SYNTHETIC HORIZONTAL BRANCHES FOR GALACTIC GLOBULAR CLUSTERS

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ABSTRACT. We present two wide sets of SHB models which have been computed for combinations of evolutionary parameters adequate to the GGC system. The effect of the enhancement of α-elements upon theoretical predictions related to the "Sandage effect" and globular cluster ages is also discussed.

Discussion

Using both the HB evolutionary tracks of Sweigart (1987, *Ap. J. Suppl.*, **65**, 95) and Lee & Demarque (1990, *Ap. J. Suppl.*, **73**, 709), we have computed wide sets of SHB models. For each combination of the evolutionary parameters Y and Z, we have varied the mean HB mass $\langle M_{HB} \rangle$ so as to yield from very blue to very red morphologies. We have considered three possibilities for the width σ_M of the (assumed) gaussian mass distribution: 0.01, 0.02, and 0.03. 50 runs (with 1200 stars each) of our new SHB code have been used to derive an extensive tabulation of morphological and pulsational parameters for each (Y, Z, $\langle M_{HB} \rangle$, σ_M) combination. Our models suggest that the lower envelope of the HB at the RR Lyrae level will differ from the ZAHB for both blue and red morphologies. Such a deviation makes the predicted HB "thickness" *at this color level* decrease for metallicities higher than [Fe/H] $\sim$ -1.3 (where several clusters with red HB morphologies are found), apparently at variance with the observations [see Catelan (1991, this volume)]. We have also studied the effect of the enhancement of α-elements upon the SHB models, through a simple re-scaling of the standard models in metallicity, as suggested by the calculations of Chieffi & Straniero (1990, private communication). Such α-enhanced models imply high ages ($\simeq$ 17 Gyr) at [Fe/H] $\simeq$ -2.2 (Y = 0.23, [α/Fe] = 0.48), practically identical to the case where [α/Fe] = 0, with important cosmological implications [cf. Catelan and de Freitas Pacheco (1991, *Astr. Ap.*, submitted)]. Moreover, a significant decrease of the predicted slope γ of the log$P$ - [Fe/H] relation results. Our models also show that reading the periods at logT_{eff} = 3.83 rather than 3.85 leads to appreciably higher γ values; accordingly, assuming [α/Fe] = 0 one obtains γ = -0.060 at logT_{eff} = 3.83 (-0.033 at 3.85), whereas assuming [α/Fe] = 0.48 one may derive γ = -0.023 at logT_{eff} = 3.85 (-0.043 at 3.83). All quoted values are for Y = 0.23.

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