

Half a century of *UBV* photometry at Hvar

I. Overview and emission-line stars and binaries [★]

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ABSTRACT

We present a summary report on 52 years of systematic photoelectric *UBV* observations of early-type emission-line stars **and binaries of all luminosity classes** secured by a number of mainly Croatian and Czech observers at the Hvar Observatory. All these observations were **carefully re-reduced** to the standard *UBV* system defined by the Johnson standard stars through the nonlinear transformation formulae. **These observations represent a very unique set of homogeneous observations, covering also the near ultraviolet parts of the electromagnetic spectrum, where the hot stars emit the maximum of their flux. This is extremely important addition to the modelling of emission-line envelopes since the existing models are usually only based on *V* magnitude observations and/or very broad-band space photometries. Our observations indicate that all emission-line stars of all luminosity classes** are light and colour variables, but there is great individuality in the behaviour of each star and often different variability patterns are found in the individual passbands. We tried to classify various types of variability only on the basis of Hvar photometry, complemented by the Hipparcos *H_p* photometry transformed to Johnson *V* passband, since these observations conveniently fill the gap in Hvar observations. **We also provide simple statistics of the recognized types of variations and a list of known binaries and multiple systems. Observations of various other types of variables, including accidental discoveries, will be reported in a follow-up paper II.**

Key words. stars: early-type – stars: emission-line (Be) – binaries: eclipsing – binaries: ellipsoidal

[★] Based on photometric observations from the Hvar Observatory and ESA Hipparcos Satellite.

^{**} Jiří Horn passed away on Dec. 13, 1994

^{***} Karel Juza passed away on March 13, 1994

^{****} Svatopluk Kříž passed away on Feb. 23, 2018

[†] Pavel Mayer passed away on Nov. 7, 2018

[‡] Stanislav Štef passed away on June 11, 2014

[§] Josef Havelka passed away on June 19, 2009

Table 1: A list of early-type emission-line stars, more frequently observed at Hvar Observatory, number of their observations, and the types of their variability (as defined in Sect. 3) found.

Star	HD/BD	No.	LTEM	LTCV	MTBIN	VLTV	RAV
<i>o</i> Cas	4180	895	p	?	EL	no	yes
γ Cas	5394	137	p	yes	?	inc	yes
V442 And	6226	964	p	no	no	dec?	yes
φ And	6811	504	no	no?	no	dec	?
φ Per	10516	678	p	yes	yes	dec	yes
V554 Per	14818	146	no	yes	no	no	yes
HR 894	18552	118	no	no	no	no	yes?
RX Cas	+67 244	361	no	no	EB	no	no?
13 Tau	23016	114	no	no	no	no	no?
17 Tau	23302	367	no	yes	no	no	no
V971 Tau	23480	265	no	yes	no	no	yes
η Tau	23630	205	no	yes	no	no?	no
BU Tau	23862	469	i	no	no	no	no
V960 Tau	36576	392	p	yes	no	no	yes
ζ Tau	37202	1100	p+i	yes	yes	no	yes
ω Ori	37490	90	p	no	no	no	yes
V731 Tau	37967	107	no	no	no	no	yes
V696 Mon	41335	318	no	no	no	dec	no?
HR 2418	47054	63	no	no	no	dec?	yes
OT Gem	58050	437	p	no	no	no	yes
β CMi	58715	168	no	no	no	no	yes
BR CMi	61273	103	no	no	EL	no	no
UX Mon	65607	152	no	no	EB	no	yes
HD 81357	81357	93	no	no	EL	no	no
κ Dra	109387	429	p	no	no	no	yes
θ CrB	138749	158	no	no	no	no	yes
V839 Her	142926	685	i	no	yes	no	no
δ Sco	143275	98	p	no	no	inc?	no?
ζ Oph	149757	168	p	no	no	no	yes
V744 Her	162732	1449	i	no	no	dec	no
V2048 Oph	164284	164	p	no	no	dec	yes
V974 Her	164447	183	p	no	no	no	no?
<i>o</i> Her	166014	182	no	no	no	no	yes
NW Ser	168797	327	no	no	no	no	yes
CX Dra	174237	1167	p	no	yes	no	yes
β Lyr	174638	544	no	yes	EB	no	yes
7 Vul	183537	131	p	no	no	no	yes
V923 Aql	183656	1620	i	yes	no	no	yes
V1294 Aql	184279	1709	p+i	yes	yes	dec	yes
V1507 Cyg	187399	193	no	no	yes	no	no
V1746 Cyg	189687	209	i?	no	no	no	yes
V1624 Cyg	191610	510	p	no	?	no	yes
20 Vul	192044	130	no	no	no	no	yes?
QR Vul	192685	191	p	no	no	no	yes
P Cyg	193237	122	no	no	no	no	yes
25 Vul	193911	124	?	no	no	no	yes
V2119 Cyg	194335	140	?	no	no	no	yes
HR 7843	195554	161	i?	no	no	no	yes
V1661 Cyg	198478	288	no	no	no	no	yes
V832 Cyg	200120	849	p	yes	yes	inc	no?
V1931 Cyg	200310	889	p	no	no	no	yes
8 Lac A	214168	151	no	no	no	no	yes
V360 Lac	216200	424	no	yes	EL	no	yes
EW Lac	217050	1281	p	no	no	inc	yes
V378 And	217543	267	p	no	no	no	yes
<i>o</i> And	217675	1636	no	yes	no	no	yes
KX And	218393	1210	no	no	yes	no	yes
KY And	218674	970	no	no	no	no	yes
LQ And	224559	590	no	no	no	no	yes

Notes. Column LTEM: p = positive correlation between the brightness and emission-line strength, i = inverse correlation between the brightness and emission-line strength; column MTBIN: EB = eclipsing binary, EL = ellipsoidal variations, yes denotes either mild sinusoidal variation with the known orbital period or some peculiar orbital changes; column VLTV: dec = slow secular decrease of brightness during phases of quiescence, inc = slow secular increase of brightness during phases of quiescence.