RevMexAA (Serie de Conferencias), **44**, 91–91 (2014)

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

MAPPING DUST-OBSCURED LIGHT IN CALIFA GALAXIES

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The Calar Alto Legacy Integral Field Area (CALIFA) survey is the first and largest survey of its kind, aiming to obtain optical datacubes for 600 nearby ($z \sim 0.01$) galaxies. Over 300 objects have already been observed. The spatial and spectral resolutions in CALIFA, combined with its sample size, offer unprecedented good quality data to study spatially resolved dust properties. This work focus on how dust is mapped by the ionised gas. By carefully removing the underlying stellar population, we measure the emission-line Balmer decrement (Hα/Hβ) in different regions in galaxies, separating H II complexes from diffuse emission. We show that the effective dust attenuation measured on an integrated spectrum is underestimated with respect to the effective attenuation on H II regions. This implies that star formation indicators based on optical and UV data should be used with care and may need to be corrected by differential dust attenuation.

For a sample of 48 CALIFA galaxies, we map the V-band attenuation (A_V) by measuring the Balmer decrement on each individual spectra ($\sim$ 1000 spectra per galaxy), as shown in Fig. 1. We also measure A_V on the total integrated spectrum of each galaxy, i.e., adding up the individual spectra of each spaxel on the CALIFA field of view.

The integrated-spectrum attenuation is not a linear function of individual H II region attenuations: It is biased by the brightest and less dusty regions. In Fig. 2 we compute the effective A_V for H II regions, and compare it to A_V from the integrated spectra. The effective attenuation $A_V^{\rm eff}$ is defined as

$$F_0\, 10^{-0.4 A_V^{\rm eff}} = \sum_i F_{0,i}\, 10^{-0.4 A_{V,i}},$$

where $F_{0,i}$ is the intrinsic emission of each region i and $F_0 \equiv \sum_i F_{0,i}$.

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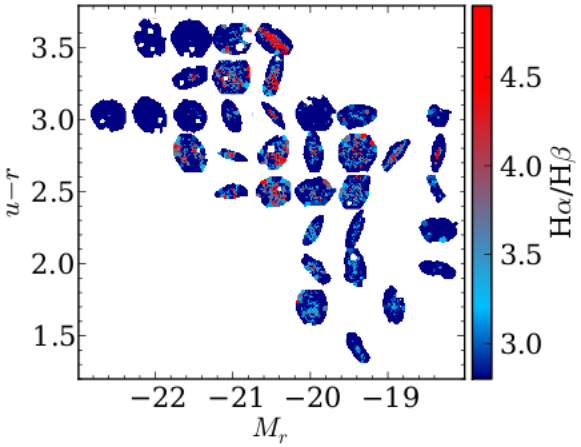

Fig. 1. Colour-magnitude diagram for $\sim$ 30 CALIFA galaxies. Each galaxy is represented by its Hα/Hβ map, as measured from CALIFA data cubes. Objects in the red sequence have a very tenuous ionised gas, so there is very little dust traced by the Balmer decrement, whereas for those in the blue cloud the attenuation is clumpy and follows the distribution of H II regions.

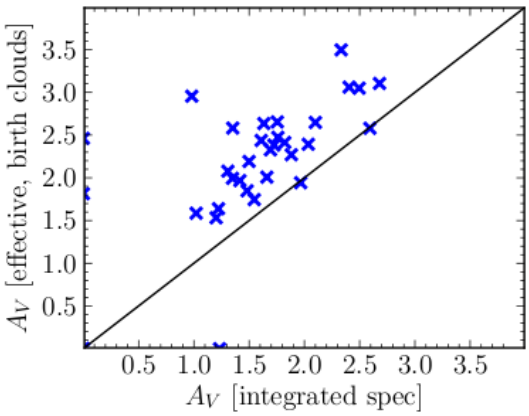

Fig. 2. Comparison of V-band attenuations as measured by the observed Hα/Hβ, assuming a Cardelli et al. (1989) law with $R_V = 3.1$ and the case B intrinsic Hα/Hβ = 2.86. The abscissa is A_V measured on the total integrated spectrum of each galaxy. The ordinate is the effective A_V for H II regions, removing the contribution from the diffuse emission. We find that the global attenuation is severely *underestimated* in comparison to the attenuation on H II regions.

REFERENCES

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