THE SUN AMONG THE STARS

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Various methods have been used in the observation, analysis and interpretation of solar analogue candidates. These are photometric observations in various photometric bands, spectrophotometric observations, method of synthetic photometry (in order to obtain magnitudes, color indices and other photometric data). We present the results of a comparative study of the Sun and the stars using all of these methods. The 4183 stars were involved into analysis. As a result we have presented a new list of candidates into solar analogues.

COMPARATIVE STUDY

- Determination of Sun's colour indexes in photometric systems *UBV, uvby, UVBRI, Vilnius, DDO.*
- Selection of stars having solar-like colour indexes in stated above photometric systems.

Sun's colour indexes were determined by method of synthetic photometry.

$$CI_{1-2} = -2.5 \log \frac{\int I(\lambda)\phi_1(\lambda)d\lambda}{\int I(\lambda)\phi_2(\lambda)d\lambda} + K_{1-2},$$

where CI – colour indexes; $I(\lambda)$ – energy distribution in star/solar spectrum; $\phi_n(\lambda)$ – filter n transmission curve; K_{1-2} – normalization factor.

Method of synthetic photometry more than once was applied for Sun's colour indexes determination in photometric systems *UBV, WBVR, Vilnius UPXYZVS*. But for all these systems, the 5 nm spectral resolution for stars used for the calibration is expliciently insufficient. The errors caused by insufficient spectral resolution are shown in Fig. 1.

We use energy distributions presented in [1] for stars with spectral resolution of 0.45 nm and in [2, 3, 4, 5] for the Sun with the same resolution. As the data used for given energy distribution in stellar spectra are presented for 351—742.7 nm wavelength range, it imposes limitation on filters in use.

Results of determination of pseudo-observed Sun's colour indexes in different photometric systems are presented in Table 1. Stars having colour indexes similar to solar ones were selected from photometric catalogues in each photometric systems. The final list (Table 2) have included stars presented in no less than in four such samplings.

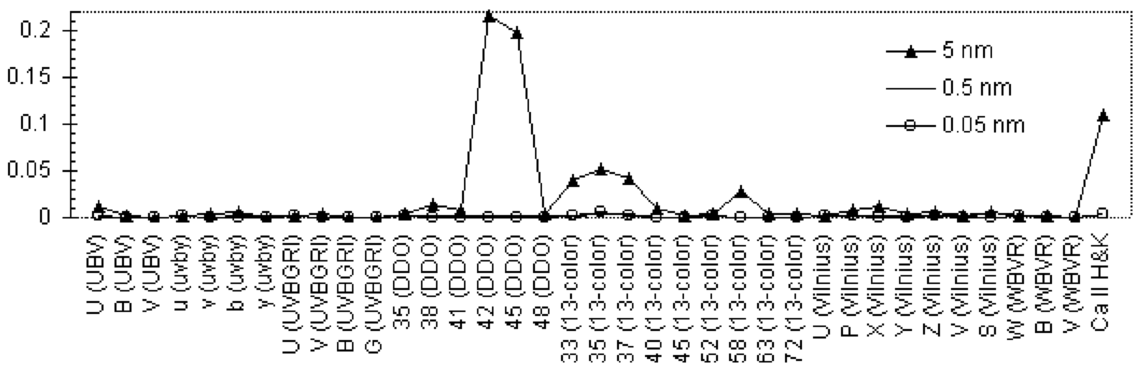

Figure 1: Errors caused by insufficient spectral resolution

Table 1: Color indices for the Sun

	[2]	[3]	[4, 5]
$B-V(UBV)$	0.654	0.684	0.653
$b-y(uvby)$	0.405	0.433	0.417
$m1(uvby)$	0.210	0.211	0.206
$C4548(DDO)$	1.017	1.018	1.012
$C4245(DDO)$	0.636	0.663	0.647
$C4142(DDO)$	0.006	0.029	0.024
$V-R(UBVRI)$	0.589	0.570	0.548
$P-X(Vilnius)$	0.684	0.659	0.644
$Y-Z(Vilnius)$	0.336	0.348	0.335
$Z-V(Vilnius)$	0.218	0.231	0.229
$V-S(Vilnius)$	0.594	0.580	0.552

Table 2: Selected stars

HD	Sp	[6]	HD	Sp	[6]	HD	Sp	[6]	HD	Sp	[6]
1461	G0V-G5V	+	26756			111812	G0III	+	181655		+
1835	G2V	+	27685	G4V—G7V	+	112257	G2III—G2V	+	186408	G2V—G3V	+
3628	G2V		28068	G1V—G5V	+	114613	dG3	+	186427	G2V—G5V	+
6582	G0IV-G8V		28099	G8V	+	115617	G5V—G6V	+	187923	G0V—G2V	+
10700	G8V-VI		28992	G5V		117176	G2.5V—G5V	+	190771	G2V—G5IV	
11397	G6IV-V		29621	G5V	+	126053	G1V—G2V	+	195564		+
13783	G8V		30246	G5V	+	135101	G5V	+	199960		+
20619		+	30495	G2V	+	140538	G5V	+	212330		+
20630	G5V	+	34411	G0IV—G2V	+	146233	G1V—G2V	+	216777	G6V	
20766	G2V	+	53705	G3V	+	157347	G5IV—G5V	+	217014	G2.5IV—G5V	+
20794	G5V—G8V	+	65583	G8V		159222	G2V—G5V	+	222143		
24341	G1V		102365	G5V	+	160691	G5V	+			
26736	G3V	+	111395	G5V—G7V		161239	G2III—G0IV				

Stars from Hardop list [6] are marked with crosses. Stars from the list [6] previously considered (such as HD 34411, HD 53705, HD 111395, HD 117176, HD 126053) were excluded as ones not obeying the selection criteria.

SUMMARY

The separate Sun's colour indexes were determined in five photometric systems *UBV, uvby, UVBRI, Vilnius, DDO.*

Stars having solar-like colour indexes in stated above photometric systems were taken from photometric catalogues.

Taking into account that such a list comprises stars of different spectral classification, we suggest that it is necessary to tighten a photometric selection criteria for stars, which are candidates in solar analogues.

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