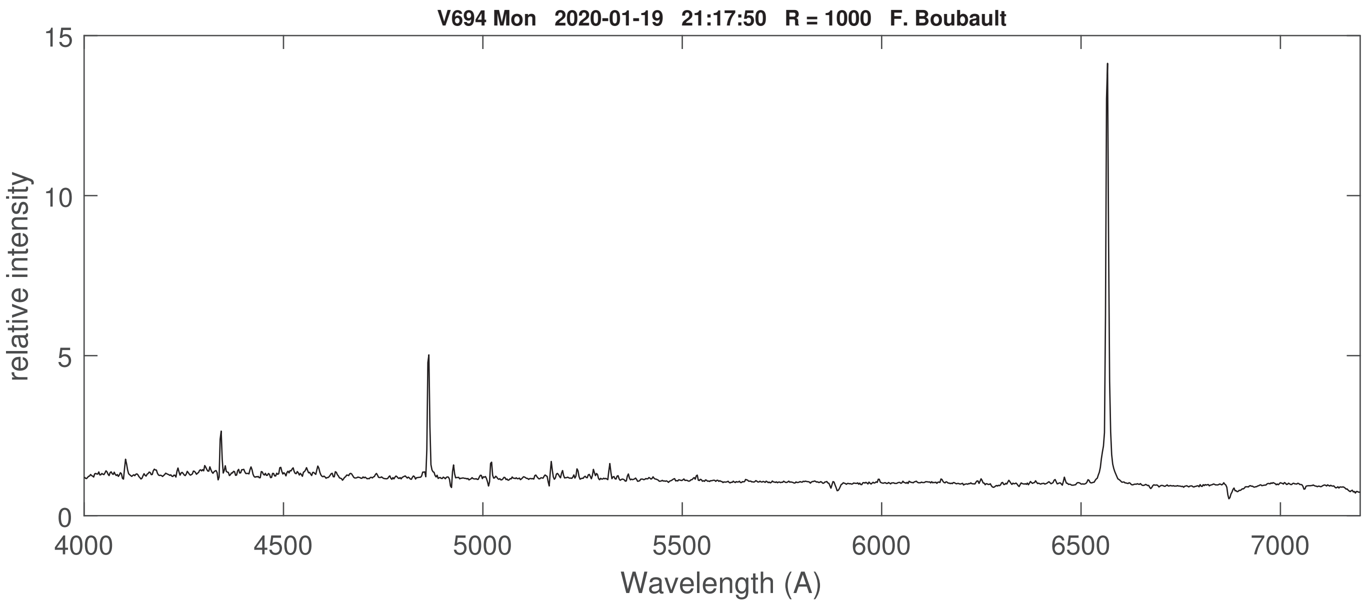
Still very bright and increasing. It is the brightest luminosity ever recorded for this object. The previous record was mag ~ 9 in 1990 (see e.g. Leibowitz and Formiggini, 2015).

The target has been monitored continuously during the quarter until the solar conjunction, 88 spectra were acquired. Special effort of observation around the scheduled observations of MWC 560 by HST and CHANDRA upon the request of Margarita Karovska. The radial velocities of the absorption components remain very low. The intensive monitoring at both-low and high resolution allow a very precise description of the weak evolution of the target.

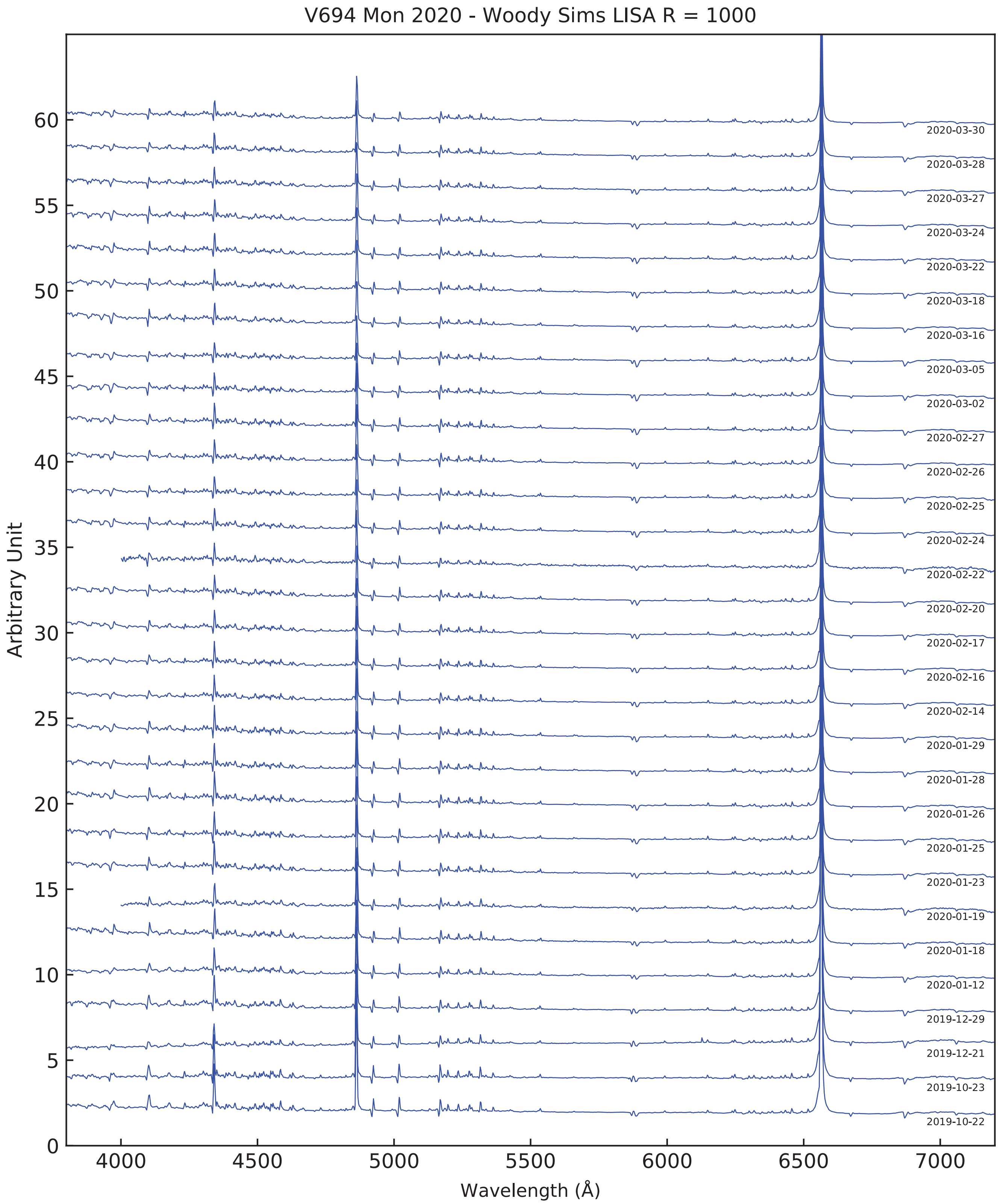
Rendez-vous in September, 2020.



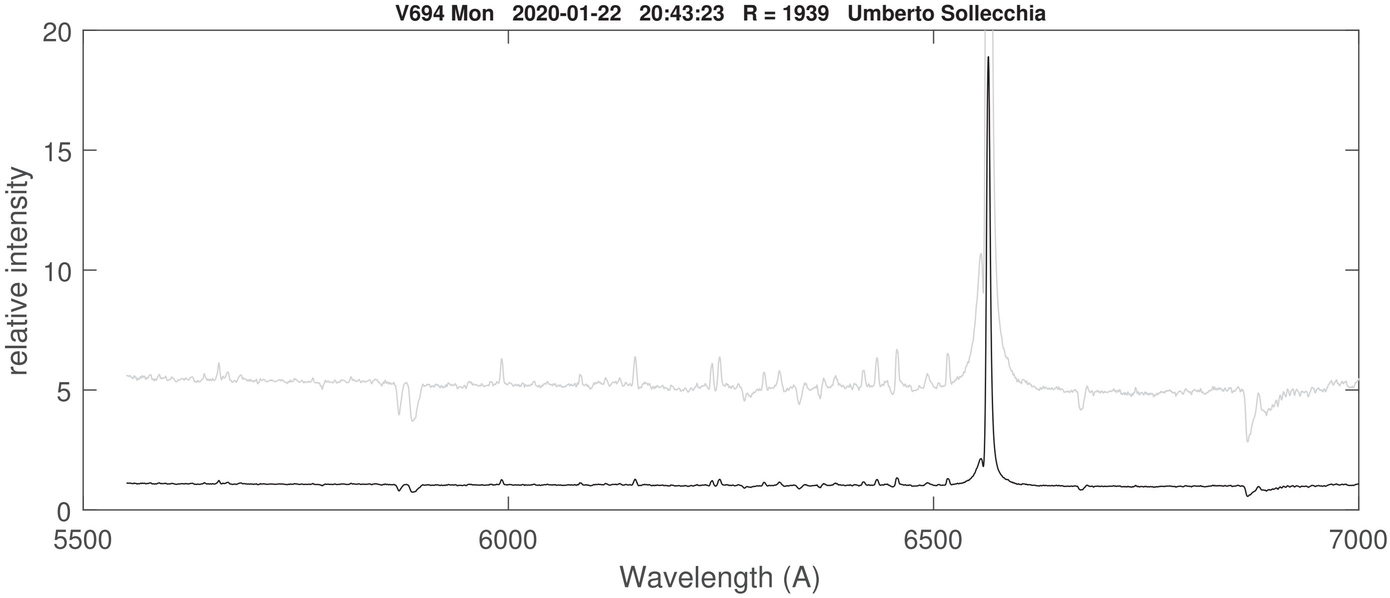
AAVSO Light Curve (V band) in 2020 and ARAS Spectra



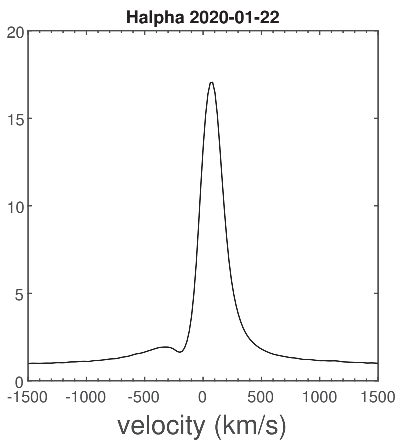
V694 Mon obtained by Franck Boubault with a LISA (R = 1000)



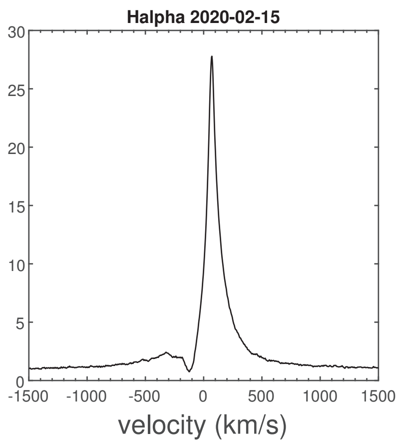
Monitoring of V694 Mon by Forrest Sims from 2019 October to 2020 March with LISA (R =1000)



Hα region obtained by Umberto Sollecchia with a home-made spectroscope (R = 2000)

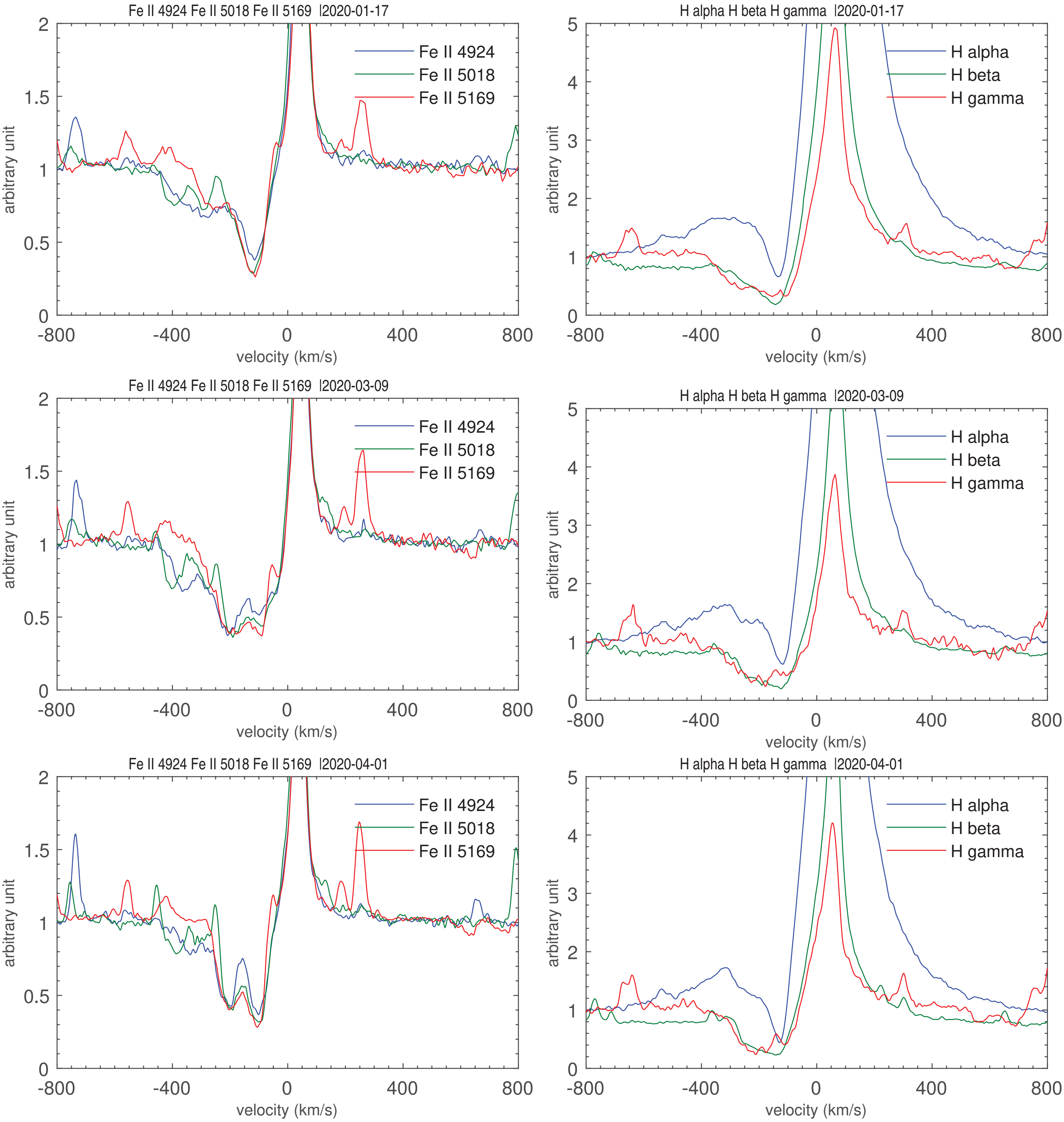


Hα profile in radial velocity

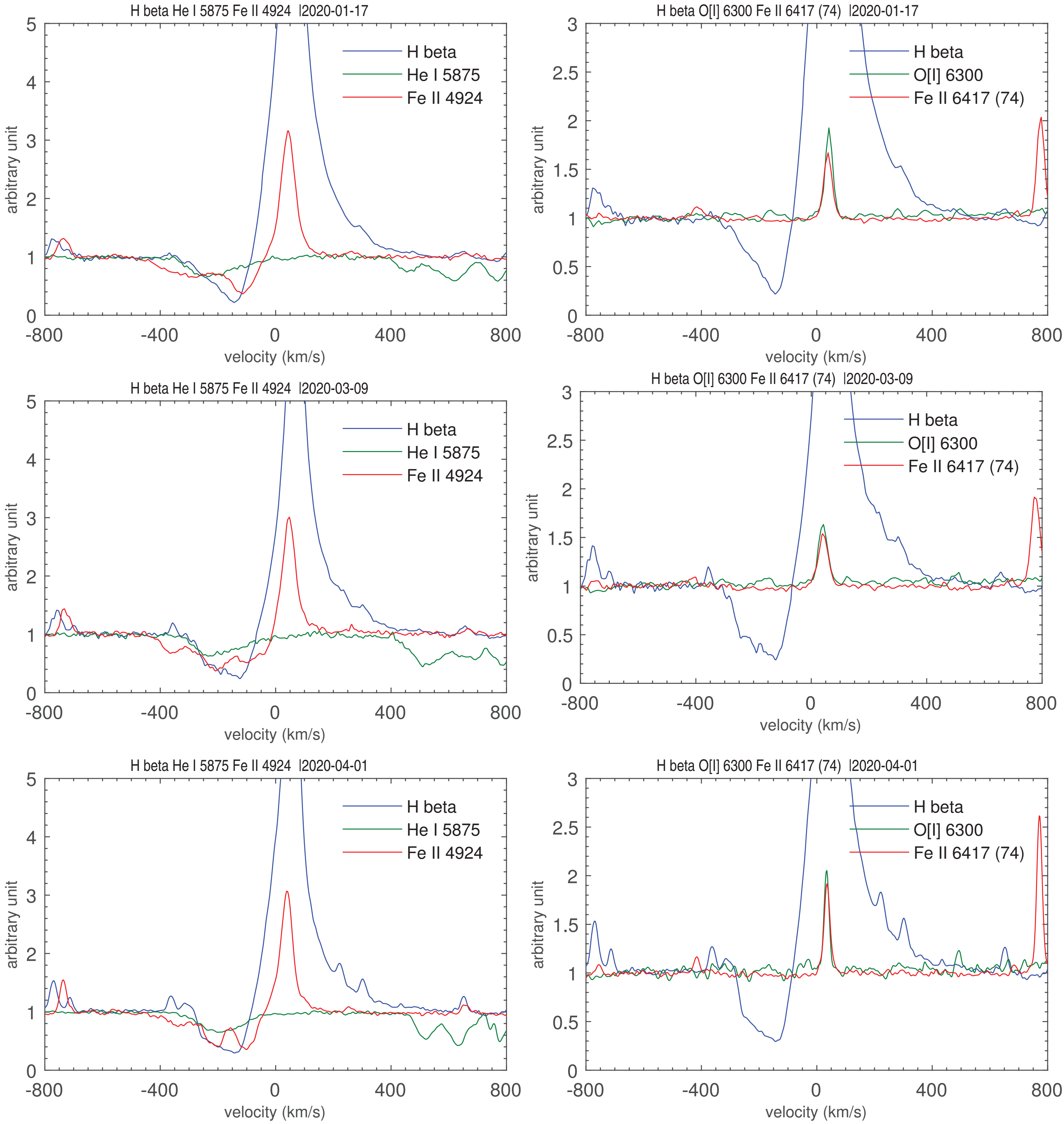


Hα profile in radial velocity from a spectrum acquired by U. Sollecchia with a home-made spectroscope at R = 15000

