COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5003

Konkoly Observatory
Budapest
12 December 2000

HU ISSN 0374 – 0676

ON THE VARIABILITY OF F1–F9 LUMINOSITY CLASS III–V STARS

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This paper considers Hipparcos photometry (ESA 1997) of luminosity class III–V F1–F9 stars from the Bright Star Catalogue, 5th edition (Hoffleit & Warren 1991) and the Supplement, 4th edition (Hoffleit et al. 1983). These stars include α^2 CVn stars, δ Sct pulsators, eclipsing binaries, irregular variables, microvariables, RS CVn stars, SX Phe stars, periodic variables of unspecified types, unresolved variables, and constant stars. Table 1 lists the mean amplitudes, which indicate the mean variability, of spectral types with at least 3 class members. We omit stars with spurious variability due to duplicity. The Hipparcos photometry does not confirm the reported variability of some stars which might indicate a change in their stellar behavior or reflect the quality of the previous photometry.

Table 2 (available electronically from the IBVS site as 5003-t2.tex and 5003-t2.txt) contains the individual star information including those of stars not used in compiling the means. For each star it lists the HR number (if any), names (Bayer, Flamsteed, and/or variable star designation), the V magnitude from the Bright Star Catalog or its Supplement, the spectral type, the Hipparcos number, the standard error (mag), the amplitude (mag), and comments (type of variable and the NSV number if there was not space in the Names column). The F stars are not particularly variable with their means being similar to those of B6–B9 III stars (Adelman, Gentry, & Sudiana 2000), A0–A2 III–V stars (Adelman, Flores, & Patel 2000), A3–A7 III and A3–F0 IV stars (Adelman 2000a), G0–G9 stars (Adelman, Davis & Lee 2000), and K0–K4 III stars (Adelman 2000b). The luminosity III star variability is consistent with the trends seen in the F supergiants (Adelman, Cay, Cay, & Kocer 2000).

Table 3 lists stars with amplitudes of 0.04–0.08 mag. Some are well-known variables while others are in need of additional observations. As a $0\overset{\mathrm{m}}{.}07$ amplitude found for Procyon is questionable, this star was omitted. Those with amplitudes greater than $0\overset{\mathrm{m}}{.}08$ are usually well-known variables: the irregular variable V1401 Aql (F1III, 0.21); the δ Sct stars γ^2 Cae (F1III, 0.09), δ Sct (F2IIIp, 0.17), 1 V474 Mon (F2IV, 0.31), and 44 IM Tau (F2IV–V, 0.10); the Algol systems MX Hya (F2IV, 0.49), R CMa (F1V, 0.40), and V1143 Cyg (F6Va, 0.11); the W UMa stars ε CrA (F2V, 0.26), CN Hyi (F6V, 0.26), and 44 Boo (F9–G1Vn, 0.15); the SX Phe star AI Vel (F2V, 0.57); the β Lyr type stars κ^1 BG Ind (F3V,0.21) and V2388 Oph (F5Vn, 0.30); and the α^2 CVn star DW Eri (F4IIIpSr, 0.09). HD 134646 (F4III, 0.09) and HD 81734 (F7V, 0.17) are unresolved variables while ι TrA (F4IV, 0.09) and HR 6844 (F2V, 0.11) are periodic variables.

Acknowledgements. SJA wishes to thank the Citadel Development Foundation for their support. Cadets Coursey and Harris are US Navy ROTC scholarship recipients.

