MAPPING DUST-OBSCURED LIGHT IN CALIFA GALAXIES

N. Vale Asari\textsuperscript{1,2}, V. Wild\textsuperscript{3}, R. Kennicutt\textsuperscript{2}, and R. Cid Fernandes\textsuperscript{1}

The Calar Alto Legacy Integral Field Area (CALIFA) survey is the first and largest survey of its kind, aiming to obtain optical data cubes 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 focuses on how dust is mapped by the ionised gas. By carefully removing the underlying stellar population, we measure the emission-line Balmer decrement (H\textalpha/H\beta) in different regions in galaxies, separating H\textsc{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\textsc{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\textsc{ii} region attenuations: It is biased by the brightest and less dusty regions. In Fig. 2 we compute the effective $A_V$ for H\textsc{ii} regions, and compare it to $A_V$ from the integrated spectra. The effective attenuation $A_V^{\text{eff}}$ is defined as

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

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

\textsuperscript{1}Departamento de Física-CFM, Universidade Federal de Santa Catarina, C.P. 476, 88040-900, Florianópolis, SC, Brazil (natalia@astro.ufsc.br).

\textsuperscript{2}Institute of Astronomy, University of Cambridge, Madingley Road, Cambridge CB3 0HA, UK.

\textsuperscript{3}School of Physics and Astronomy, University of St Andrews, North Haugh, St Andrews KY16 9SS, UK.

\begin{figure}
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\includegraphics[width=\textwidth]{fig1.png}
\caption{Colour-magnitude diagram for $\sim$ 30 CALIFA galaxies. Each galaxy is represented by its H\textalpha/H\beta 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\textsc{ii} regions.}
\end{figure}

\begin{figure}
\centering
\includegraphics[width=\textwidth]{fig2.png}
\caption{Comparison of V-band attenuations as measured by the observed H\textalpha/H\beta, assuming a Cardelli et al. (1989) law with $R_V = 3.1$ and the case B intrinsic H\textalpha/H\beta = 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\textsc{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\textsc{ii} regions.}
\end{figure}

REFERENCES