RevMexAA (Serie de Conferencias), **44**, 49–49 (2014)

IMPROVEMENT AND ANALYSIS OF MILES SPECTRAL LIBRARY FOR STELLAR POPULATION MODELLING

A. de C. Milone[1], A. Sansom[2], A. Vazdekis[3], P. Sánchez-Blázquez[4], C. Allende Prieto[3], J. Falcón-Barroso[3], and R. da Silva[5]

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

We are improving the MILES empirical library of stellar spectra (Sánchez-Blázquez et al. 2006, Cenarro et al. 2007) in order to build more realistic simple stellar population (SSP) models with variable α-enhancement: (i) compilation of [E/Fe], (ii) comparisons of stellar spectral models against MILES data plus empirical analysis of the blue spectral region, (iii) Galactic kinematic classification of library stars, and (iv) expansion of the library observing stars with known parameters.

The main limitation of current empirical stellar spectral libraries is the incompleteness of chemical caracterization of their stars. Usually, only iron is assumed as metallicity tracer, but the spectra of stars and stellar systems strongly depend on the abundance of others elements relative to iron (e.g. CNO and α groups) Furthermore, [α/Fe] represents a very useful ingredient for SSP models to characterise star formation history in galaxies since it is a good temporal scale indicator for the star formation.

Firstly [Mg/Fe] was compiled with an error of about 0.1 dex over a uniform scale for 752 stars in the MILES (Milone et al. 2011). [Mg/Fe] was collected from published high-resolution (HR) spectroscopic analyses (315 stars) as well as measured at mid-resolution through LTE spectral synthesis of two Mg features using the MILES spectra (437 stars). Calcium is another α element whose spectral features are being analysed (e.g. Ca I λ5513Å) following the same semi-automated approach applied for magnesium, for which we have collected [Ca/Fe] from literature. We are also searching for C, N and O abundances in HR works. These elements play an important role in the blue part of spectrum. HR works will be choosen to define uniform scales for [Ca/Fe], [C/Fe], [N/Fe] and [O/Fe] considering the agreement between the works' $T_{\rm eff}$, log g and [Fe/H] scales and the MILES scales.

[1]Instituto Nacional de Pesquisas Espaciais, Av. dos Astronautas 1758, Cep 12227-010, São José dos Campos, Brazil (andre.milone@inpe.br).
[2]JHI/UCLan, Preston, UK.
[3]IAC, Tenerife, Spain.
[4]UAM, Madrid, Spain.
[5]OAR, Monte Porzio Catone, Italy.

To test theoretical predictions of Lick line-strengths based on spectral responses to changes in element abundances, we compared them with MILES empirical data (Sansom et al. 2013). This work showed good agreement for some Fe-sensitive and Mg-sensitive indices, but poor agreement for the Hγ and Hδ age-sensitive indices. Better self consistency between element abundance changes and opacities may be needed to improve the theoretical predictions for variable abundance patterns. Comparisons of MILES spectra between pairs of similar stars (in $T_{\rm eff}$ and log g) have highlighted the influence of abundance change driven by iron in the region below 4400Å, where there are molecular features involving C, N and/or O (e.g. CN and CH bands).

We have classified MILES stars according to their Galactic population membership by computing the probability of a given star belonging to the thin disc, thick disc, halo, or to a transition population. This classification can be considered in our SSP modelling in order to select chemically homogeneous sets of stars over the α and iron-peak element abundances, specifically for -0.8 $\leq$ [Fe/H] $\leq$ -0.2 dex.

We will include into MILES an additional sample of spectra from 218 stars, for which the photospheric parameters and Mg abundances are known. This will fill in some gaps of the library 4-D parameter space and increase the star density in other regions. These spectra were taken in two runs in 2011 adopting the same spectroscopic instrumental setup employed for constructing the MILES library. The stars parameters have been calibrated onto the MILES system, while their [Mg/Fe] will be calibrated soon.

In summary, we are taking steps to improve one of the MILES empirical stellar library, and to use it to test theoretical models. Our aim is to utilise sets of well chemically characterised stars and theoretical stellar spectra to build SSP models for a range of ages and composition, in order to improve the recovery of star formation history in galaxies.

REFERENCES

Cenarro, J. et al. 2007, MNRAS, 374, 664
Milone, A. de C. et al. 2011, MNRAS, 414, 1227
Sánchez-Blázquez, P. et al. 2006, MNRAS, 371, 703
Sansom, A. E. et al. 2013, MNRAS, 435, 952