Table 1: The mean amplitudes of various types of F1 through F9 stars

Spectral class	Number	Mean ampl. (mag)	Comment
F1III	16	0.041 ± 0.049	0.023 ± 0.008 without 3 stars
F2III	26	0.030 ± 0.031	0.021 ± 0.005 without 4 stars
F3III	13	0.022 ± 0.006	
F4III	15	0.039 ± 0.024	0.028 ± 0.008 without 3 stars
F5III	23	0.024 ± 0.014	0.021 ± 0.008 without V784 Cas
F6III	11	0.025 ± 0.007	
F7III	3	0.040 ± 0.017	HR 8269's amplitude 0.06
F8III	4	0.022 ± 0.005	
F1III–IV	10	0.024 ± 0.014	0.020 ± 0.007 without BZ Gru
F2III–IV	9	0.027 ± 0.013	
F3III–IV	9	0.027 ± 0.017	0.021 ± 0.006 without AL CVn
F5III–IV	3	0.020 ± 0.000	
F6III–IV	4	0.025 ± 0.010	
F7III–IV	3	0.023 ± 0.006	
F1IV	17	0.028 ± 0.011	
F2IV	20	0.055 ± 0.110	0.023 ± 0.013 without 1 Mon & MX Hya
F3IV	20	0.024 ± 0.008	
F4IV	15	0.029 ± 0.022	0.022 ± 0.07 without ι Leo & ι TrA
F5IV	31	0.025 ± 0.008	
F6IV	20	0.022 ± 0.005	
F7IV	12	0.026 ± 0.009	
F8IV	8	0.025 ± 0.005	
F9IV	3	0.020 ± 0.000	
F2IV–V	7	0.044 ± 0.025	0.035 ± 0.005 without IM Tau
F3IV–V	9	0.029 ± 0.008	
F4IV–V	5	0.026 ± 0.005	
F5IV–V	9	0.028 ± 0.018	
F6IV–V	8	0.022 ± 0.007	
F7IV–V	5	0.026 ± 0.005	
F8IV–V	3	0.023 ± 0.006	
F1V	21	0.043 ± 0.082	0.026 ± 0.010 without R CMa
F2V	54	0.042 ± 0.081	0.026 ± 0.010 without AI Vel, HR 6844, & ε CrA
F2.5V	4	0.025 ± 0.010	
F3V	39	0.030 ± 0.031	0.024 ± 0.006 without HR 3936 & BG Ind
F4V	40	0.023 ± 0.006	
F5V	85	0.026 ± 0.031	0.022 ± 0.007 without AR Dor & V2388 Oph
F5–6V	3	0.023 ± 0.006	
F6V	80	0.021 ± 0.029	0.007 ± 0.031 without CN Hyi & V1143 Cyg
F6–7V	4	0.028 ± 0.005	
F7V	80	0.027 ± 0.018	0.025 ± 0.008 without HD 81734
F8V	75	0.026 ± 0.008	
F9V	31	0.025 ± 0.013	