V694 Mon

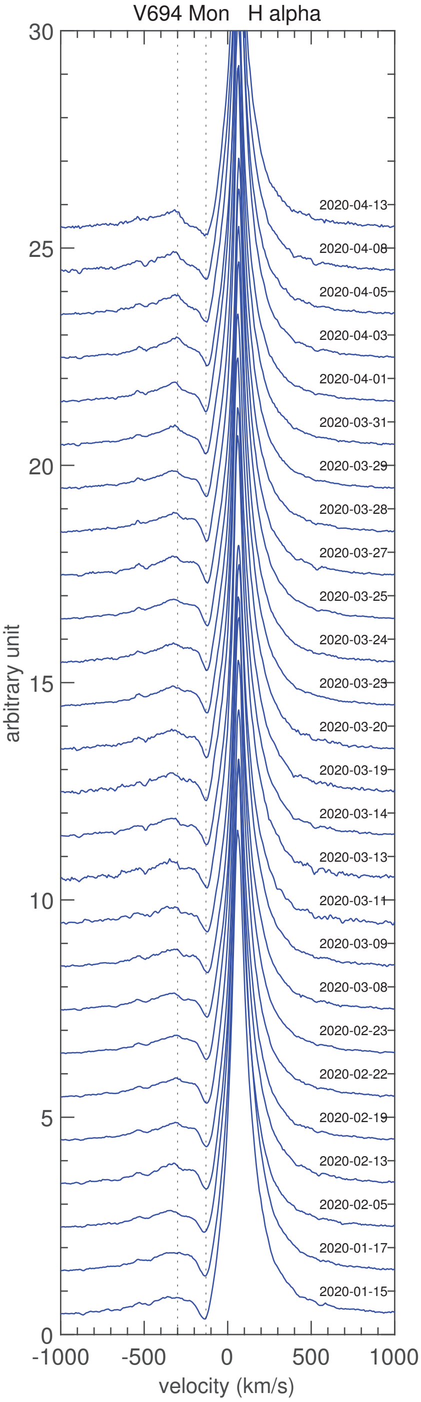


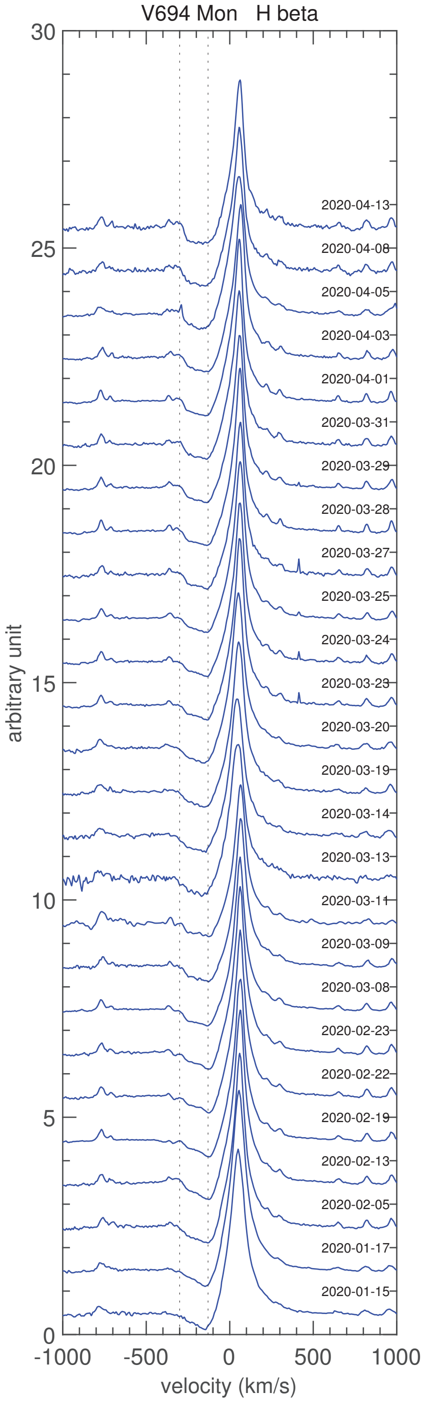
Comparison of the profiles of Fe II (42) multiplet and Balmer lines at three epochs during the quarter. The profiles are extracted from Echelle spectra obtained by Joan Guarro, Tim Lester, François Teyssier

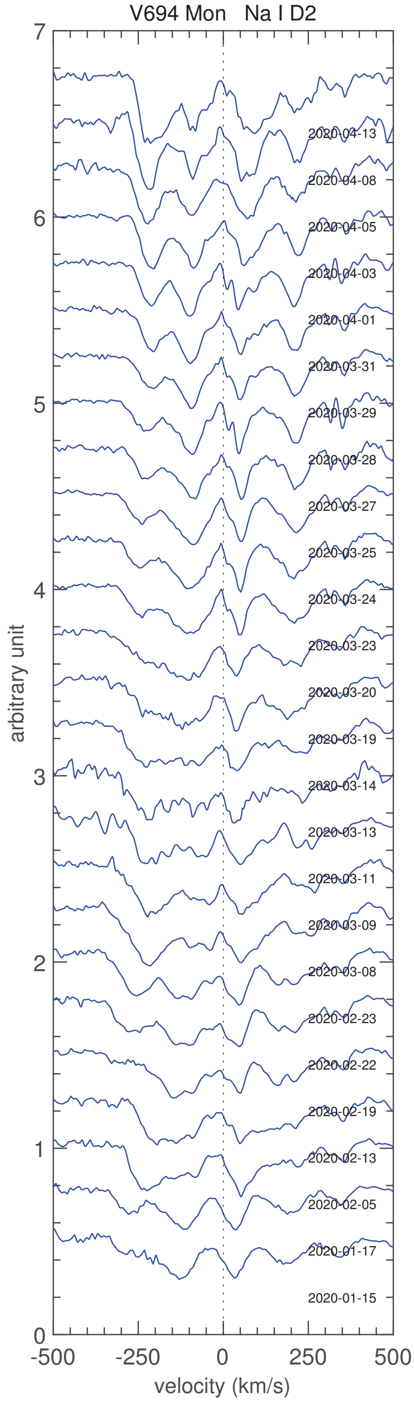


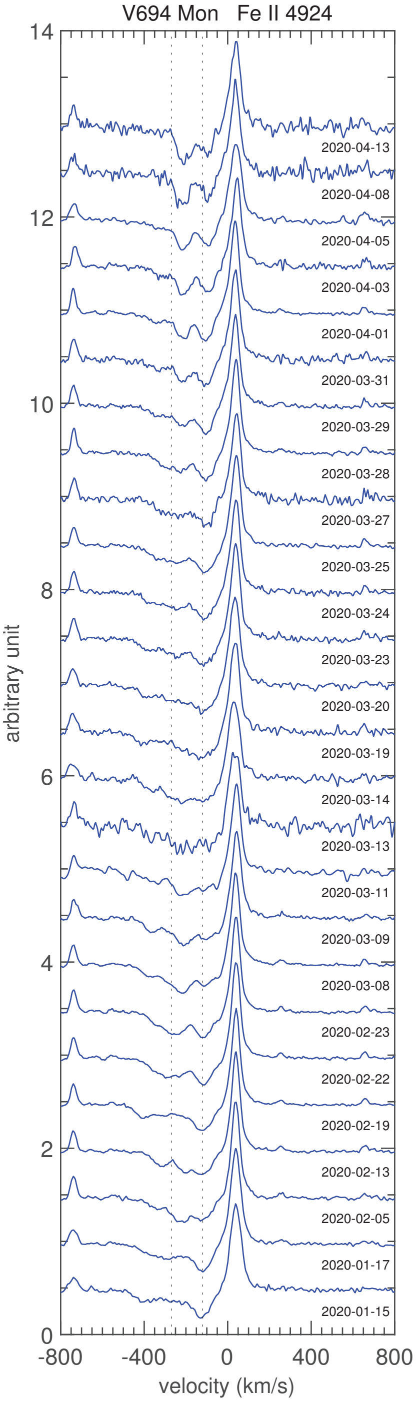
The same as previous page , but comparison of various species.
Left: we note that the maximum velocity of the absorption of He I 5876 line is the same than Hβ maximum absorption velocity. Right: the radial velocity of emission lines of several Fe II multiplets coincide precisely with the neutral oxygen.

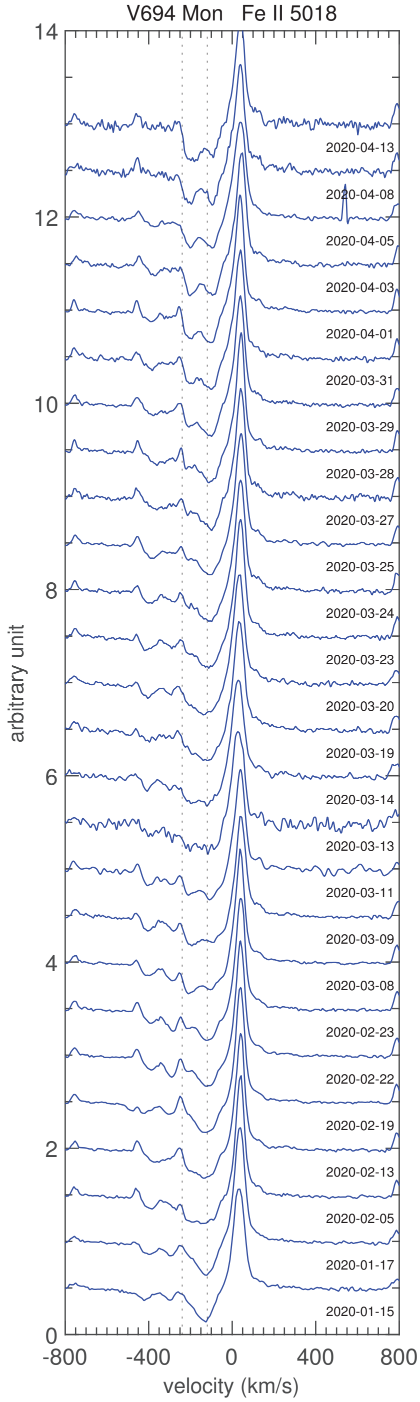
We present the evolution of selected lines from echelle spectra. 26 echelle spectra were secured in 2020 until the 13th of April 2020 by T. Lester, J. Guarro and F. Teyssier.

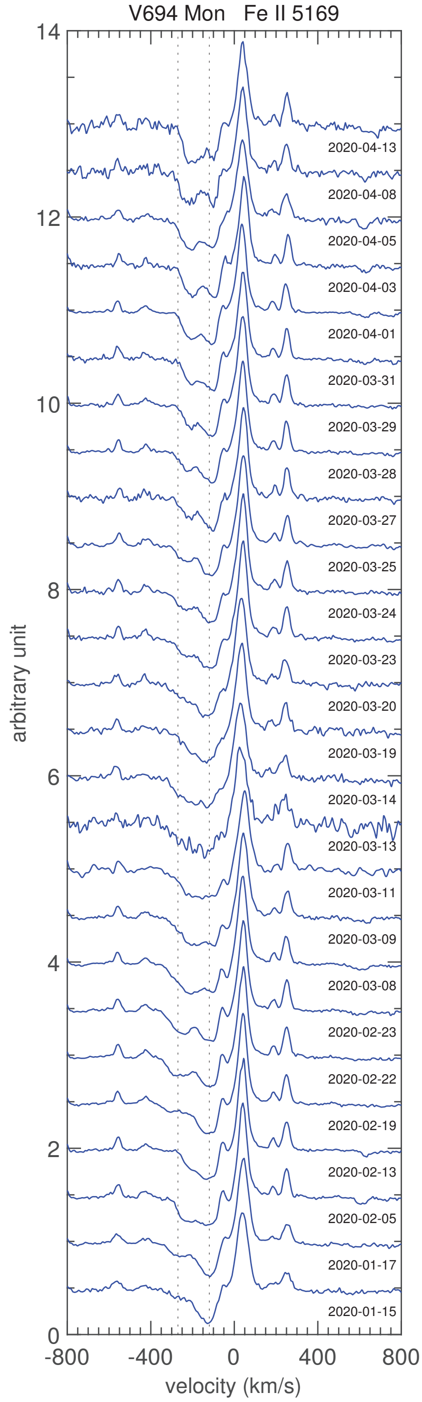




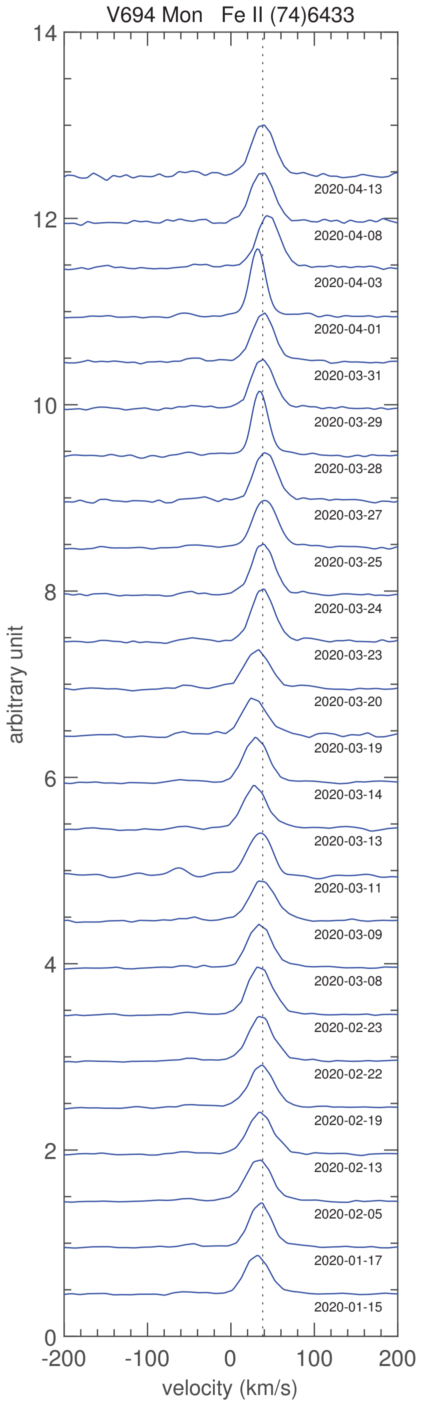


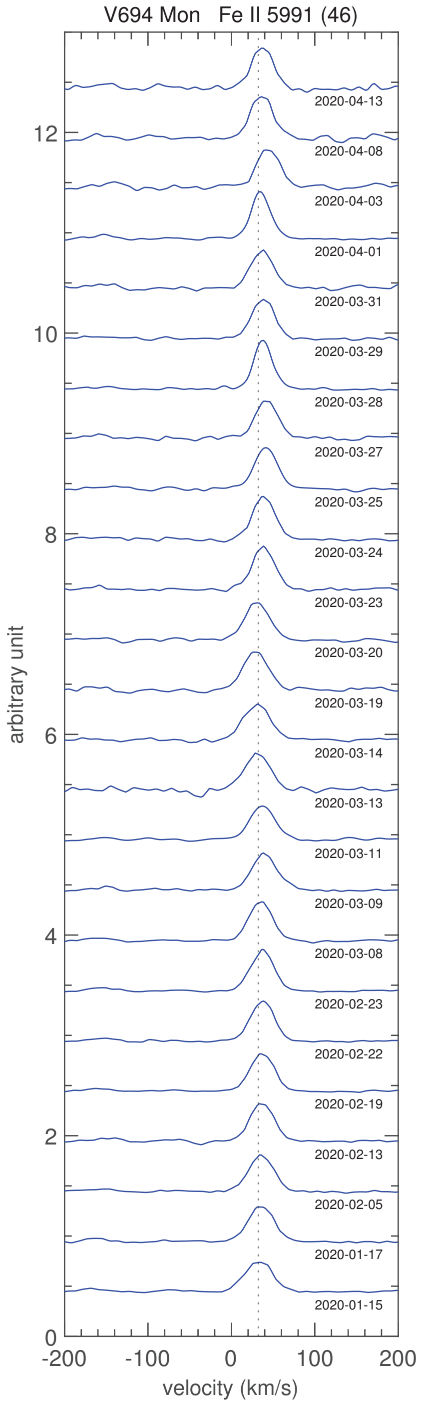

V694 Mon Fe II 4924
arbitrary unit
velocity (km/s)
0
2
4
6
8
10
12
14
-800
-400
0
400
800
2020-04-13
2020-04-08
2020-04-05
2020-04-03
2020-04-01
2020-03-31
2020-03-29
2020-03-28
2020-03-27
2020-03-25
2020-03-24
2020-03-23
2020-03-20
2020-03-19
2020-03-14
2020-03-13
2020-03-11
2020-03-09
2020-03-08
2020-02-23
2020-02-22
2020-02-19
2020-02-13
2020-02-05
2020-01-17
2020-01-15

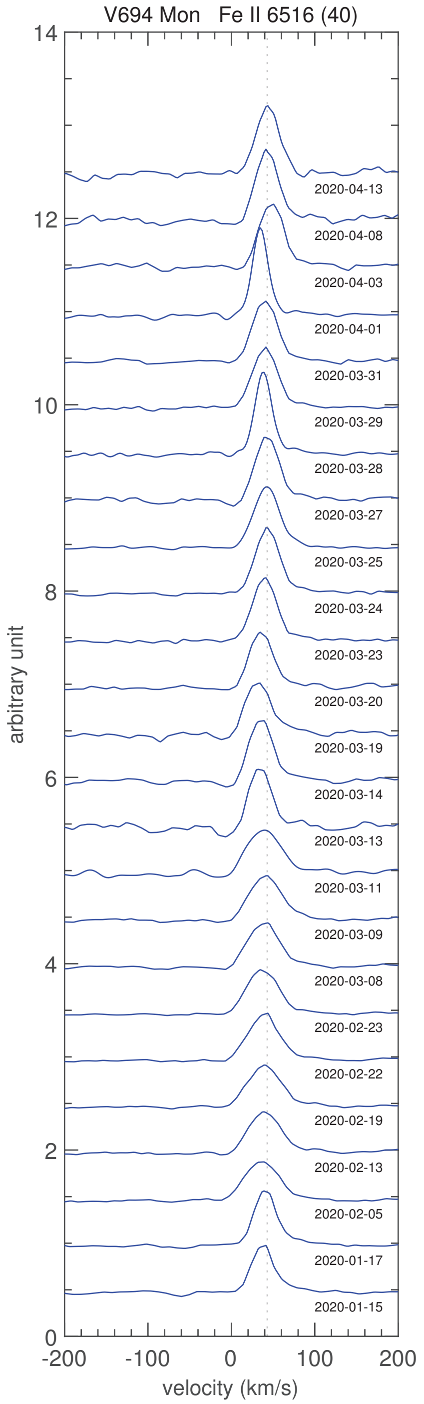

V694 Mon Fe II 5018
arbitrary unit
velocity (km/s)
0
2
4
6
8
10
12
14
-800
-400
0
400
800
2020-04-13
2020-04-08
2020-04-05
2020-04-03
2020-04-01
2020-03-31
2020-03-29
2020-03-28
2020-03-27
2020-03-25
2020-03-24
2020-03-23
2020-03-20
2020-03-19
2020-03-14
2020-03-13
2020-03-11
2020-03-09
2020-03-08
2020-02-23
2020-02-22
2020-02-19
2020-02-13
2020-02-05
2020-01-17
2020-01-15

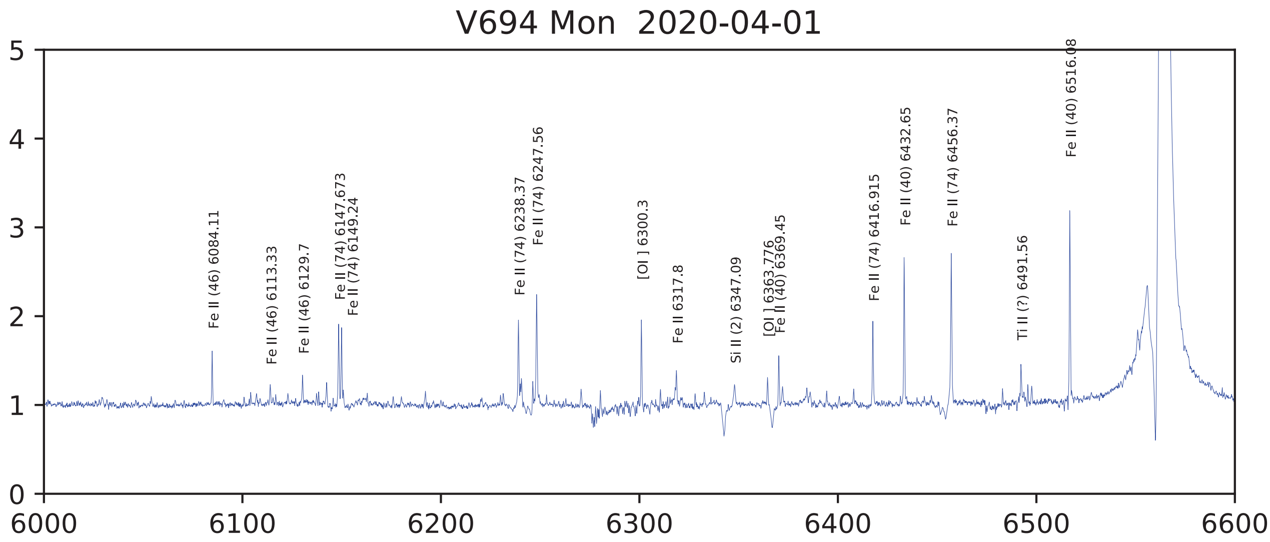

V694 Mon Fe II 5169
arbitrary unit
velocity (km/s)
0
2
4
6
8
10
12
14
-800
-400
0
400
800
2020-04-13
2020-04-08
2020-04-05
2020-04-03
2020-04-01
2020-03-31
2020-03-29
2020-03-28
2020-03-27
2020-03-25
2020-03-24
2020-03-23
2020-03-20
2020-03-19
2020-03-14
2020-03-13
2020-03-11
2020-03-09
2020-03-08
2020-02-23
2020-02-22
2020-02-19
2020-02-13
2020-02-05
2020-01-17
2020-01-15

Line profiles of selected Fe II lines, multiplets 40, 46 and 74, in the red part of the spectra.
The narrowest line slighlty displaced toward blue on 28-03 and 01-04 are obtained with the spectrocope with the higher resolution (R = 14000). Same comment for [OI] 6300 line, page 53.





