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New Empirical Fitting Functions of the Lick/IDS indices using MILES

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Abstract. Here we present new empirical fitting functions for the Lick/IDS line-strength indices as measured in MILES (Medium-resolution INT Library of Empirical Spectra; Sánchez-Blázquez *et al.*, Cenarro *et al.* 2007). Following previous work in the field (Gorgas *et al.* 1993; Worthey *et al.* 1994; Worthey & Ottaviani 1997), these functions describe the empirical behavior of the line-strength indices with the atmospheric stellar parameters. In order to derive the fitting functions we have devised a new procedure which, being fully automatic, provides a better description of the line-strength index variations in the stellar parameter space.

Keywords. stars: abundances, fundamental parameters – galaxies: stellar content – globular clusters: general

1. The new method

The moving-boxes method is an automatic procedure which avoids the subjectivity in the choice of stellar parameters intervals to derive fitting functions. The procedure consists in the fitting of local polynomials (up to the 2nd degree in the three atmospheric stellar parameters) in a narrow temperature window ($\Delta\theta = 0.2$). These windows are moved at small steps ($\Delta\theta = 0.001$) covering the whole temperature interval. When necessary the fits are computed independently for two gravity intervals (dwarfs and giants). Finally, the predicted index for a given set of stellar parameters is derived from a weighted average of the fitting functions corresponding to all the moving boxes in which the input parameters were included.

2. An example: empirical fitting functions for H$\delta_{\rm A}$ index

As an example of this work, we present the comparison between the computed fitting functions by Worthey *et al.* (1994) using Lick's library (Figure 1, left pannels) and using the new method over the MILES library (Figure 1, right pannels).

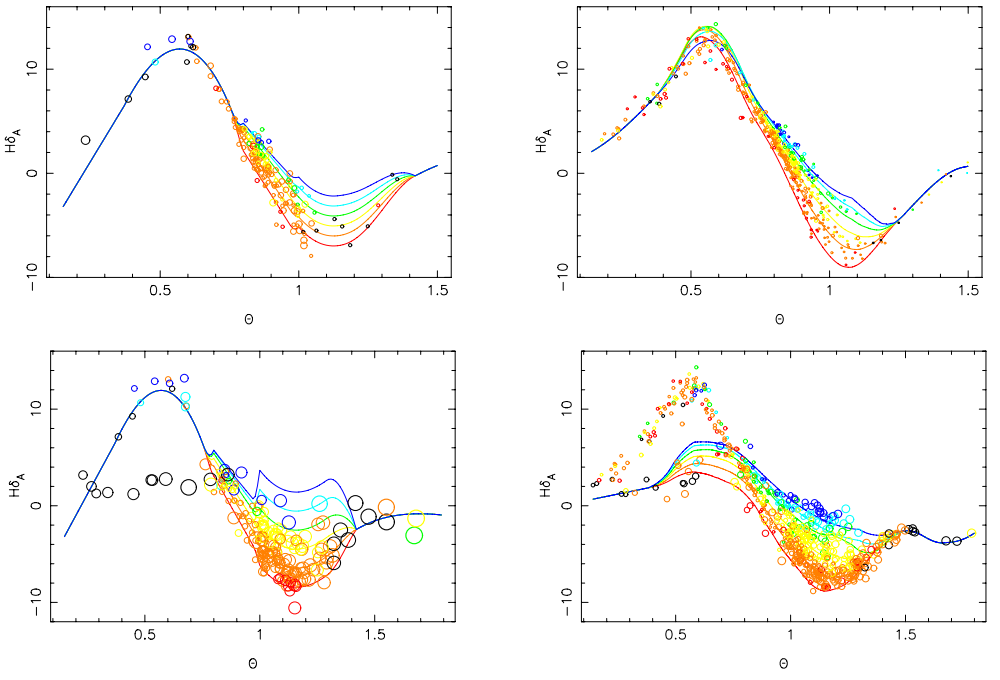

Figure 1. Left: Empirical calibration of Hδ_A index presented by Worthey & Ottaviani (1997) using the original Lick/IDS library data. Right: Empirical calibration of Hδ_A index computed with the new method based on moving boxes using the MILES library. In both cases we present separately the empirical fitting functions for dwarf (upper pannels, fitting lines for log $g = 4.5$ dex) and giant (lower pannels, fitting lines for log $g = 2.0$ dex) stars.

3. Future work

These empirical fitting functions have been computed at the spectral resolution of MILES (2.3 Å). We are now in the process of introducing the spectral resolution as a fourth parameter. The future release of the fitting functions will allow a direct comparison of the model predictions with spectra at any given instrumental resolution and intrinsic velocity dispersion (above the nominal resolution of MILES).

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