Table 3: F stars with amplitudes of 0.04–0.08 magnitudes

Name	HD number	Spectral type	HIP number	SE (mag)	Amp. (mag)	Comments
CG Gru	214441	F1III	111833	0.0017	0.06	DSCT
BB Phe	2724	F2III	2388	0.0015	0.05	DSCT
ρ Phe	4919	F2III	3949	0.0024	0.07	DSCT
LT Vul	177392	F2III	93603	0.0010	0.04	DSCT
γ Dor	27290	F4III	19893	0.0020	0.07	EW
HR 3325	71433	F4III	41452	0.0010	0.04	
V947 Cen	113537	F4III	63849	0.0028	0.04	P
HR 5817	139478	F4IIIp	76384	0.0016	0.04	
V784 Cas	13122	F5III	10141	0.0041	0.08	DSCT
	33924	F5III	24658	0.0012	0.04	
HR 8269	205877	F7III	106978	0.0009	0.06	U
BZ Gru	208435	F1III–IV	108347	0.0018	0.06	DSCT
11 β Cas	432	F2III–IV	746	0.0017	0.04	DSCT
54 Hya	129926	F2III–IV	72197	0.0013	0.05	U
4 AL CVn	107904	F3III–IV	60467	0.0017	0.07	DSCT
HR 6890	169268	F6III–IV	90174	0.0010	0.04	
NSV 488	8391	F0/2IV	6418	0.0013	0.05	U
HR 4803	109799	F1IV	61621	0.0021	0.04	U
DK Vir	115308	F1IV	64769	0.0015	0.04	DSCT
HR 5079	117281	F1IV	65698	0.0014	0.04	
	159340	F0/2IV	86119	0.0012	0.04	
	189307	F2IV	98577	0.0013	0.04	
QQ Tel	185139	F2IV	96721	0.0035	0.07	DSCT
	87638	F3IV	49434	0.0010	0.04	
	207826	F3IV	107710	0.0045	0.04	
78 ι Leo	99028	F4IV	55642	0.0007	0.07	SV
	85821	F5IV	48483	0.0011	0.04	
HR 5537	131040	F5IV	72508	0.0052	0.04	MV
HR 6375	155078	F5IV	83962	0.0005	0.04	
HR 8363	208177	F5IV	108144	0.0064	0.04	
HR 2072	39937	F7IV	27737	0.0014	0.05	
ZZ Boo	121648	F2IV/V+F2Iv/V	68064	0.0011	0.04	EA/DM
	140130	F2IV/V	77067	0.0016	0.04	
HR 8945	221740	F2IV–V	116399	0.0009	0.04	
	135208	F3IV/V	74593	0.0010	0.04	
HR 5766	138498	F3IV–V	76407	0.0007	0.04	
26 Cet	6288	F1V	4979	0.0022	0.04	MV
HR 6849	168092	F1V	89401	0.0014	0.04	
39 Peg	213617	F1V	111278	0.0018	0.05	U
HR 1470	29364	F2V:	21619	0.0016	0.04	NSV 1676
HR 2384	46273	F2V	30953	0.0009	0.04	U
HR 4686	107192	F2V	59767	0.0017	0.05	P
KQ Lup	137785	F2V	75818	0.0020	0.05	E
V949 Sco	158741	F2V	85839	0.0022	0.04	DSCT

Table 3 (cont.)

Name	HD number	Spectral type	HIP number	SE (mag)	Amp. (mag)	Comments
HR 6786	166114	F2V	89099	0.0011	0.04	U
NZ Peg	206043	F2V	106897	0.0018	0.06	DSCT
HR 9106	225233	F2V	357	0.0010	0.04	
HR 3874	84447	F2–3V	47762	0.0012	0.04	
HR 3936	86358	F3V	48895	0.0022	0.07	I
HR 8507	211575	F3V	110091	0.0014	0.04	
HR 673	14221	F4V	10830	0.0013	0.04	
AR Dor	34349	F5V	24221	0.0010	0.08	E:
	172416	F5V	91732	0.0021	0.04	U
	184151	F5V	96081	0.0007	0.04	
NSV 1614	28406	F6V	20948	0.0016	0.04	
	152923AB	F6V	83174	0.0012	0.05	
	102357	F7V	57488	0.0019	0.05	MV
HR 4533	102634	F7V	57629	0.0013	0.05	U
HR 5779	138763	F7V	76233	0.0020	0.04	U
ρ Tel	177171	F7V	93815	0.0014	0.04	U
HR 8843	219482	F7V	114948	0.0010	0.04	MV
HR 1179	23856	F8V	17689	0.0008	0.04	
111 V1119 Tau	35296	F8V	25278	0.0014	0.04	P
	63008	F8V	37718	0.0011	0.04	
17 Vir	107705	F8V	60353	0.0186	0.04	
	116156	F8V	65159	0.0009	0.04	
HR 5148	119124	F7–9V	66704	0.0012	0.04	U
	128563	F8V	71510	0.0018	0.04	
HR 5583	132375	F8V	73309	0.0013	0.04	
	157466	F8V	85007	0.0007	0.04	
	108147	F9V	60644	0.0010	0.04	
	112196	F9V	63008	0.0022	0.04	U
V819 Her	157482	F9Vn:	84949	0.0009	0.08	EA
DL Eri	24832	F1V	18455	0.0021	0.04	DSCT

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