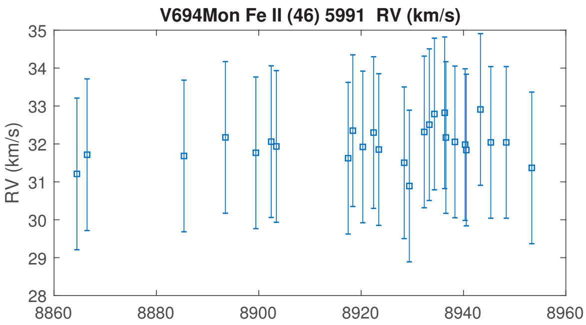


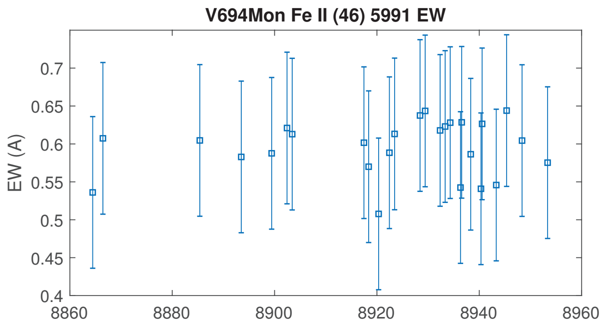


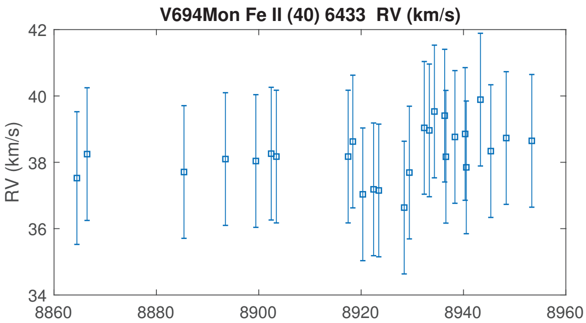
Lines identification in the range 6000 - 6600 Å

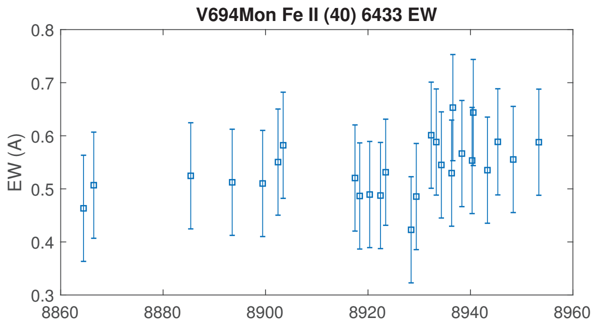
Id	λ_0 (Å)	λ_m (Å)	R.V. (km.s[-1])	σ (km.s[-1])
Fe II (46) 5991 Å	5991.38	5292.02	+ 32.0	0.5
Fe II (74) 6417Å	6416.91	6417.55	+ 29.6	0.7
Fe II (40) 6433 Å	6432.38	6435.50	+ 38.2	0.8
Fe II (40) 6516 Å	6516.08	6517.00	+ 42.7	0.8

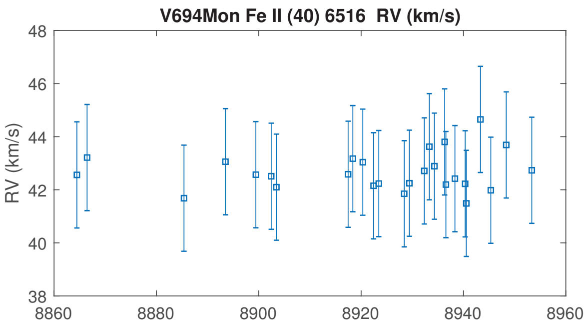
Radial velocity of the center of the lines (Mean value for 26 spectra)
λ_0 = rest wavelength λ_m = measured wavelength of the center of the line at height = 50%

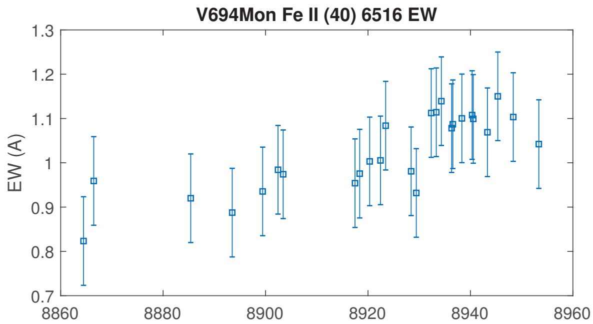


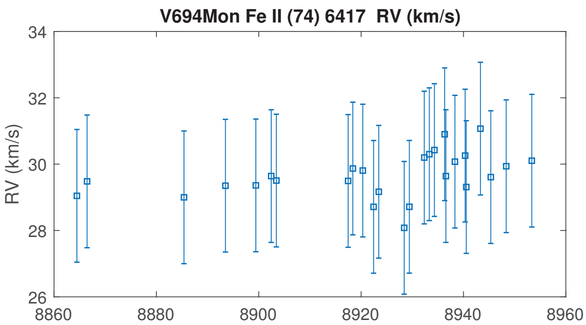


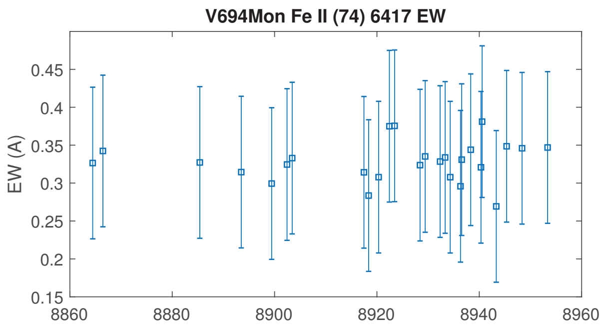




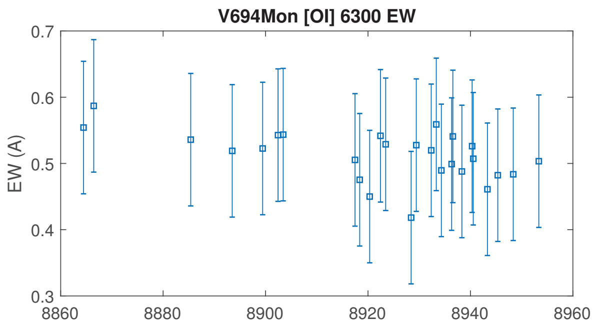


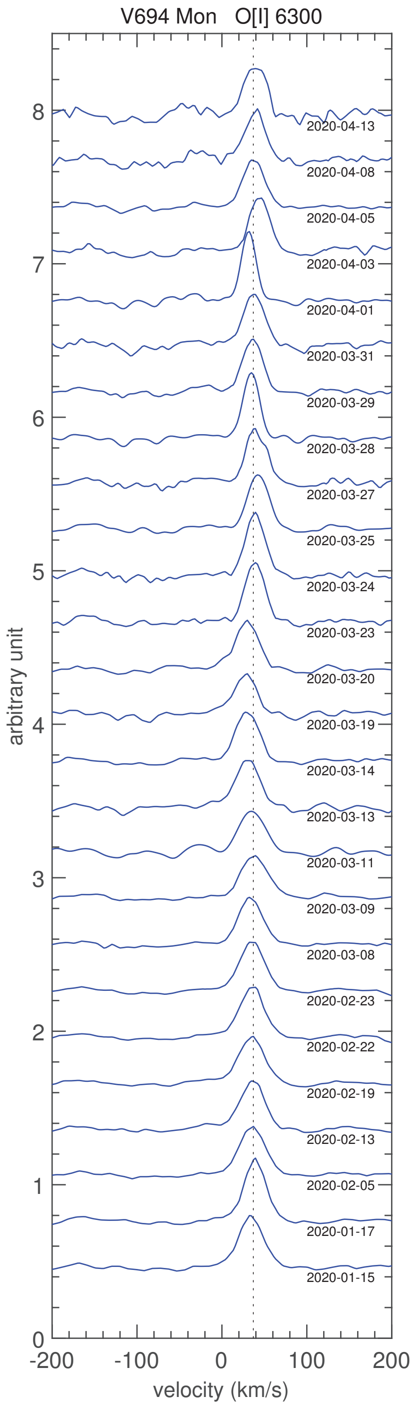


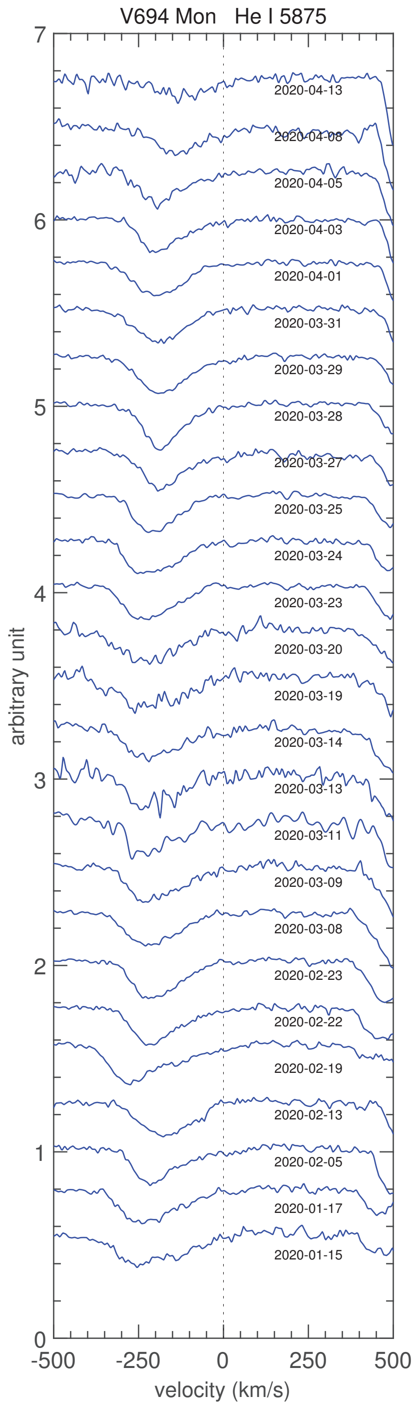


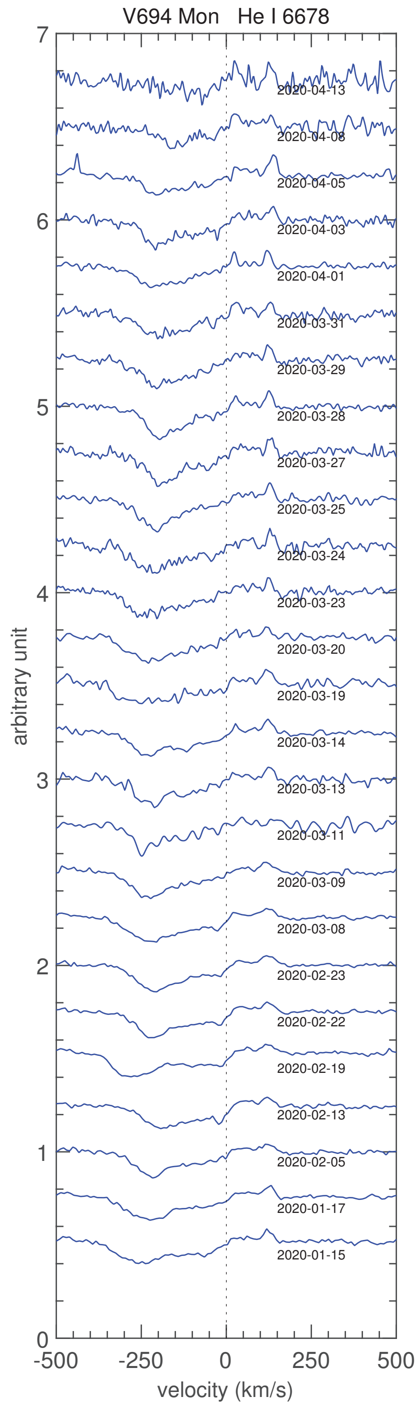


Radial velocities and equivalent widths of some lines during 2020-Q1

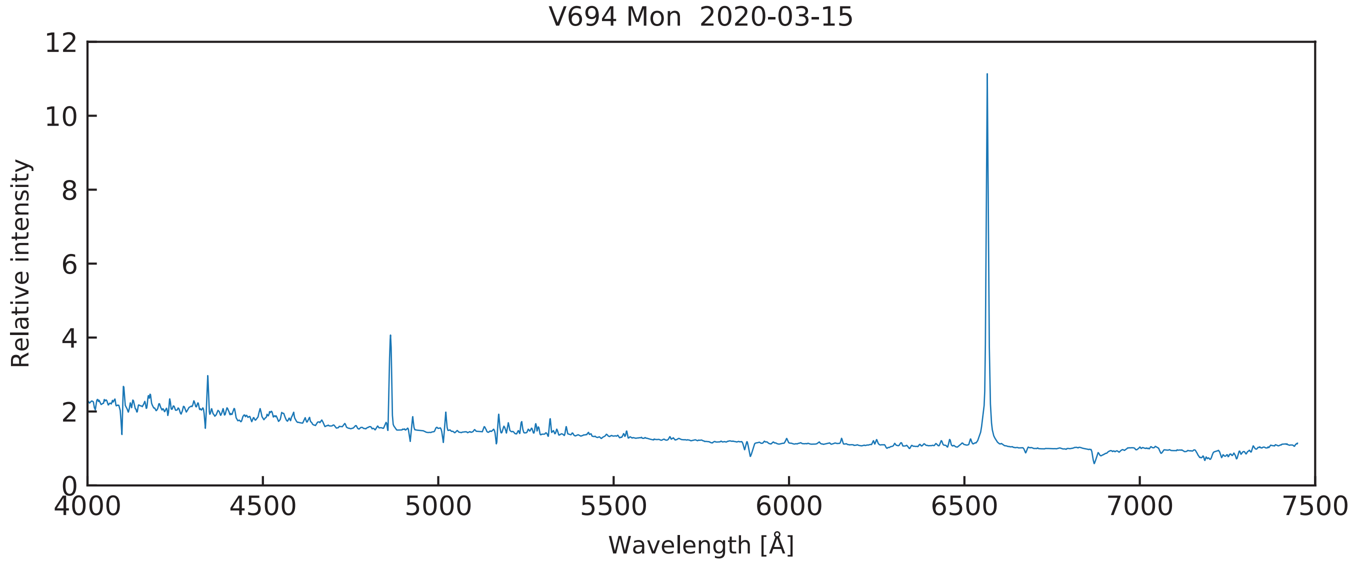



V694 Mon O[I] 6300
arbitrary unit
velocity (km/s)
2020-04-13
2020-04-08
2020-04-05
2020-04-03
2020-04-01
2020-03-31
2020-03-29
2020-03-28
2020-03-27
2020-03-25
2020-03-24
2020-03-23
2020-03-20
2020-03-19
2020-03-14
2020-03-13
2020-03-11
2020-03-09
2020-03-08
2020-02-23
2020-02-22
2020-02-19
2020-02-13
2020-02-05
2020-01-17
2020-01-15

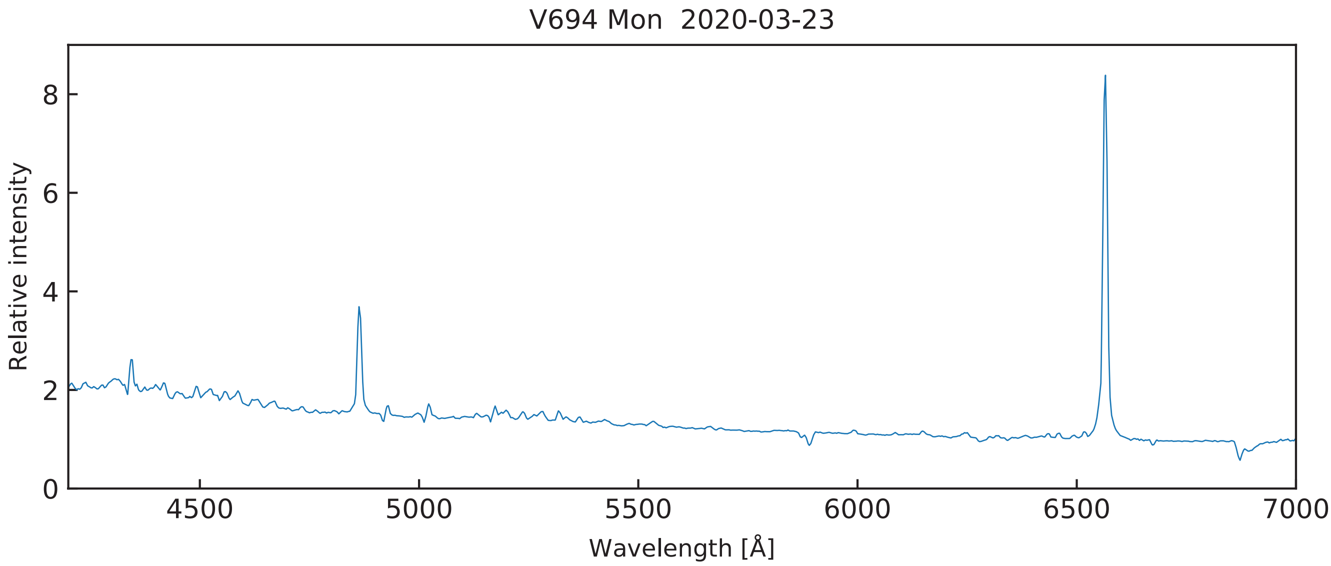

V694 Mon He I 5875
arbitrary unit
velocity (km/s)


V694 Mon He I 6678
arbitrary unit
velocity (km/s)

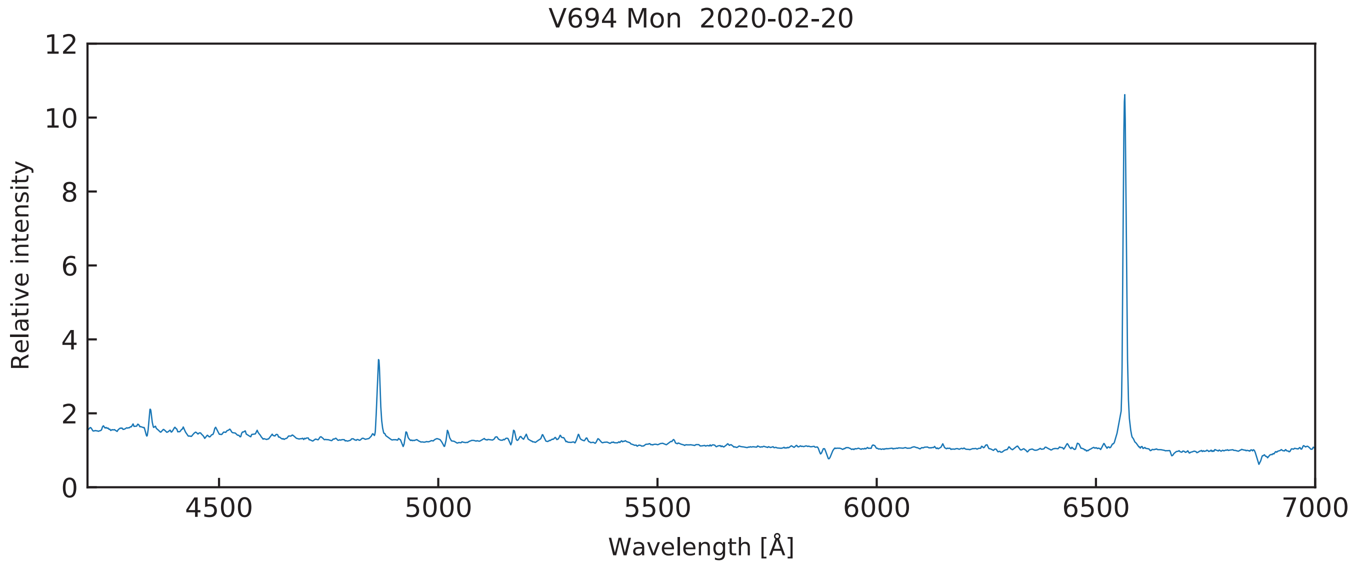
Examples of low resolutionspectra obtained by different observers



