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COMPARISON BETWEEN STANDARD EVOLUTION MODELS FOR HIGH AMPLITUDE δ Sct STARS[1]

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RESUMEN. Hemos contrastado las últimas observaciones uvbyβ obtenidas en los observatorios de Sierra Nevada (España) y La Silla (Chile) acerca de estrellas δ Sct de gran amplitud con diferentes modelos standard de evolución. Hemos encontrado un buen acuerdo entre los modelos evolutivos de Claret et al. (1989) y los de Vanden Berg (1985), sin embargo, se detecta un efecto sistemático respecto a las masas deducidas si comparamos con los modelos de Hejlesen, como ya fue indicado por Andersen et al. (1984). Los resultados obtenidos mediante los modelos evolutivos son comparados con los obtenidos a partir de la teoría de pulsación, encontrándose buena concordancia entre ambos.

ABSTRACT. Recents uvbyβ observations of high amplitude δ Sct stars obtained at Sierra Nevada (Spain) and La Silla (Chile) observatories are compared with standard evolution models. We find very good agreement between Claret et al. model's (1989) and those from Vanden Berg (1985). However, a systematic effect on the derived masses is found if we use the Hejlesen's results as indicated by previous work by Andersen et al. (1984). The results derived from the evolution models are compared with those derived from pulsation theory. A good agreement is found.

Key words: STARS-δ SCUTI — STARS EVOLUTION

A systematic uvbyβ study of high amplitude δ Sct stars have been carried out at Sierra Nevada (Spain) and La Silla (Chile) observatories. These observations together with other ones (Langford, 1976; Breger, 1977; Breger et al., 1978; Rodríguez et al., 1988; López de Coca et al., 1990) are compared with standard evolution models for solar composition from Hejlesen (1980a,b) (X=0.70,Z=0.02), Vanden Berg (1985) (Y=0.25,Z=0.0169) and Claret et al. (1989) (X=0.70, Z=0.02).

In Table I are listed the masses, bolometric magnitudes and ages obtained by using the different evolutionary sequences. It is shown a very good agreement between Claret et al. model's and those from Vanden Berg. However, a systematic effect on the derived masses is found if we use the Hejlesen result's.

It has been already noted by Andersen et al. (1984) that models from Hejlesen agree not very well with their observations, the evolutionary sequences obtained by Hejlesen were too hot. Hence, for equal temperatures the mass is smaller and for equal masses the star is younger. These effects were interpreted by Andersen et al. as caused by differences in helium abundances.

The same effects for solar abundances are also detected by Claret et al., but it is now interpreted by differences in the opacities used. Hejlesen used the Cox et al. (1969) values while Claret et al. have used the latest opacity library from Los Alamos (Huebner et al., 1977). Moreover, disagreement in log g are also found by Claret et al., in such a way that evolution in main sequence go faster by using the Hejlesen model's. These disagreements are not significants for stars beyond 10 $M_\odot$, but for 1 $M_\odot$ the mass of the star is reduced about 10% by using the Hejlesen model's.

[1] Partially based on observations collected at European Southern Observatory, La Silla, Chile.

As can be seen from Table II (from Rodríguez et al., 1990) a good agreement between the results derived from evolution models and those derived from pulsation theory is found.

TABLE I. Evolution

	Claret et al.			Vanden Berg			Hejlesen		
Star	$M_\odot$	M_{bol}	Age (10^9)	$M_\odot$	M_{bol}	Age (10^9)	$M_\odot$	M_{bol}	Age (10^9)
EH Lib	1.80	1.68	1.3	1.79	1.68	1.4	1.64	1.78	1.1
HD 79889	1.80	1.70	1.3	1.77	1.72	1.5	1.62	1.81	1.2
GP And	1.74	1.72	1.5	1.74	1.72	1.5	1.60	1.81	1.3
AI Vel	1.86	1.42	1.2	1.86	1.42	1.3	1.70	1.52	1.1
SZ Lyn	1.82	1.52	1.3	1.83	1.52	1.4	1.68	1.61	1.1
AD CMi	1.88	1.36	1.2	1.88	1.36	1.3	1.72	1.46	1.1
RS Gru	2.03	0.97	0.92	2.05	0.96	0.97	1.93	1.03	0.78
DY Her	1.95	1.18	1.1	1.95	1.18	1.1	1.83	1.25	0.91
BS Aqr	2.29	0.52	0.68	2.30	0.52	0.72	2.24	0.55	0.52
VX Hya	2.14	0.76	0.82	2.17	0.75	0.83	2.09	0.79	0.63
RY Lep	2.45	0.22	0.55	2.48	0.21	0.58	2.47	0.21	0.40
VZ Cnc	2.34	0.43	0.64	2.38	0.41	0.66	2.32	0.44	0.48

TABLE II. Pulsation

Star	$R_\odot$	$M_\odot$	M_{bol}
EH Lib	2.28	1.66	1.68
HD 79889	2.43	1.71	1.57
GP And	2.54	1.74	1.63
AI Vel	2.74	1.81	1.43
SZ Lyn	2.92	1.88	1.23
AD CMi	2.96	1.88	1.22
RS Gru	3.42	2.04	0.92
DY Her	3.45	2.05	1.03
BS Aqr	4.33	2.30	0.60
VX Hya	4.78	2.43	0.45
VZ Cnc	4.89	2.45	0.43
RY Lep	5.90	2.71	0.00

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