

The Effect Of Alpha-Element Enhancement On Surface Brightness Fluctuation Magnitudes And Broad-Band Colors

Hyun-chul Lee¹, Guy Worthey¹ and John P. Blakeslee¹

¹Washington State University
email: hcllee@wsu.edu

Abstract. We present the effects due to alpha-element enhancement on surface brightness fluctuation magnitudes and broad-band colors in order to investigate the calibration zero-point. We study these effects at ages covering 0.1 to 13 Gyr and metallicities of $Z=0.0003$ to 0.04 using the Teramo group's isochrones, BaSTI. Our preliminary results indicate that alpha-enhanced models are needed to match massive red galaxies while solar-scaled models are fine for dwarf blue galaxies to reproduce their independently estimated ages and metallicities.

Keywords. Stars: abundances, galaxies: stellar content

1. Introduction

The surface brightness fluctuation (SBF) magnitudes and colors are widely used as one of the most powerful distance indicators as well as useful tools for probing stellar populations. To our continued consternation, however, only solar-scaled SBF models have been calculated in the past.

2. Our Preliminary Results

Here we report, for the first time, alpha-element enhanced SBF models and compare them with observations. For those purposes, we have employed the Teramo Isochrones (Pietrinferni *et al.* 2004, 2006; Cordier *et al.* 2007; <http://www.te.astro.it/BASTI>) in this study. In general, alpha-element enhanced SBF magnitudes are brighter and their broad-band colors are redder where the alpha-element enhancement is defined at a fixed total metallicity (cf., <http://www.astro.rug.nl/~sctrager/FTSPM/Lee.alpha.pdf>). Our results also illustrate the dramatic impact of convective core overshooting on the predicted broad-band colors for models with ages near 1 Gyr (see also http://astro.wsu.edu/hcllee/hcllee_208_AAS_10_07.pdf).

Figure 1 shows our preliminary results (aes: alpha-enhanced standard, sss: solar-scaled standard, where 'standard' means no convective core overshooting) in the $V - I$ vs. SBF I-band Magnitude. Two observational fiducial lines (thick straight lines) are overlaid with our theoretical models. The dotted line is SBF I-band $\text{Mag} = -2.13 + 2.44 \times [(V - I) - 1.00]$ from Mieske, Hilker, & Infante (2006) for dwarf blue galaxies, while the solid line is SBF I-band $\text{Mag} = -1.68 + 4.5 \times [(V - I) - 1.15]$ from Mei *et al.* (2005, originally calibrated at Blakeslee *et al.* 2002) for massive red galaxies. From the comparisons, it seems that our preliminary results indicate that alpha-enhanced models are needed to match massive red galaxies while solar-scaled models are fine for dwarf blue galaxies to reproduce their independently estimated ages and metallicities. The full investigation will be presented at Lee, Worthey, & Blakeslee (2007).

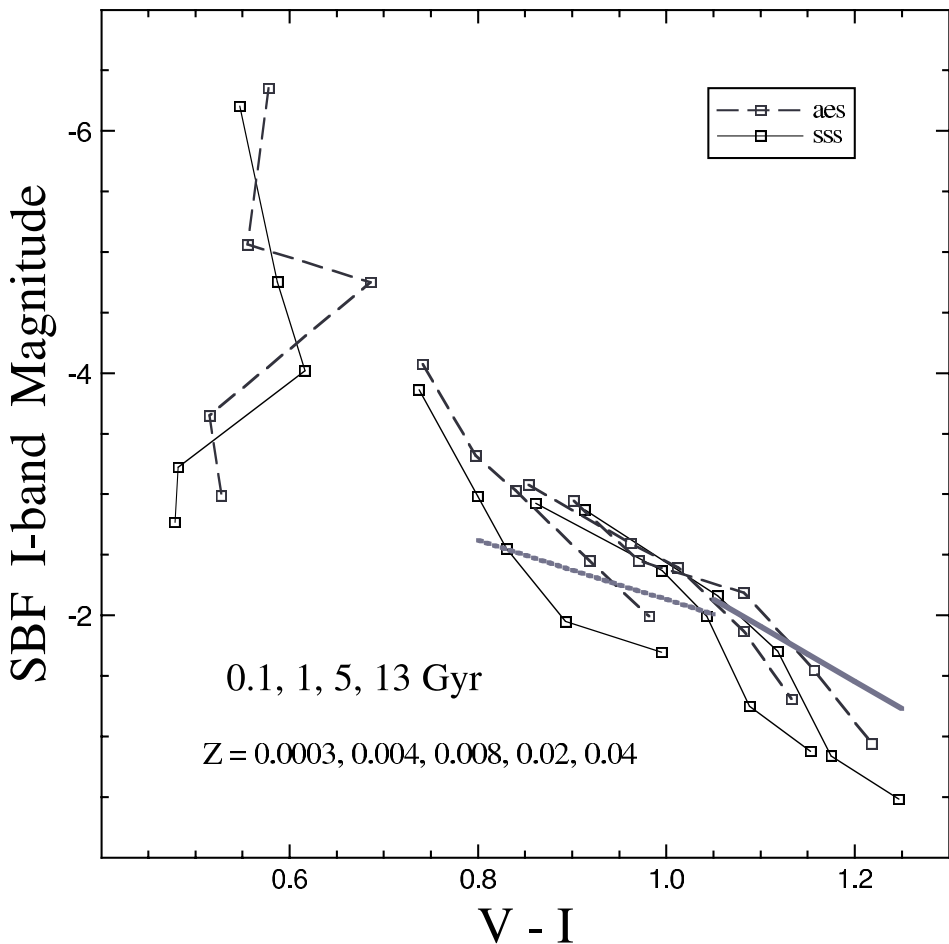


Figure 1. $V - I$ vs. SBF I-band Magnitude at 0.1, 1, 5, and 13 Gyr (left to right). Solid lines with squares are solar-scaled models while dashed lines with squares are alpha-enhanced models. At given ages, SBF I-band Magnitudes become fainter and $V - I$ colors become redder, in general, with increasing metallicity. Two observational fiducial lines are compared with our theoretical models (see text).

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