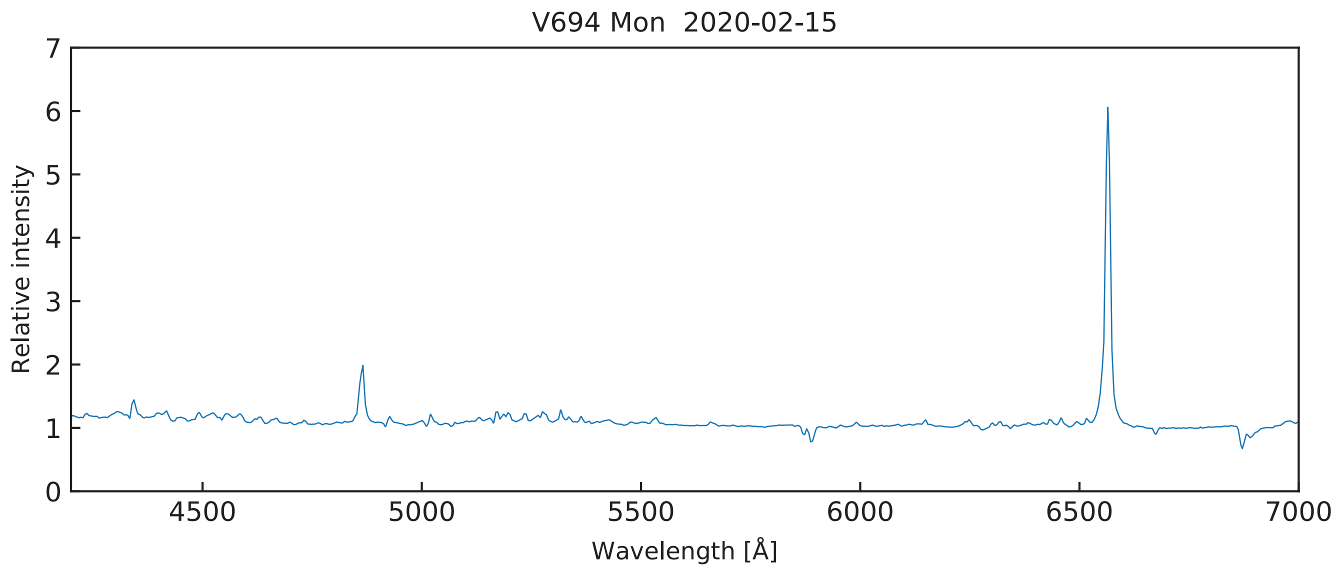
Spectrum obtained by Jacques Michelet with a LISA (R = 1000)



Spectrum obtained by Christophe Boussin with an ALPY (R = 600)



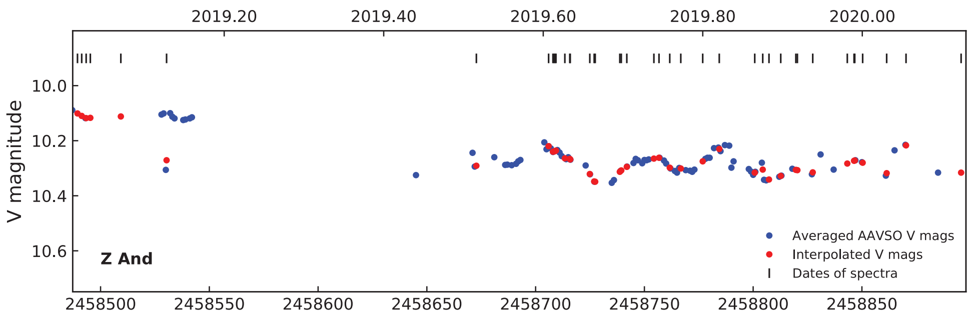
Spectrum obtained by Antonino Ventura with an UVEX3 (R = 680)



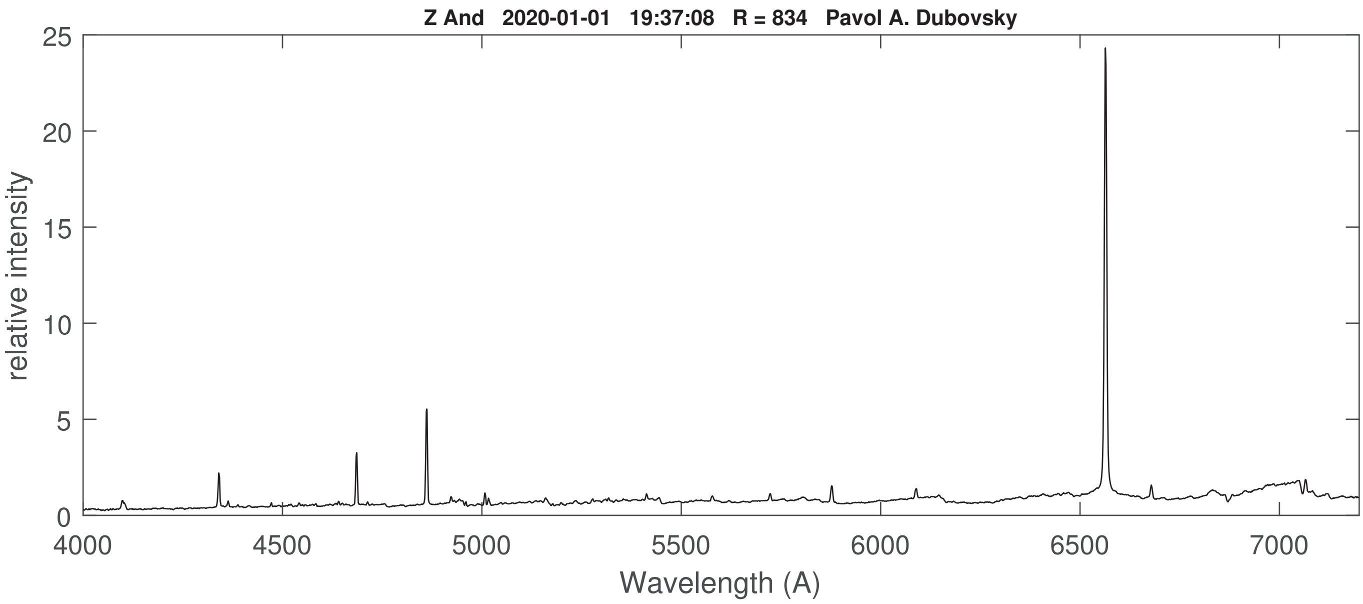
Spectrum obtained by Lorenzo Franco with an ALPY(R = 600)

Coordinates (2000.0)	
R.A.	18 14 34.2
Dec	+20 59 21.2
Mag V	10.3 (2019-12)

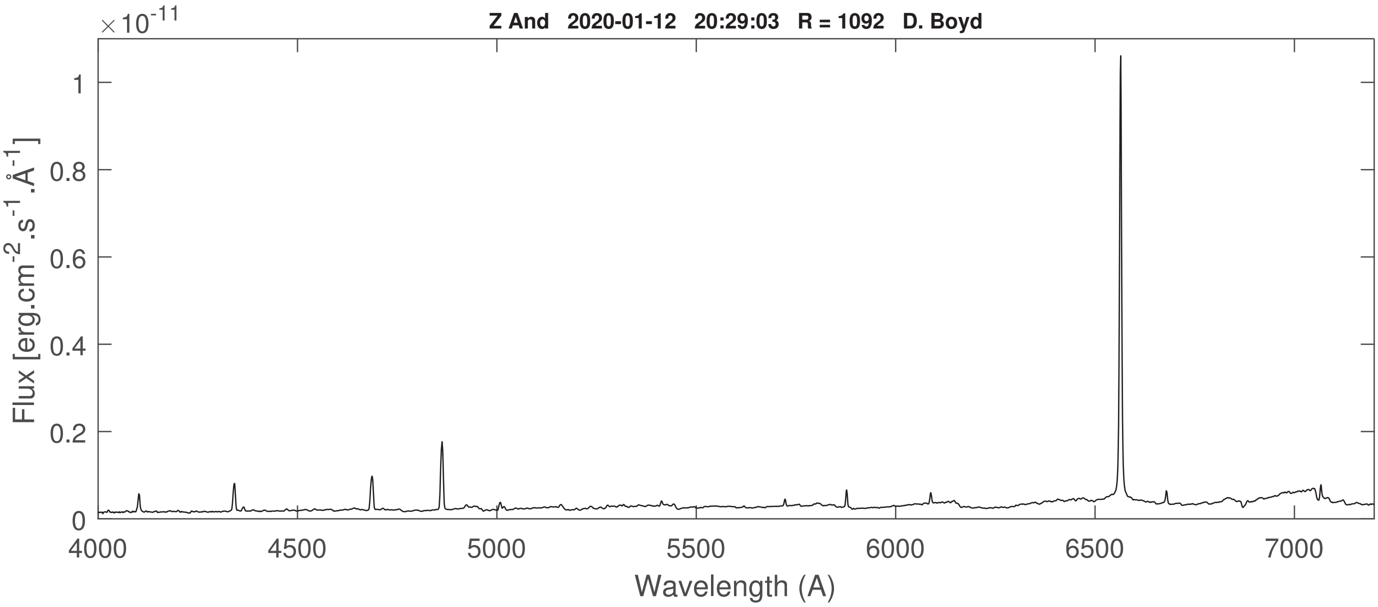
In quiescent state after 2018 outburst
Orbital phase
01/1/2020: 0.317
01/4/2020: 0.436

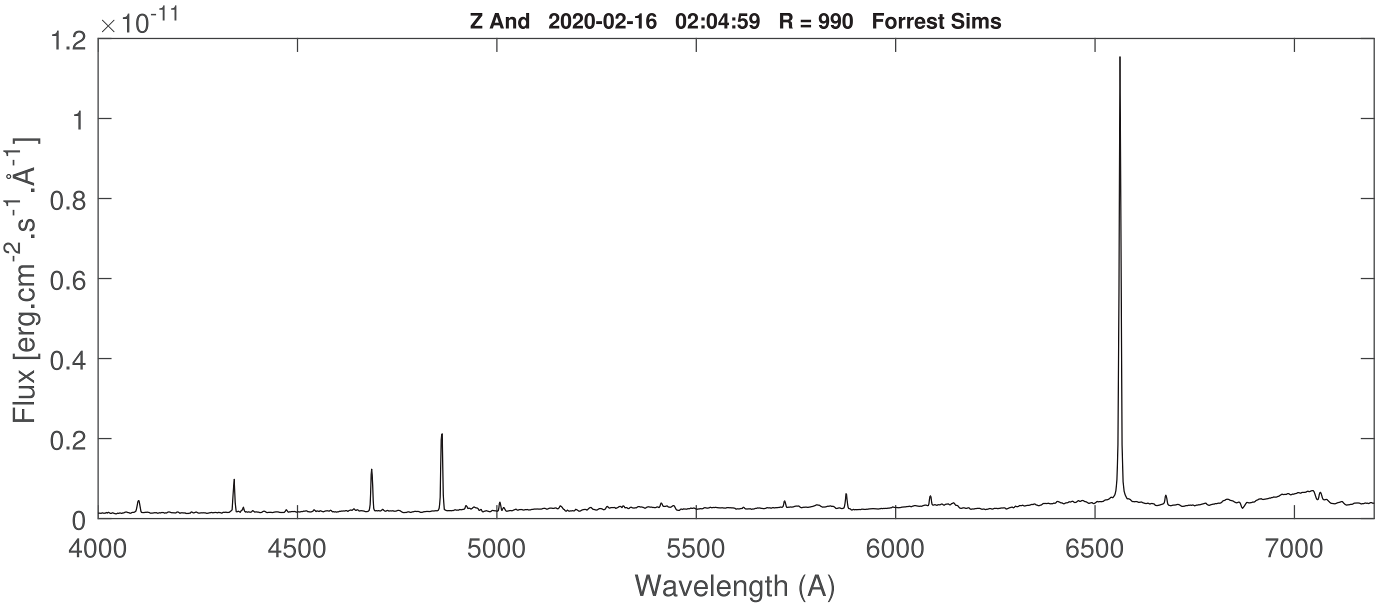


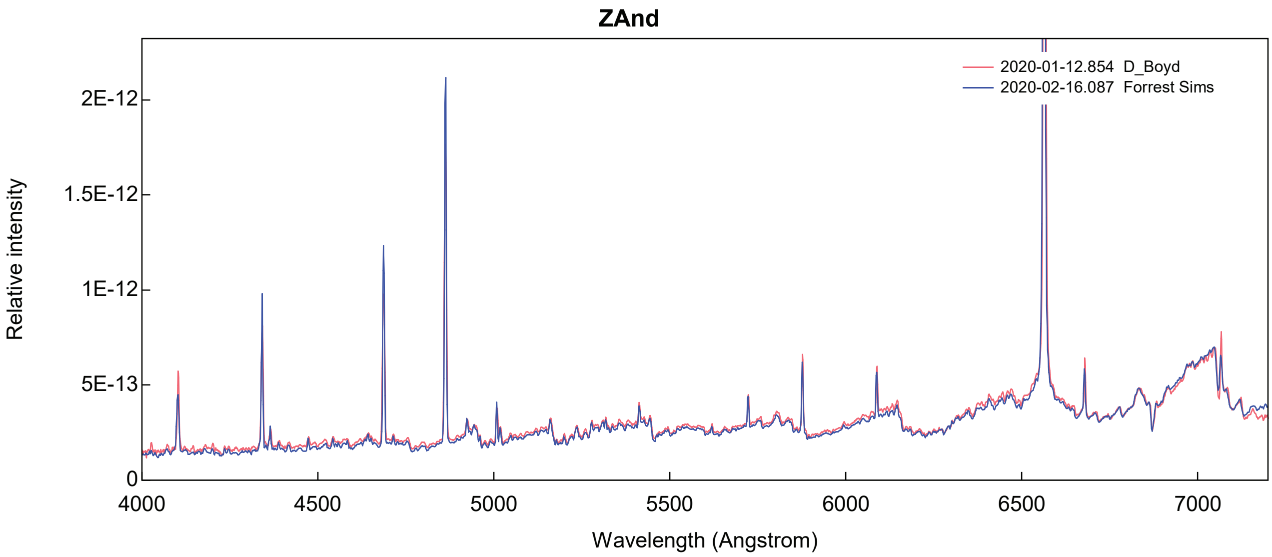
AAVSO V-band lightcurve and dates of ARAS spectra (lines)



Z And

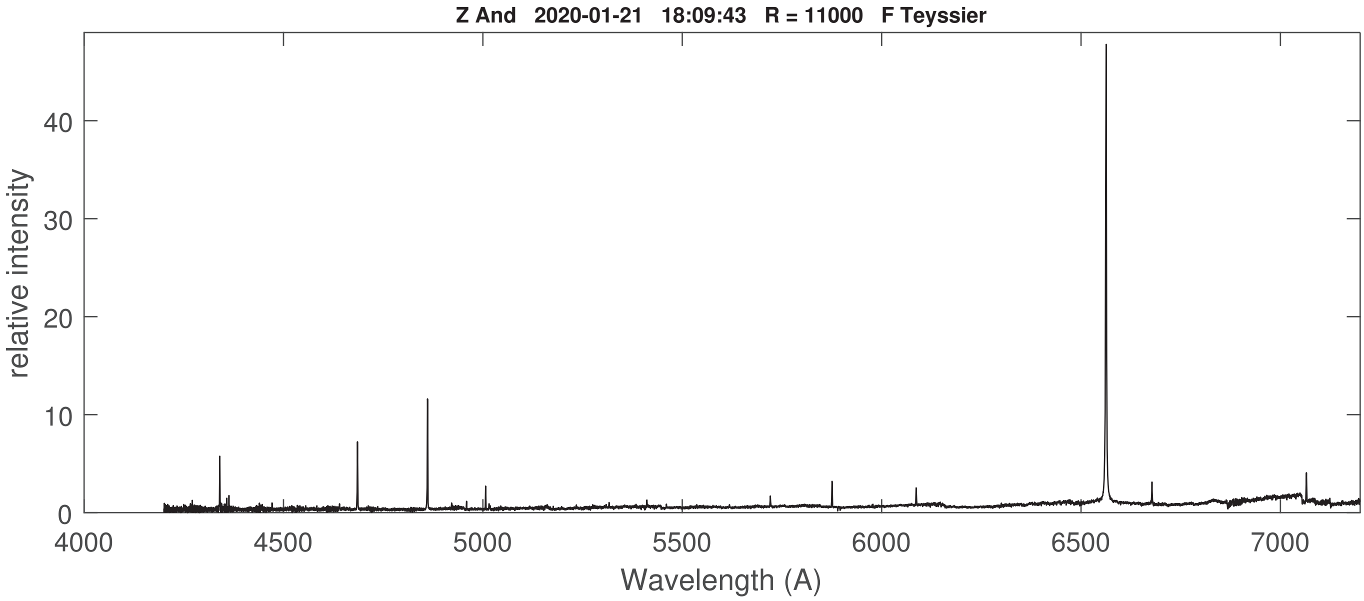




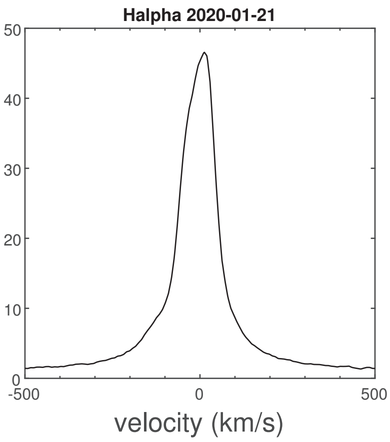


Flux calibrated spectra obtained by David Boyd and Woody Sims with LISA (R = 1000). We note the very good instrumental/atmospheric correction

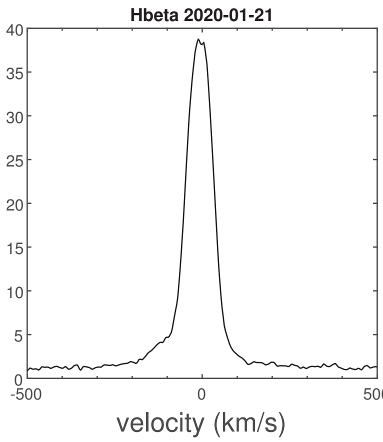
Z And



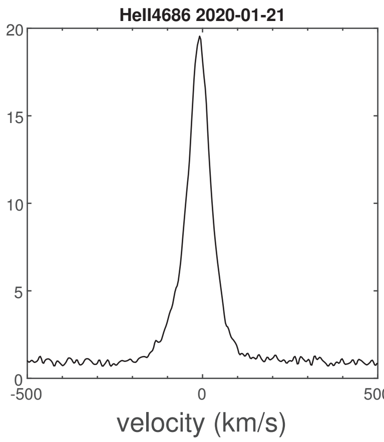
Z And 2020-01-21 18:09:43 R = 11000 F Teyssier
relative intensity
Wavelength (A)



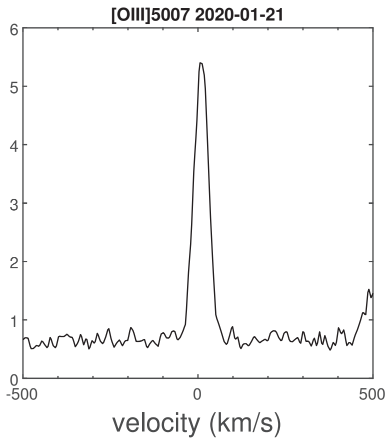
Halpha 2020-01-21
velocity (km/s)



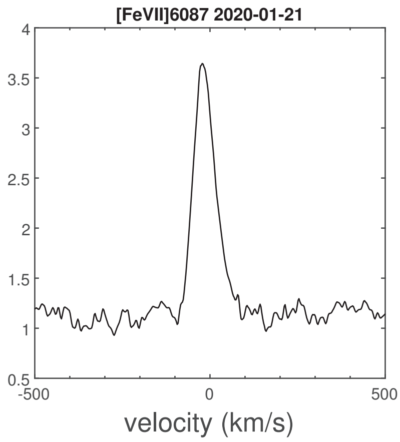
Hbeta 2020-01-21
velocity (km/s)



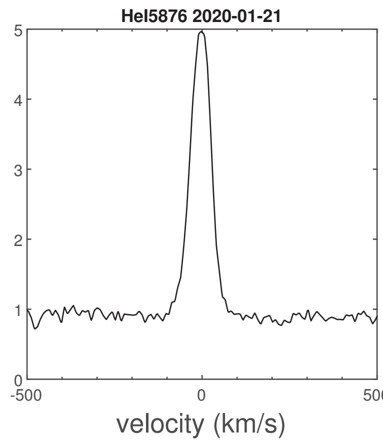
HeII4686 2020-01-21
velocity (km/s)



[OIII]5007 2020-01-21
velocity (km/s)



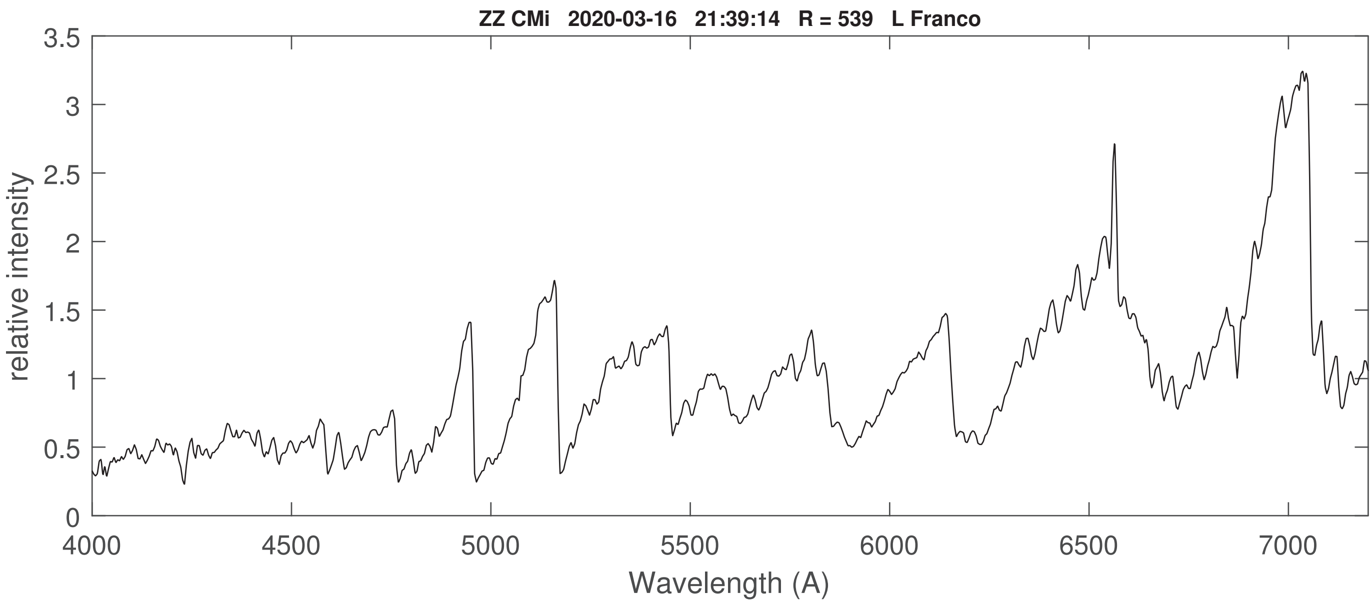
[FeVII]6087 2020-01-21
velocity (km/s)

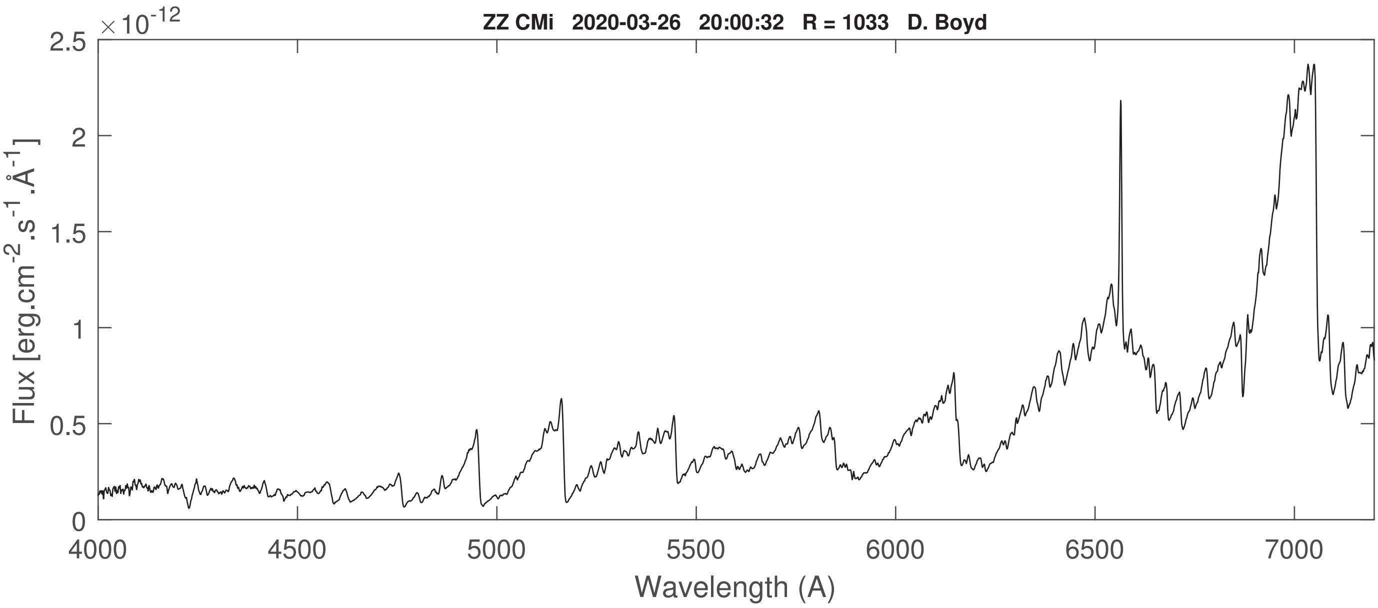


HeI5876 2020-01-21
velocity (km/s)

ZZ CMi

Coordinates (2000.0)	
R.A.	18 14 34.2
Dec	+20 59 21.2
Mag V	10.3 (2019-12)

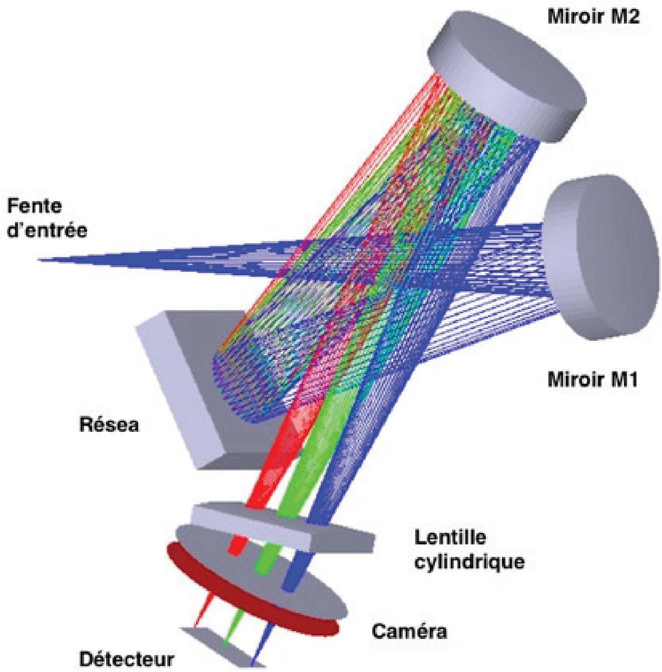




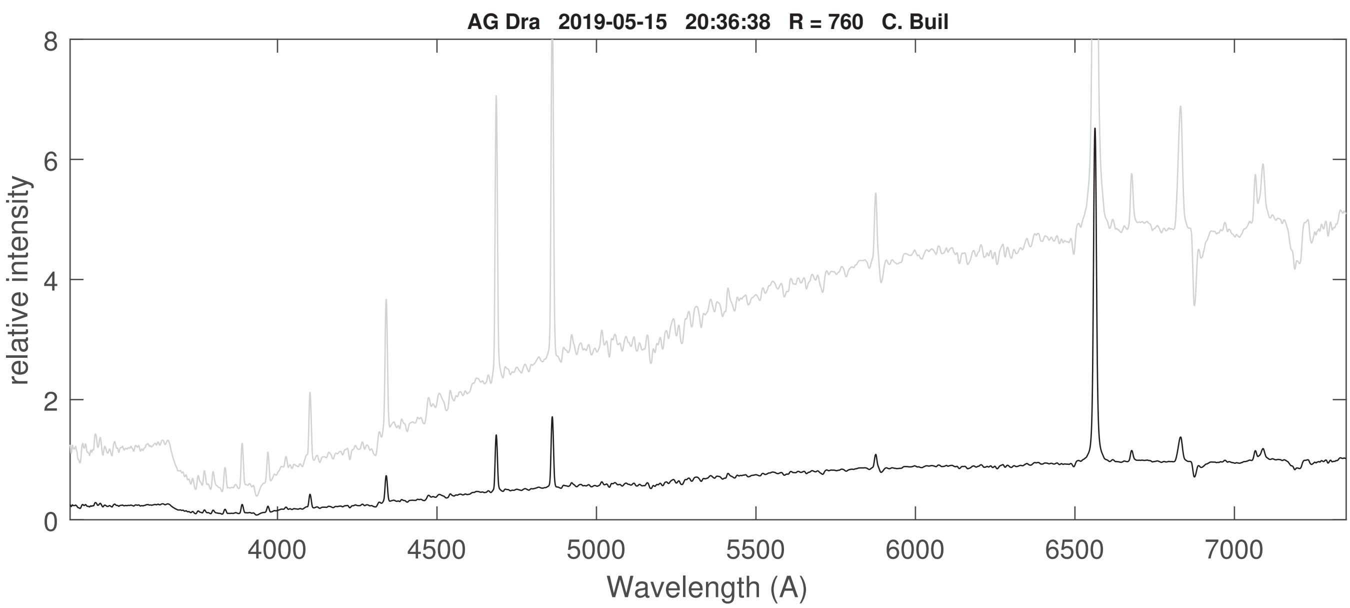
UVEX is a collective project managed by Christian Buil, Pierre Dubreuil, Stéphane Ubaud, Jean-Luc Martin, Alain Lopez, Pierre Thierry. UVEX is a spectrograph mainly intended for astronomical observations on relatively small sized telescopes. In its first concept UVEX has been conceived for near UV spectroscopy, down to 3300 Å. Further developments allowed to explore the near IR until 9500 Å.

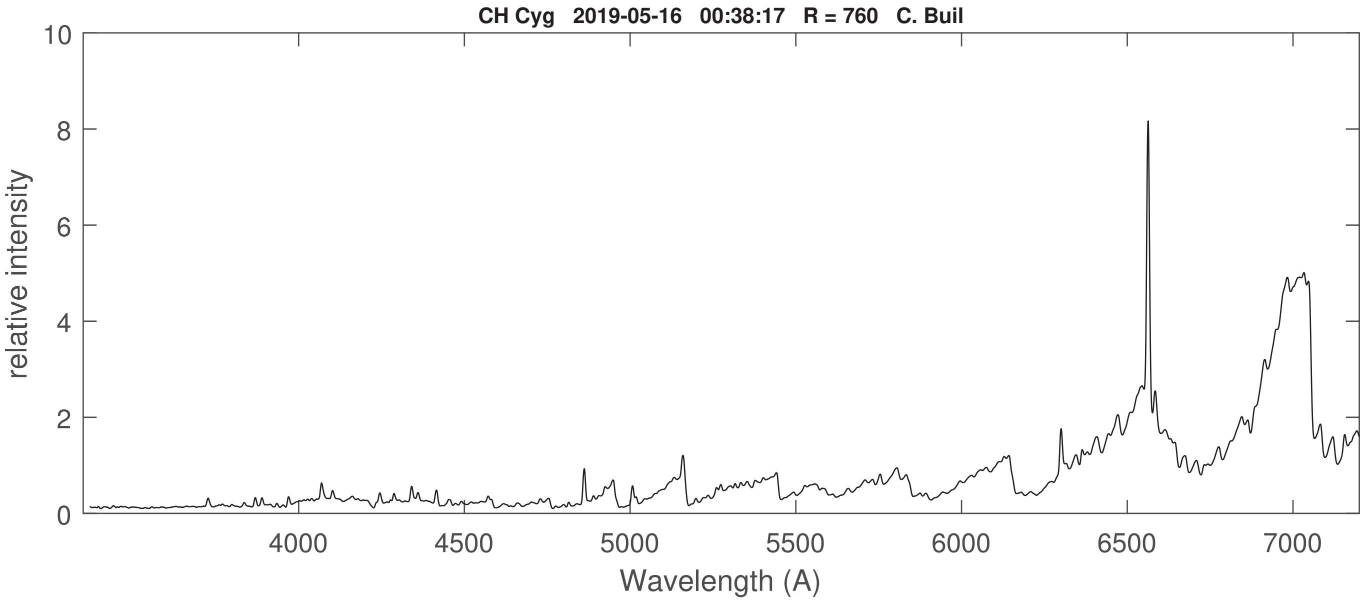
Links to UVEX Project:

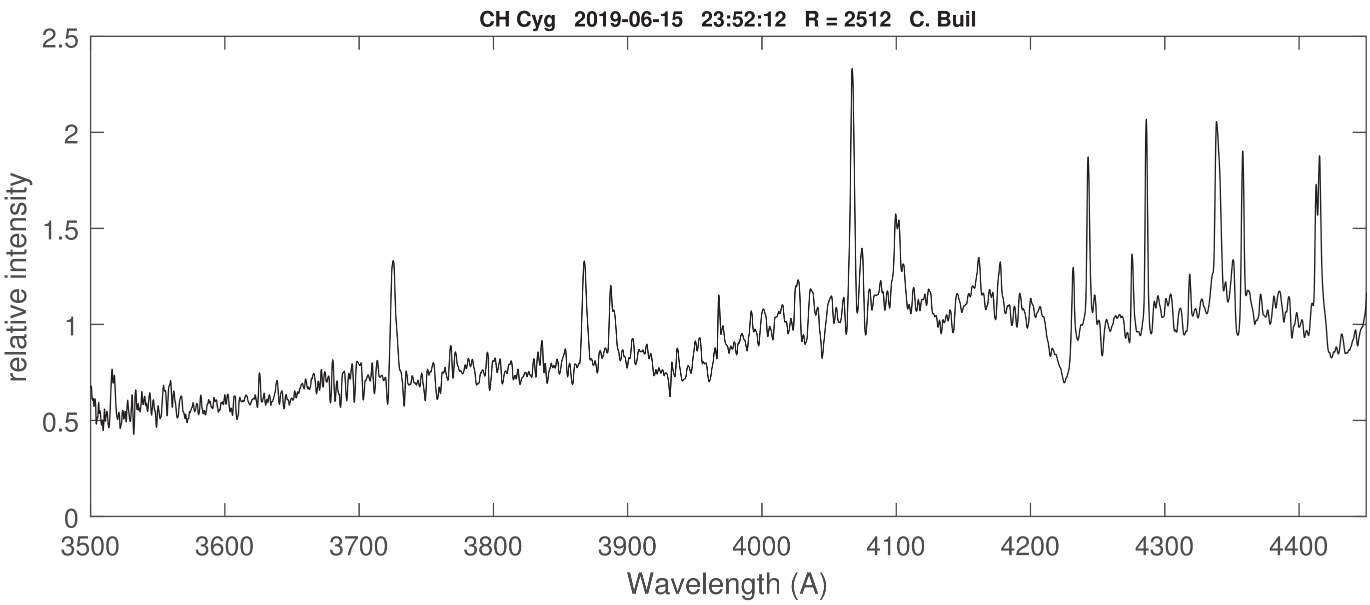
French
http://www.astrosurf.com/buil/UVEX_project/
English
http://www.astrosurf.com/buil/UVEX_project_us/
Site projet UVEX
http://spectro-uvex.tech/?p=1095
ARAS Forum:
http://spectro-aras.com/forum/viewforum.php?f=45

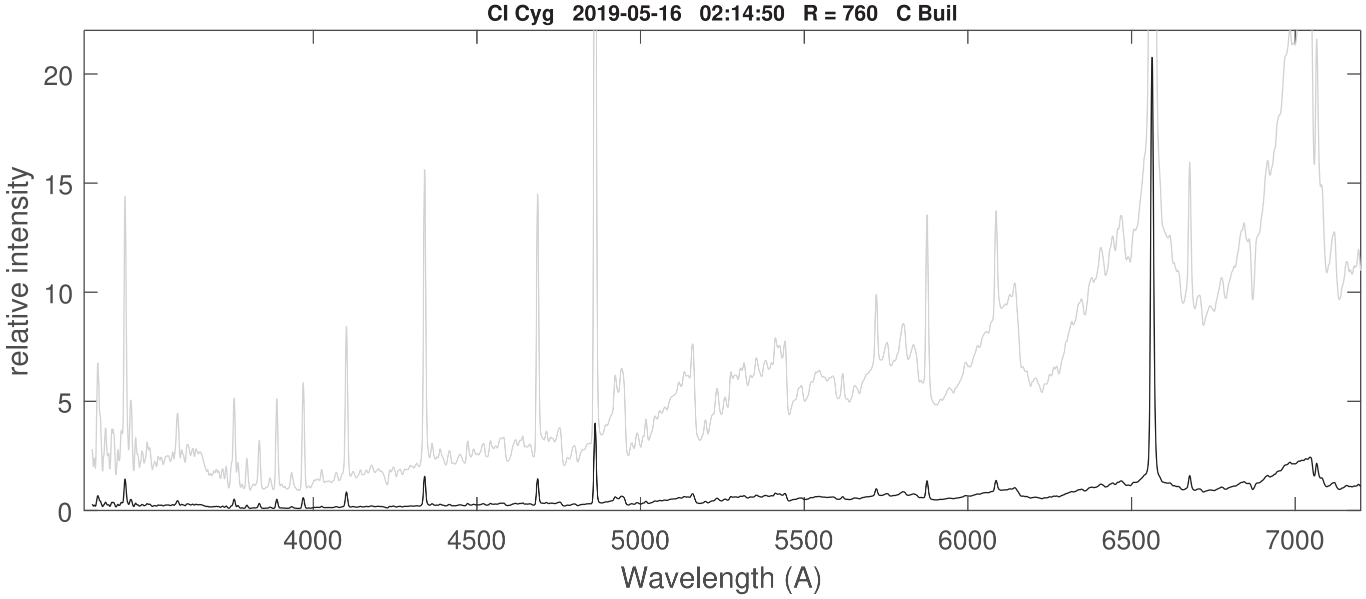


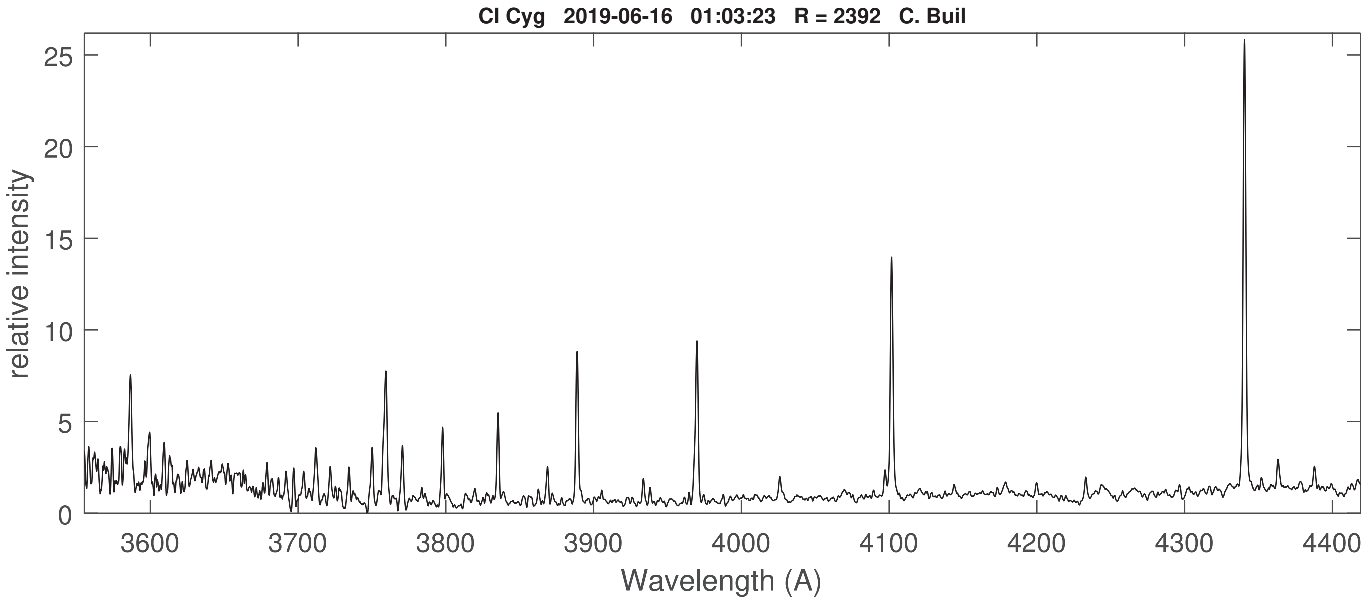
Here, we presents results obtained on symbiotic stars in the UV.

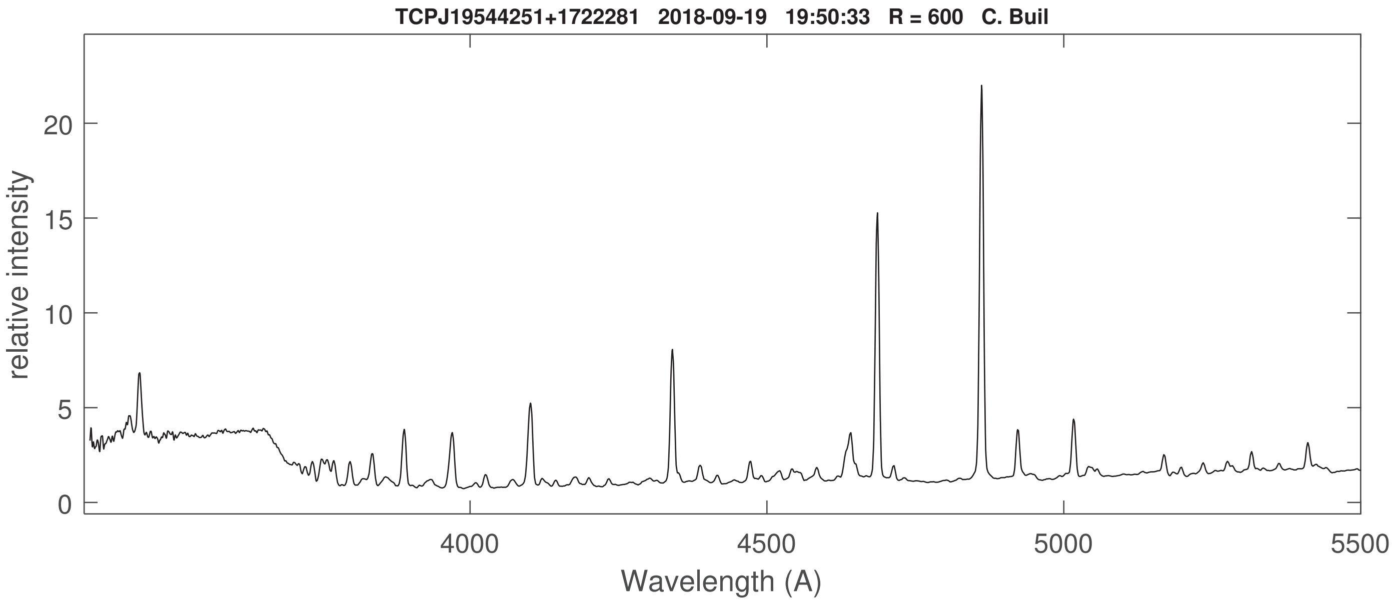


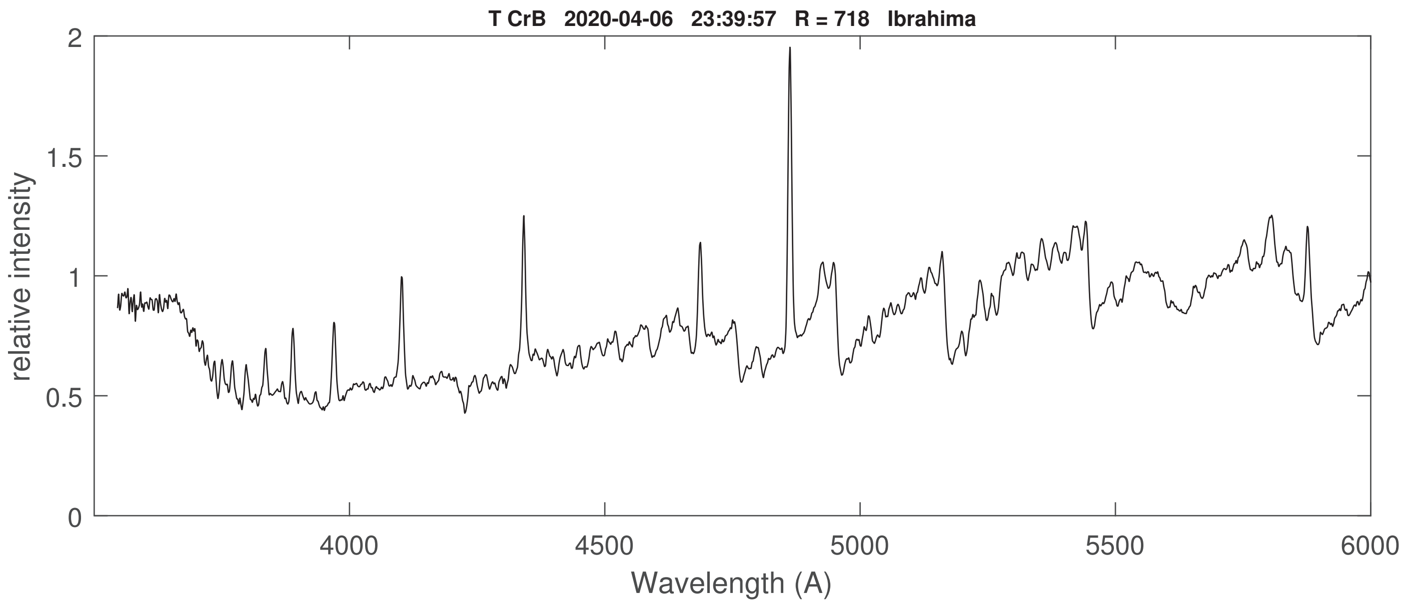

CH Cyg 2019-05-16 00:38:17 R = 760 C. Buil
relative intensity
Wavelength (A)
0
2
4
6
8
10
4000
4500
5000
5500
6000
6500
7000


CH Cyg 2019-06-15 23:52:12 R = 2512 C. Buil
relative intensity
Wavelength (A)
0
0.5
1
1.5
2
2.5
3500
3600
3700
3800
3900
4000
4100
4200
4300
4400

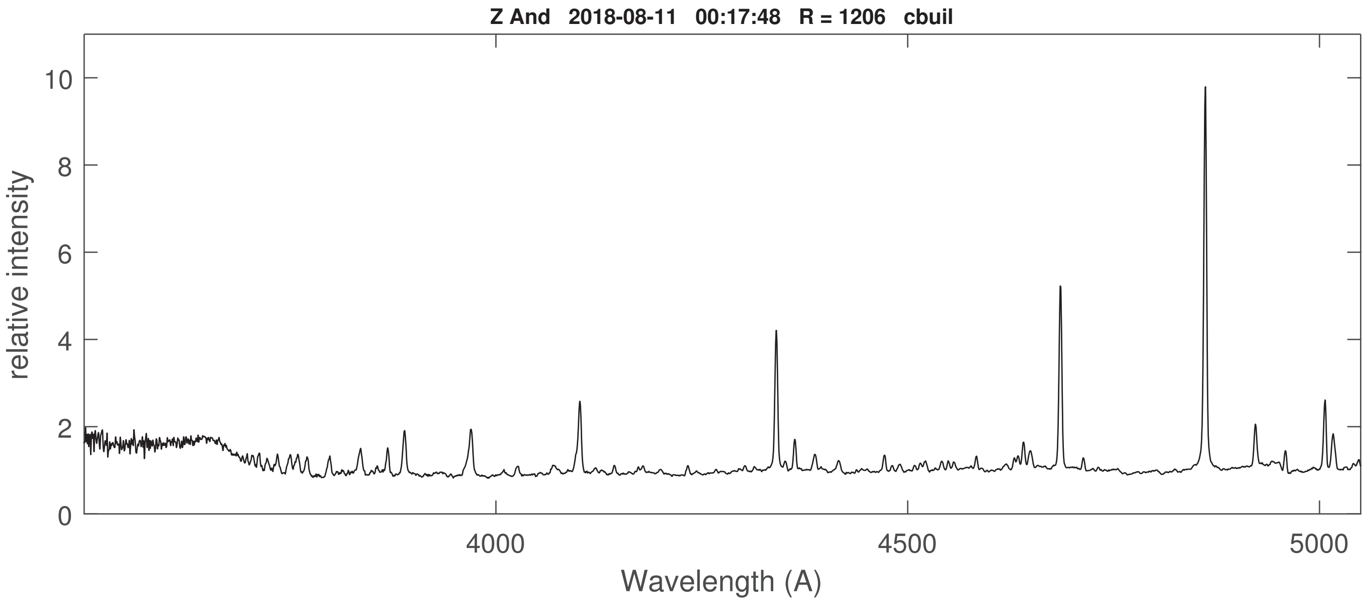

CI Cyg 2019-05-16 02:14:50 R = 760 C Buil
relative intensity
Wavelength (A)
0
5
10
15
20
4000
4500
5000
5500
6000
6500
7000

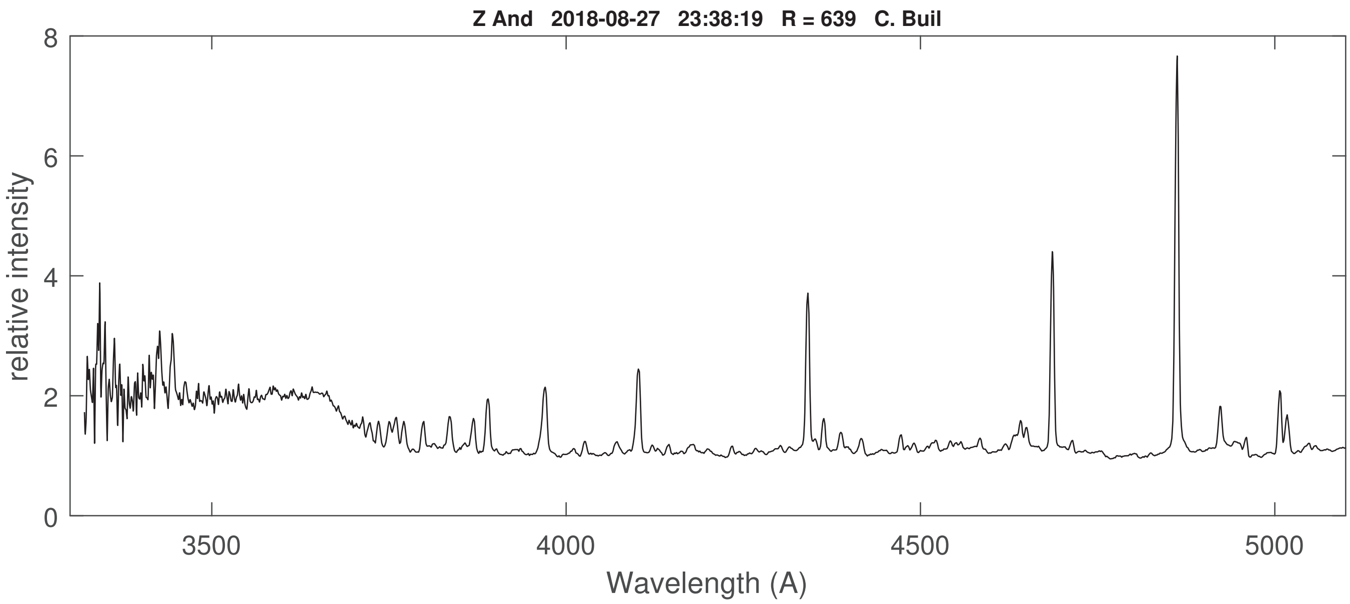

CI Cyg 2019-06-16 01:03:23 R = 2392 C. Buil
relative intensity
Wavelength (A)
0
5
10
15
20
25
3600
3700
3800
3900
4000
4100
4200
4300
4400





Strong Balmer jump B^- = -0.3


Z And 2018-08-11 00:17:48 R = 1206 cbuil
relative intensity
Wavelength (A)
0
2
4
6
8
10
4000
4500
5000


Z And 2018-08-27 23:38:19 R = 639 C. Buil
relative intensity
Wavelength (A)
0
2
4
6
8
3500
4000
4500
5000

Eruptive stars spectroscopy
Cataclysmics, Symbiotics, Novae

Eruptive Stars
Information Letter n° 45 #2020-01 27-06-2020
Observations of Jan. - Apr. 2020

Spectroscopic observations of the Dwarf Nova TCP J21040470+4631129

Abstract:
Abstract:
The unusual behaviour of this dwarf nova during 2019 continued in 2020. After remaining around 15th magnitude for 3 months, it experienced another superoutburst at the end of March 2020. It rose rapidly to V magnitude 10.8, faded by one magnitude over the next 9 days, then dropped quickly back to 15th magnitude. The new outburst was reported in ATel 13646.

Observers:
F.Sims, C. Boussin, P. Somogyi, T. Medulka, P. Dubovsky

Star:

TCP J21040470+4631129

15 spectra obtained during and immediately after this new outburst were reported to the ARAS database. 12 spectra were flux calibrated using V magnitudes interpolated from AAVSO V band observations at the times of recorded spectra.

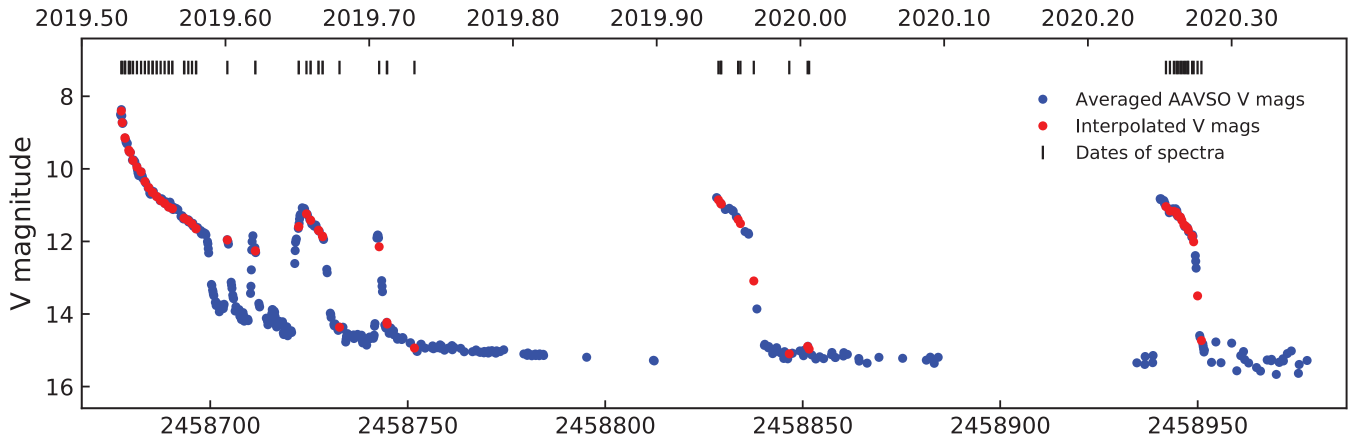


Fig.1 - AAVSO V band lightcurve (0.1 day mean, blue), dates of ARAS Spectra (dark lines) and interpolated V magnitudes (red).

Coordinates (2000.0)	
R.A.	21 04 04.7
Dec	46 31 12.9
Mag V max	8
Mag V min	15

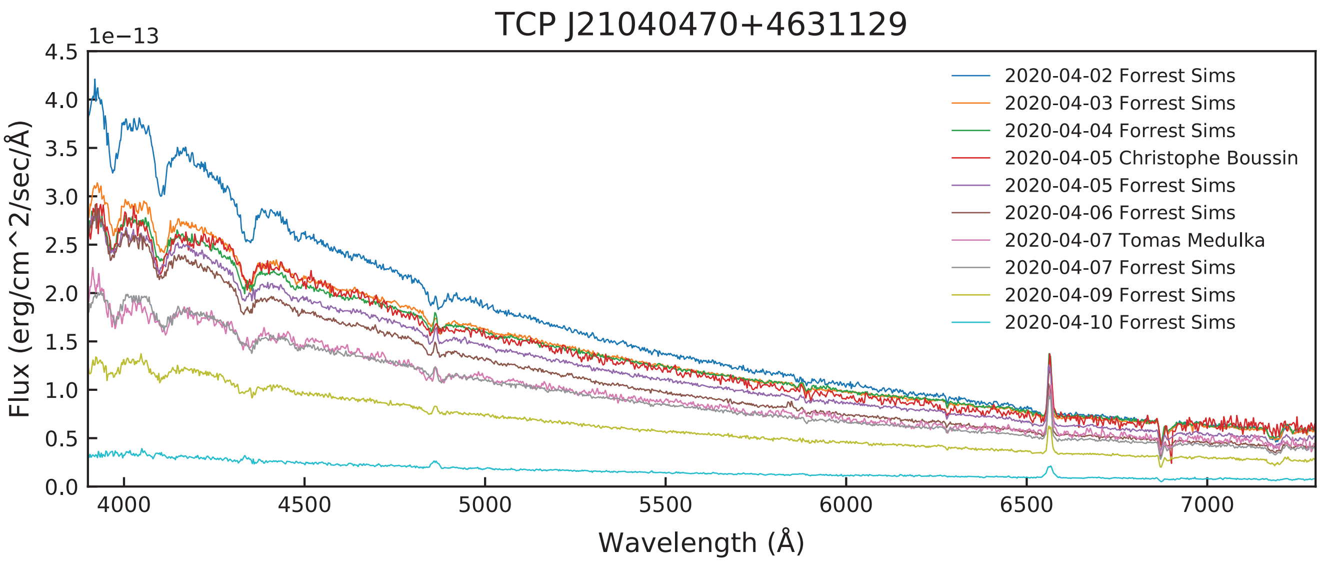


Fig.2 - Spectra recorded during the outburst between 31 March and 9 April 2020.

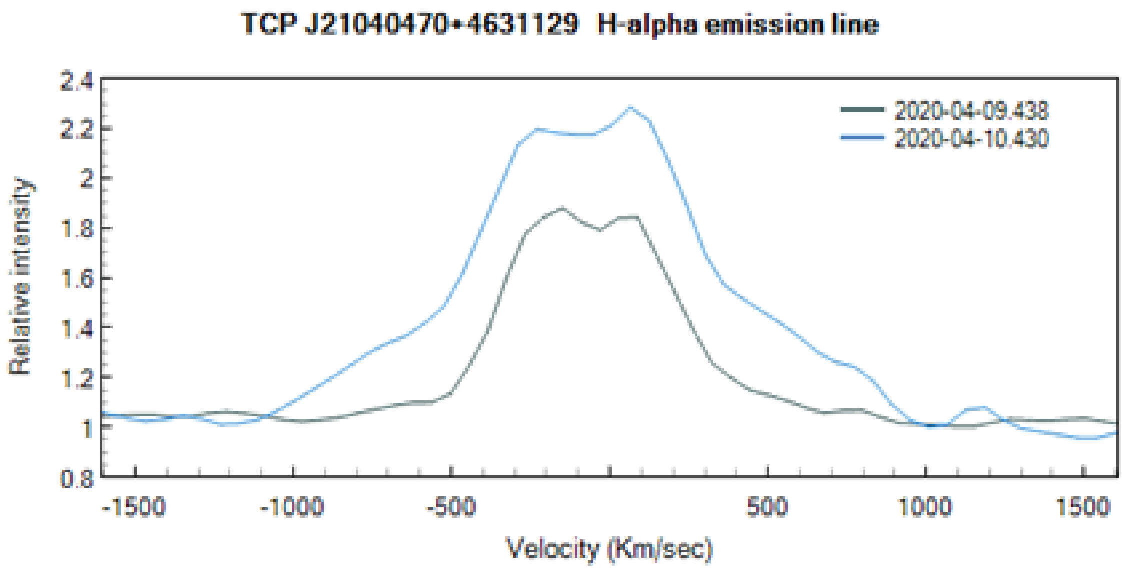


Fig.3 - Change in width of the Hα emission line between 9 and 10 April.

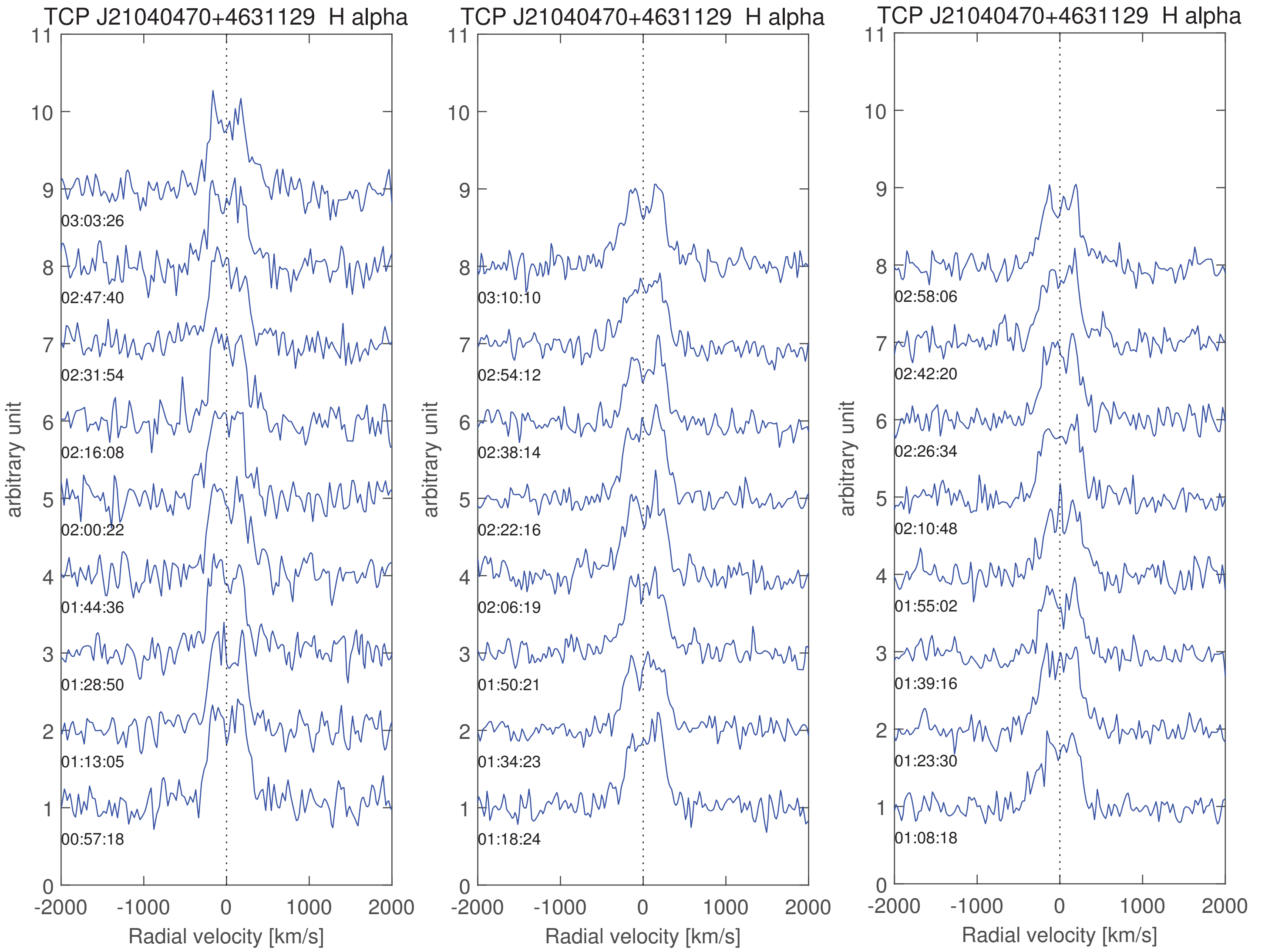


Fig.4 - Time series of Ha obtained by P. Somogyi with a Lhires III 600 l/mm (R = 2500) on 2020 April 6, 8 and 9

Two comets were reported in spring 2020 with visual magnitudes around 8.5 and therefore bright enough to be recorded with a LISA and C-11. This proved challenging as the diffuse coma made a difficult guiding target and long exposures were necessary to record sufficiently dense spectral images. The spectra of both comets show prominent emission features of radicals formed by dissociation of molecules in the coma by solar radiation. These features are identified in the images below. Cyanogen CN is formed from hydrogen cyanide HCN, diatomic carbon C_2 from acetylene C_2H_2 and ethane C_2H_6, and NH_2 from ammonia NH_3. The strong C_2 emission feature around 5100 Å, known as the Swan band, is in the green part of the spectrum and is responsible for comets appearing green in colour images. The emission features are similar in both comets, except that NH_2 is noticeably weaker in C/2017 T2.

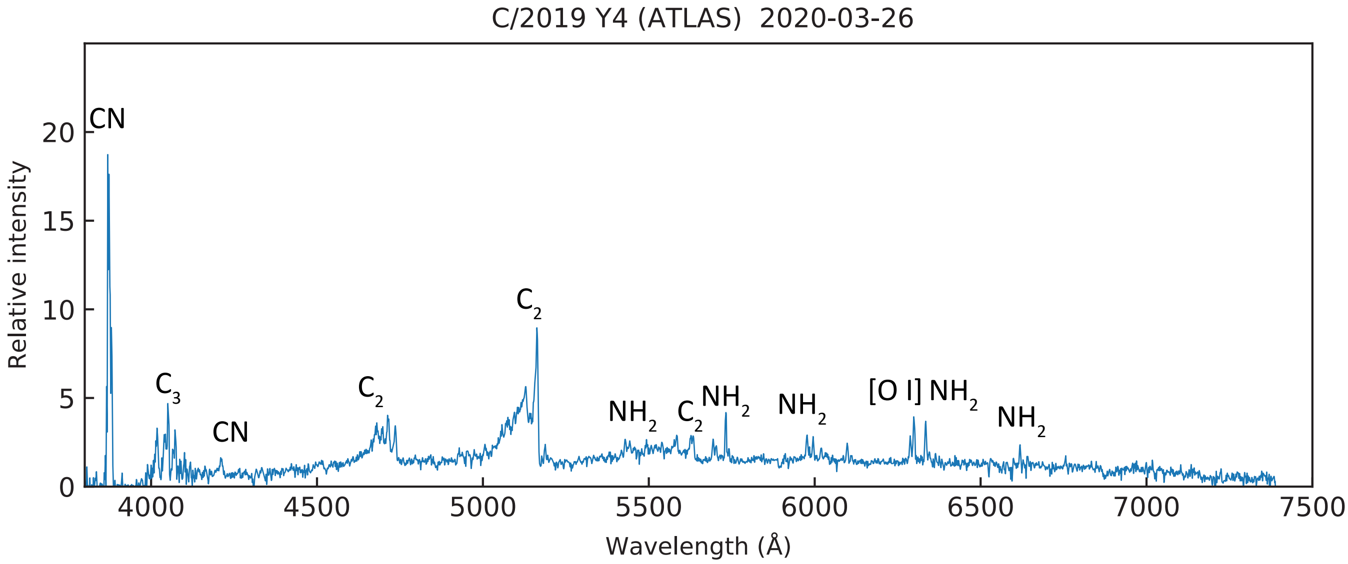


Fig.1 – Spectrum of C/2019 Y4 (ATLAS) - David Boyd - LISA (R =1000)

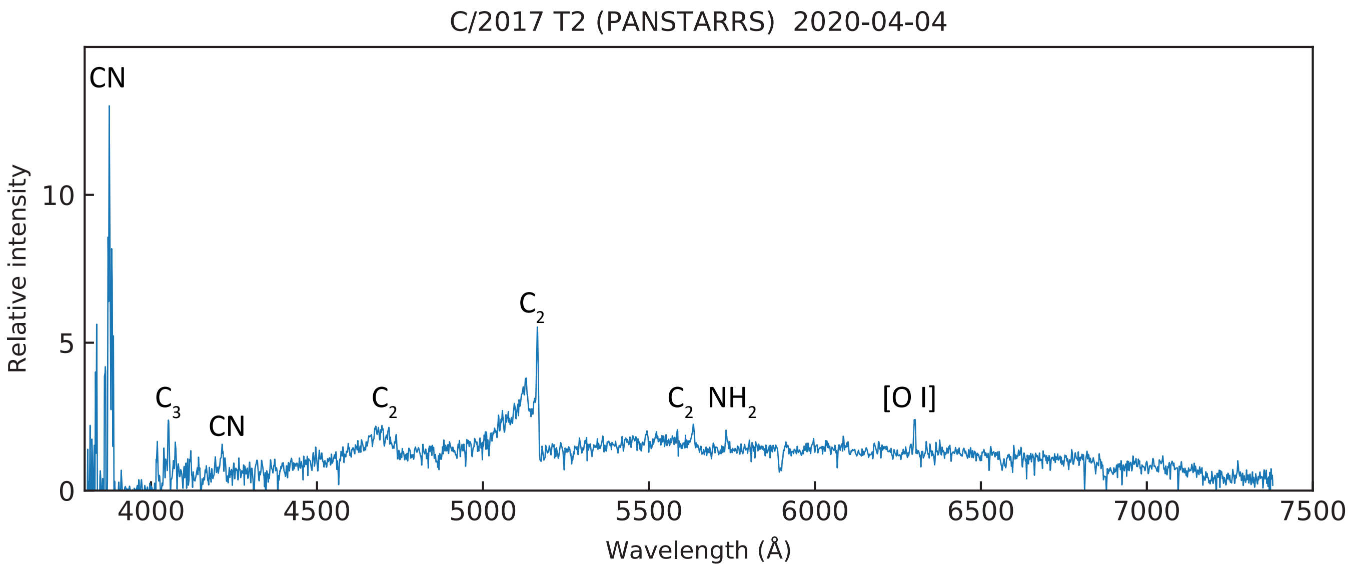


Fig.2 – Spectrum of C/2017 T2 (PANSTARRS) - David Boyd - LISA (R =1000)

Steve Shore

Astronomy is burdened by the fundamental constraint that we have to work deductively, and inversely, when trying to understand an observation[1]. It's not only that we can't perform experiments on a cosmic scale, we can't always know in advance what will happen or when. A well known source may misbehave, but at least in such cases we have some prior constraints on our knowledge of the phenomenon. But when we face a previously unknown transient source, it's a dierent story. You might look at it this way. There's a saying in English that to make a rabbit stew, you first have to catch a rabbit (sorry for those vegetarians among the readers). But it's more subtle. You first have to know what a rabbit is, to identify it. Being fuzzy, having long ears, and hopping may not be enough to unambiguously hone in on the prey. It might be a rabbit impersonator. Such is the problem we face with classical novae (CN), supernovae (SN), Luminous Blue Variables (LBV), and a host of other extreme events.

Knowing what to specify as the "success criteria" is a big part of the problem

How to impersonate a nova

As spectroscopists, you know the conditions of the medium leave fingerprints all over the observed spectrum but not all of these are unique. If you're dealing with a stationary object, by which I mean a "simple" star in hydrostatic and thermal balance that is neither pulsating nor in an interacting binary, you can predict the spectroscopic appearance in a way that depends on only a few physical properties. Once you know the mass and radius of the star, or more simply its surface gravity (which is the same in spectral classification terms as the luminosity class) and the total emitted flux (which gives you the surface temperature), you require only the abundance set of the elements of which the star is composed to compute the emergent spectrum. This is the underpinning of spectral classification: stars with the same thermal and mechanical properties are alike. The changes resulting from the evolution of a star are slow enough that you can match, at any moment, the object's spectrum with one calculated with some set of properties.

Two come to mind immediately. A stellar wind may be independent of time but it is not *hydrostatic*. A photosphere there must be because the underlying object is opaque at some depth. But the density and pressure of the layers through which we're looking won't be the same as a star of the same properties but without a wind. This is really science fiction since to be physically consistent a wind has to arise "naturally" from the same conditions that govern the stellar structure. But we can think of the atmosphere as clothing on top of star's body and just change the costume. Now the resulting spectrum depends on many new properties of the enveloping gas: the velocity gradient, the mass loss rate (or mass accretion if you turn it around), and the final velocity. And that's if the ow is steady. Allow it to vary and you introduce time into the picture. Photons don't just leave, they diffuse. OK, they travel longer distances between interactions as the density drops toward the periphery but that's only part of the story. I'll remind you of an earlier discussion about winds, that the escape of a photon depends on the optical depth, not only on the density. So where the change in the outflow velocity over space is rapid the medium is more transparent than

[1] A moment's reflection on scientic method might help here, Francois raised the question. To reason back fromwhat we see to the cause is detective work and inverse to inductive reasoning.. You all remember Hercule Poirot andSherlock Holmes, right? This isn't the same as taking a theoretical construct, making a prediction, and performingan experiment. We have to go looking for something that looks like what we predicted and be very careful to specifythe selection criteria to insure that the object, when found, really corresponds to what was predicted. In astronomy, that's very hard. Knowing what to specify as the "success criteria" is a big part of the problem.

The classification of transients is, consequently, harder than for normal stars since the prevailing conditions don't allow a unique association of a few physical properties to the resulting spectrum.

where the velocity reaches some terminal value.If you have a rapidly shifting absorber it gives a pass to photons at some wavelengths coming from below and the line saturates only with very high column densities. But if the velocity changes very little along the line of sight, even at low density the photons see something more like a static atmosphere and although they can go some large physical distance they can eventually be absorbed by the gas. This is the basis of the absorption component in a P Cygni profile. Now let the dynamical picture change in time, on a timescale comparable to the diffusion time, and uniqueness disappears. One part of the atmosphere may be turning more opaque while another is becoming more transparent and these are at different locations. You, sitting so far away, can't spatially resolve this: you only see what emerges at each wavelength. So the appearance can change in a way that depends on which spectral interval you're observing. It's complicated but not hopeless because the emergent spectrum is still reflecting the history of the transfer process. By this I mean you can unravel some of the information by watching the changes over time. This is the physical basis of interpreting observations of transients and why it's a more complicated affair than steady sources. What I've set up is a way of contrasting what forms the basis of most inferences about the properties of normal stars and those that violate any or all of these prescribed conditions. The classification of transients is, consequently, harder than for normal stars since the prevailing conditions don't allow a unique association of a few physical properties to the resulting spectrum. You have to work backwards. Say you detect a supernova in some galaxy. You know, or think you know, what it is based on its light curve and luminosity. So when you take a spectrum at some moment in the event, you associate that with the conditions in the source at that time. Supernovae of type Ia, for instance, were shown in the '60s and '70s to be remarkably similar at the same stage in the event in each spectral interval and were quickly realized to be standard candles, that is essentially the same (how much "the same" is another issue to discuss in future columns). The spectra show no Balmer lines, for instance, so when you see the transient, even if you have only a brief time observing it, the spectrum can be matched to templates (archival examples, like fingerprints in a forensic match) that depend on when the data were taken. You see this in the ATels, when a transient is identified as, for instance, "SN Ia three days past maximum light" or "two days before maximum light" and so on. It's because of the regularity of the spectroscopic development in this particular type of supernova. The same doesn't hold for SN II or any of the other subclasses, they have different light curves and spectroscopic sequences and are not as regular. But they do have certain signatures that distinguish them from SN Ia, especially the appearance of hydrogen lines and different velocities. Again, there are many templates and these may be said to match one or another prototypical (well studies) source. But herein lies the problem. Since the interpretation is not unique because similar physical conditions can produce similar looking

[2] A moment's reflection on scientic method might help here, Francois raised the question. To reason back fromwhat we see to the cause is detective work and inverse to inductive reasoning.. You all remember Hercule Poirot andSherlock Holmes, right? This isn't the same as taking a theoretical construct, making a prediction, and performingan experiment. We have to go looking for something that looks like what we predicted and be very careful to specifythe selection criteria to insure that the object, when found, really corresponds to what was predicted. In astronomy, that's very hard. Knowing what to specify as the "success criteria" is a big part of the problem.

[1]

This again masks the underlying system yet the spectrum may resemble a nova in many ways!

spectra even if the source is different, a very bright transient may not be a SN II, for instance, but a source that similar structure arising from a different origin. I'll go back to the rabbit. If you have a cat dressed in a rabbit costume it will look like a bunny but not be one.

When an LBV goes into outburst, it's thought that this is an eruptive ejection of a large amount of mass in an enhanced wing. The star, which may in quiescence be quite hot (an O star) then becomes cloaked in its own wind that recombines when the column density is large. This, like what happens in a classical nova, shifts the peak of the energy distribution from the UV to the optical and the star brightens while showing a spectrum that looks like a cooler supergiant. The velocities may be large since the star is luminous and massive (we're talking about 40 $M_\odot$ or even more) and can reach luminosities comparable to that of a supernova. So in that sense, it may resemble what it isn't because the conditions under which the spectrum was formed are similar. That is, the wind can look like a dense, massive shell moving at a few thousand km/s with hydrogen and He lines. But there are two very important differences. Even in the absence of an identifiable precursor, the timescales will be different if it's not an explosion. The rate of change of the spectrum will not be the same as an SN II, not will the longer term light curve. But in a snapshot, it may impersonate one. And because it's not the destructive cataclysm of a supernova, there can repeat. The LBVs are so called precisely because they do recur, although you may have to wait decades or even centuries. The essence is that if you have a pseudo-photosphere - that is, an opaque surface that changes its location within the expanding gas over time - the precise sequence of spectral appearances over time will not be the same as a SN. The same holds for mergers. Two ordinary stars (even if one is a white dwarf, I think you'll agree that's more ordinary than a black hole or neutron star) that merge fuse under extraordinarily violent conditions. A vast envelope can be expelled, in what seems an explosion, from the central source. This again masks the underlying system yet the spectrum may resemble a nova in many ways! The ejecta are escaping, they show a velocity structure that may be ballistic, and their subsequent development may look for all purposes like a nova. But the source is completely different and so are the timescales. Here we are truly fortunate to have a single, unambiguous example of such an event, V1309 Sco. Having been photometrically observed for a long time before it's eventual outburst, the light curve changed from a WUma type (a contact, double eclipse with continuous light variations outside of the eclipses resulting from a sort of peanut) to a single continuous variation and a systematically decreasing period for a few years before the eruption. The merged system is still unobserved, masked by the massive (of order fractions of a solar mass) of now completely recombined gas of the ejecta.

Classical novae don't eject much mass, less than 10^{-4} $M_\odot$. This is an essential physical property of the origin of the event: a thermonuclear explosion provoked by the ignition of gas accreted on a white dwarf from a companion. The trigger is pulled when the right pressure is reached at the bottom of the accreted layer to ignite the nuclear reactions. As the ejecta expand, as we've discussed over the years, the white dwarf remains an active illuminating source and the thinning ejecta are subjected to its hard spectrum so it goes from an optically thick, pseudo-photospheric appearance to a nebular spectrum. The timescale depends on the amount of mass ejected and the velocity with which the gas expands, but the sequence is confined to an interval of months. As you know, the first rise is because of the sudden increase in the opacity of the ejecta as they expand, the *iron curtain* phase, with the spectrum shifting from the UV to the optical. This is the same for *all* ejecta, the amplitude of the rise differs from one to another depending on geometry and amount of mass ejected but the basic mechanism is the same. In other words, the gross features of the event are because the light has to cross the ejecta and the ejecta change over time in similar ways in all explosive events. So when you see a spectrum, while it's not a unique sequence in time, it's more or less regular and comparatively brief. In fact, the single, unique, signature that you've seen a thermonuclear explosion instead of a merger or a mass loaded wind is the altered abundances in the ejecta, the 3 fossil record of the mixing and processing in the stages leading up to the ejection. In LBVs, the nitrogen abundances are higher than normal but this is from long term mixing inside the star and not from the driving of the mass loss. For mergers, well, it's not so clear and that's because the spectra are so much more complicated but it doesn't seem that the abundances are altered. In contrast, there's a subgroup of transients - and it's not many - that look just like novae spectroscopically but develop much more slowly. These are not tremendously energetic but are slower in turning transparent. They're usually called "slow novae", they linger around maximum light for many months, but eventually show similar sequences of optical fading and nebular emission lines. Another distinguishing property is the photometric maximum itself. It's very unsteady, with what one might call “flares" or “brightenings". In an attempt to order the diverse light curves collected over the last almost century by the AAVSO, a very subjective ordering was introduced by Strope and Schaefer[3] that divides the form of the curves into a half-dozen categories (with subtypes), among which a small set are called "J" for *jitter*, all of which are this slow decline type. ASASSN-17hx is a recent example and one we worked on rather extensively[4]. Another may be ASASSN-18fv = V906 Car. Among the older systems, HR Del is also similar, you'll get the idea from flipping through the light curves in the Strope and Schaefer paper. These excursions have been interpreted variously, as shocks and multiple ejections or periodic ionization and recombination waves driven by the underlying source. Whatever the final picture, it suggests that these are not the usual garden variety low mass ejections.

Whatever the final picture, it suggests that these are not the usual garden variety low mass ejections.

To explain further and connect this with imposters of other types, such as LBVs that look like supernovae, you can imagine having a fog through which you're passing a beam of light. Vary the light and the diffusion from the fog will cause the signal to smear out in time. Now change the *spectrum* of the light so sometimes it peaks in the optical and sometimes in the UV.

[3] https://ui.adsabs.harvard.edu/abs/2010AJ....140...34S/abstract
[4] https://ui.adsabs.harvard.edu/abs/2020A&A...635A.115M/abstract

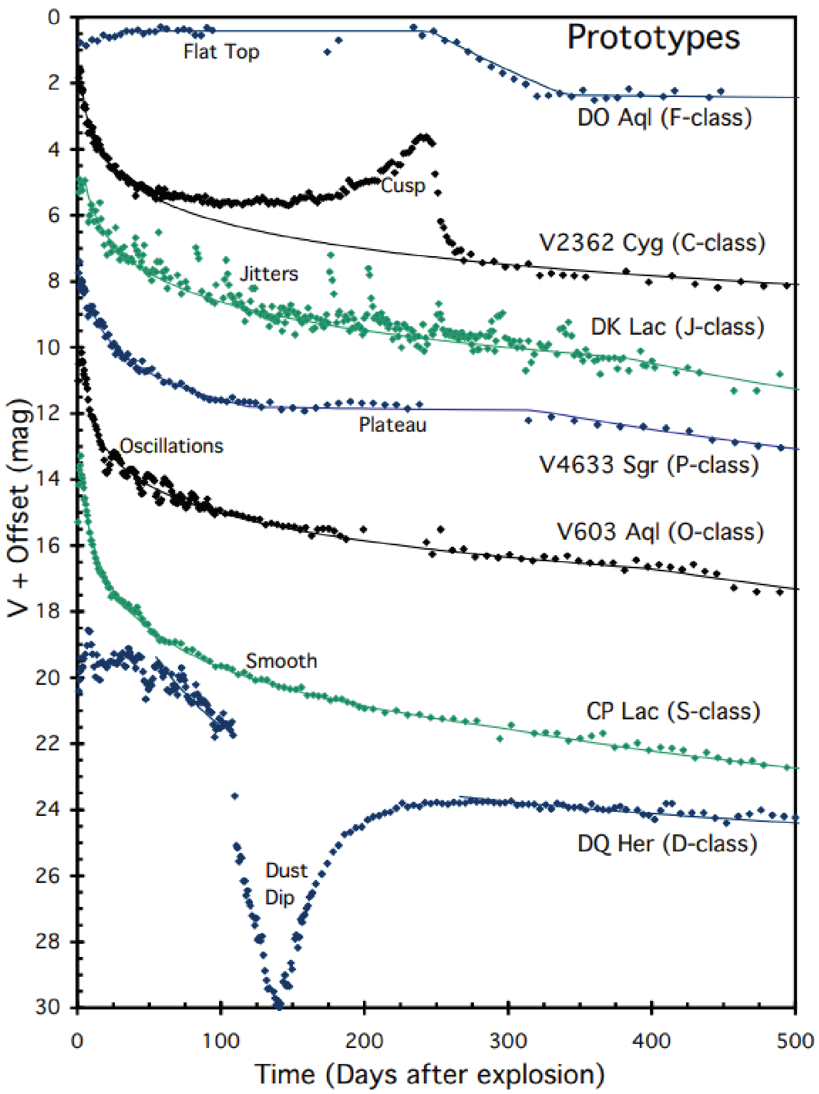
The same region will now respond by ionizing when the source is hard and recombining when the source is soft but there will again be a delay as the signal diffuses through the medium. Different parts of this fog will change at different times and alter the signal as it propagates outward so you'll see the emergent spectrum also change over time. It doesn't matter what's causing the light to change, though, you only see the response of the fog if you can't see the underlying source directly. That's, again, an inverse problem, going from the observed behavior back to the source knowing the physics of the radiation transfer. If there are shocks or a pulsating source underneath the outcome may look the same, it only depends on how much overlying mass you have.

The bolometric balancing act

There's a very important physical process involved in this discussion, one that merits a bit more explanation: the redistribution of flux in a “passive" medium. The ejecta in most cases, other than supernovae, act as filters. In this sense, they are passive - they modify the light without contributing to the luminosity. First, consider the absorption process in ejecta surrounding an active source. The photosphere within the ejecta is wherever the medium is completely opaque to the light from below, the deepest layer to which we can see from outside. Whatever causes the opacity, at each wavelength there will be some point - if early enough in the expansion - that seems to be a surface: this is the pseudo-photosphere. Remember, the “pseudo" part is because it's not a stationary location in the ejecta. Now if you have any increase in the opacity of the more peripheral layers, the location of this surface moves outward; similarly, a decrease in opacity means it moves inward. If the amount of energy that must pass is always the same, this changes the effective temperature. Another way of saying this is that if this special surface moves outward, it looks cooler and this also alters the state of the more external parts of the ejecta. If they were initially ionized, anything that causes the radiation to “cool" can permit more recombination, hence an increase in the line opacity. If the incoming light is peaked toward the UV but the ejecta are opaque there, the flux has to emerge in the optical. This accounts for the band- dependent light curves in these passive transients. When the ejecta, on expansion, recombine the visible brightness increases in balance to the decrease in the UV. As the ejecta thin out, though, the effective temperature increases, progressively more UV light reaches the periphery, and the opacity drops. The redistribution is, therefore, less effective and as the UV increases the visible decreases. The balance isn't precise, it depends on the geometry since some flux is lost from non-spherical ejecta that is never reprocessed but for complete covering the redistribution is said to be “bolometrically constant". Now let the underlying source vary. If its spectrum becomes harder, the ionization of the ejecta will increase and the ejecta will become more transparent. This leads to a decrease in the flux emerging in the visible. Conversely, if the source turns “soft", the opposite happens. The source becomes brighter in the visible and less ionized. So alternations of ionization and recombination waves can be produced by the variations of a still active source. The possibly misleading aspect of photometry is that you don't measure the whole energy distribution, only that emerging in your band. Spectroscopy, on the other hand, because the distribution of lines and ionization states depends on the complete radiation field, can provide information about unseen parts of the spectrum. This is what seems to be happening in sources like ASASSN-17hx: when the visible is bright, the spectrum is less ionized and less excited. When the visible is low, the spectrum is more ionized and excited. There are other, non-repetitive examples in many classical nova light curves.

Coda for this issue

We'll continue this in the next issue and also discuss aspects of spectroscopic time series. For now, I hope this has given you a feeling for how to perform a sort of forensic investigation, comparing and contrasting properties of the observations, and how to avoid imposing too quick an interpretation on something at first glance. In these dark times, solice comes from the deep contemplation and intellectual union with the Universe. You are the precious evidence of that.



The prototypes of Novae Lightcurves from Strope & Schaefer (2010)

Publications using ARAS database in 2019

First glance at the recently discovered symbiotic star HBHA 1704-05 during its current outburst

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.

Skopal, A., Sekeráš, M., Kundra, E., Komžík, R., Shugarov, S. Y., Buil, C., Berardi, P., & Zubareva, A.

Contributions of the Astronomical Observatory Skalnate Pleso, 2019, 49, 424.

Hα orbital variations of the symbiotic star EG And from optical spectroscopy

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, $\phi \approx 0.4$. This suggests that the ionized region is partially optically thick in the Hα line.

Shagatova, N., Skopal, A., Sekeráš, M., Teyssier, F., Shugarov, S. Y., Komžík, R., Garai, Z., Kundra, E., & Vaňko, M.

Contributions of the Astronomical Observatory Skalnate Pleso, 2019, 49, 406.

Study of long-term spectroscopic variability of symbiotic stars based on observations of the ARAS Group

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 2015, 165 years after its nova-like flare-up.

Merc, J., Gális, R., & Teyssier, F.

Contributions of the Astronomical Observatory Skalnate Pleso, 2019, 49, 228.

The current active stage of the symbiotic system AG Draconis

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.

Gális, R., Merc, J., & Leedjärv, L.

Contributions of the Astronomical Observatory Skalnate Pleso, 2019, 49, 197.

Studying symbiotic stars and classical nova outbursts with small telescopes

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. <P />

Skopal, A.

Contributions of the Astronomical Observatory Skalnate Pleso, 2019, 49, 189.

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

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 these observations, 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.

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

Open European Journal on Variable Stars, 2019, 197, 23.

The peculiar outburst activity of the symbiotic binary AG Draconis

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 describedin detail.

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

Open European Journal on Variable Stars, 2019, 197, 15.

The symbiotic star AX Per is going into strong outburst

AX Per is a well-known eclipsing symbiotic binary consisting of a giant of type M4.5 III (Muerset & Schmid 1999, A & AS, 137, 473) and probably a white dwarf

Merc, J., Galis, R., Teyssier, F., Boyd, D., Sims, W., Boussin, C., & Campos, F.

The Astronomer's Telegram, 2019, 12660, 1.

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

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 ?1×10^{23} to 1×10^{21} cm^{-2}, and the emission measure decreased from ?2×10^{62} to ?8.5×10^{60} 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) $\times 10^{39}$ $(d/4.5\ kpc)^2$ erg s^{-1}, lasting from day 2 to at least day 100.

Skopal, A.

\apj, 2019, 878, 28.

Optical photometry and spectroscopy of V612 Sct: slow classical nova with rebrightenings

We present the results of multicolour $UBVR_CI_C$ CCD photometry and optical echelle spectroscopy of the slow classical nova V612 Sct, discovered during its outburst on 2017 June 19.41 UT. The nova reached its brightness maximum V_{max}=8.42 mag and B_{max}=9.53 mag on 2017 July 29.99 UT. The light curve allows to classify it as a slow nova of the J-class with multiple peaks on the decline. We used the V and B light curves to find the rates of decline t_3,V=105 d and t_3,B=224 d. We estimated by applying MMRD relations the absolute magnitudes of the nova at maximum MV_{max}=-6.67 and MB_{max}=-6.44. The latter value yields a mass of 0.65 $M_\odot$ for the white dwarf component. We estimated the colour excess E(B-V) = 0.755 and found the distance 3.5 kpc to the nova. The study of radial velocities of Hα and Hβ P Cyg absorptions revealed two distinct components of the expanding envelope accelerated by a variable wind with the terminal velocity up to 1900 km.s^{-1}. The P Cyg absorptions were most enhanced during rebrightenings.

Chochol, D., Shugarov, S., Hambálek, Ľ., Guarro, J., & Krushevska, V.

Contributions of the Astronomical Observatory Skalnate Pleso, 2019, 49, 159.

NuSTAR Detection of X-Rays Concurrent with Gamma-Rays in the Nova V5855 Sgr

We report the first detection of hard (~10 keV) X-ray emission simultaneous with gamma-rays in a nova eruption. Observations of the nova V5855 Sgr carried out with the NuSTAR satellite on Day 12 of the eruption revealed faint, highly absorbed thermal X-rays. The extreme equivalent hydrogen column density toward the X-ray emitting region (3×10^{24} cm^{-2}) indicates that the shock producing the X-rays was deeply embedded within the nova ejecta. The slope of the X-ray spectrum favors a thermal origin for the bulk of the emission, and the constraints of the temperature in the shocked region suggest a shock velocity compatible with the ejecta velocities inferred from optical spectroscopy. While we do not claim the detection of nonthermal X-rays, the data do not allow us to rule out an additional, fainter component dominating at energies above 20 keV, for which we obtained upper limits. The inferred luminosity of the thermal X-rays is too low to be consistent with the gamma-ray luminosities if both are powered by the same shock under standard assumptions regarding the efficiency of nonthermal particle acceleration and the temperature distribution of the shocked gas.

Nelson, T., Mukai, K., Li, K.-L., Vurm, I., Metzger, B. D., Chomiuk, L., Sokoloski, J. L., Linford, J. D., Bohlsen, T., & Luckas, P.

\apj, 2019, 872, 86.

Continuing optical spectroscopic observations by the ARAS Group of the symbiotic-like recurrent nova V3890 Sgr.

Sims, F., Bohlsen, T., Cazzato, P., Dubovski, P. A., Guarro Flo, J., Garde, O., Luckas, P., Sollecchia, U., Arlic, G., Leveque, M., Souchu, J., & Nougayrede, J. P.

The Astronomer's Telegram, 2019, 13108, 1.

Echelle spectroscopy of TCP J21040470+4631129

We report optical echelle spectroscopy (R 11000, 4100-7300A) the newly reported transient TCP J21040470+4631129 (discovered on 2019 Jul.12.190 UT by Hideo Nishimura).

Teyssier, F.

The Astronomer's Telegram, 2019, 12936, 1.

Dramatic broadening of emission lines in TCP J21040470+4631129

We report on new optical and X-ray observations of the WZ Sge-type dwarf nova TCP J21040470+4631129 (hereafter TCP2104) discovered on 2019 July 12. The object experienced two superoutbursts and three rebrightenings, and now is slowly declining (ATel #12936, #12947, #13009, #13122).

Neustroev, V., Watkins, A. E., Kvist, P. E., Halsio, E. P., Ruokanen, A. E. N., Anetjarvi, M. M., Tordai, T., Page, K. L., Osborne, J. P., Sjoberg, G., Boyd, D., Marsh, T. R., Gaensicke, B. T., Knigge, C., Zharikov, S., Rautio, R. P. V., Rikkola, T. A., Poranen, L., Sarkar, E., & Kuin, N. P. M.

The Astronomer's Telegram, 2019, 13297, 1.

The disappearance and reappearance of optical emission lines and the drop in a Swift/XRT count rate during the recent rebrightening of TCP J21040470+4631129

We report the results of our continuing optical and X-ray monitoring of the bright WZ Sge-type dwarf nova TCP J21040470+4631129 (hereafter TCP2104) discovered on July 12, 2019 (for previous reports, see ATel #12947, #13009).

Neustroev, V., Boyd, D., Sims, F., Page, K. L., Tordai, T., Brincat, S. M., Galdies, C., Sjoberg, G., Zharikov, S., Osborne, J. P., Kuin, N. P. M., Marsh, T. R., Gaensicke, B. T., & Knigge, C.

The Astronomer's Telegram, 2019, 13122, 1.

Observers' Forum: Spectroscopic observations of the outburst of a WZ Sge dwarf nova

Boyd, D.

Journal of the British Astronomical Association, 2019, 129, 300.

Eruptive stars spectroscopy
Cataclysmics, Symbiotics, Novae

Spectroscopic monitoring of eruptive stars (e.g. symbiotic binaries, classical novae) by amateurs around the world, in both the northern and southern hemispheres, is a fundamental activity of the ARAS (Astronomical Ring for Amateur Spectroscopy) initiative. The group of volunteers demonstrates what can be accomplished with a network of independent, very small telescopes (from 20 to 60 cm), furnished with spectrographs of different resolution, from 500 to 15000, and covering the range from 3600 to 9000 Å. The observing program concentrates on bright symbiotic stars (64, to date) and novae (41, to date). The main features of the ARAS activity are rapid response to alerts, long term monitoring and high cadence. A part of the program involves collaborations based on requests from professional teams (e.g. CH Cyg, AG Dra, R Aqr, SU Lyn, T CrB) for long term monitoring or specific events.

Submit your spectra:

Please :
- respect the procedure
- check your spectra BEFORE sending them

Resolution should be at least R = 500

1/ reduce your data in accordance with standard procédures (notably offset, dark, flat, correction of atmospheric and instrumental response)
2/ the header must be compliant with BeSS file format
3/ name your file as: _novadel2013_yyyymmdd_hhh_Observer
  Example: _chcyg_20130802_886_toto.fit
4/ send you spectra to francoismathieu dot teyssier at bbox dot fr for inclusion in the ARAS database

ARAS database:

http://www.astrosurf.com/aras/Aras_DataBase/DataBase_EruptiveStars.htm

Conditions for use of data in publications

Note there is a first level validation check prior to adding spectra to this table. Users should verify the quality of the spectra.
Use of these data in research publications is encouraged subject to the following conditions:

*ARAS DataBase Eruptive Stars should be acknowledged with reference to http://articles.adsabs.harvard.edu/pdf/2019CoSka..49..217T

* Observers' contribution must be acknowledged

* Observers contributing a significant amount of data or whose data are pivotal to the findings of the paper should be included as co-authors.

Please contact François Teyssier (francoismathieu.teyssier [at] bbox.fr) before submitting the publication.

The Letter is prepared by François Teyssier (FR), David Boyd (UK), Forrest Sims (US)

Download previous issues of the Eruptive Stars Information Letter:

http://www.astrosurf.com/aras/novae/InformationLetter/InformationLetter.html

The letter in the SAO/NASA Astrophysics Data System

https://ui.adsabs.harvard.edu/abs/2019ESIL...43...19T/abstract

Your observations, taken with higher cadence than usually followed in the literature will be key to understanding thisin a broad range of systems.

S. Shore, 2015

... the presented results showed also the importance of professional/amateur collaborations. ARAS Group is a perfect example that such collaboration can be very successful and can bring important results. Thanks to amateur photometric and spectroscopic data, we are now able to monitor the evolution of symbiotic systems on timescales which were not previously available.

R. Gàlis& al., 2019

We are grateful to all of the amateur astronomers that contributed their observations to this paper. In particular, we are thankful to members of the ARAS group for their wonderful work.

K. Ilkwiecz & al., 2015

High cadence of both photometric and spectroscopic observations as provided by AAVSO and ARAS databases allows a detailed mapping of usually fast events of outbursts

A. Skopal, 2019