Polycyclic Aromatic Hydrocarbon fraction at ~20 pc scale in the Magellanic Clouds

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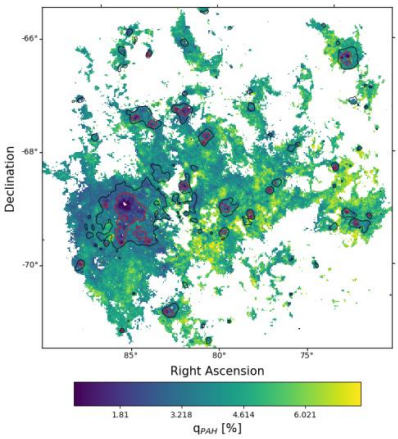
The spatial variations of dust properties within a galaxy and their correlation with local environment provide critical insights into the life cycle of dust. Low metallicity galaxies, in particular, let one study the dust life cycle in environments relevant for galaxies earlier in the history of the Universe.



In this work, we present maps of the dust properties in the Small and Large Magellanic Clouds (SMC, LMC), two nearby, highly resolved, low metallicity galaxies, fit with the Draine & Li (2007; DL07)[1], Compiegne et al. (2011)[2] and THEMIS (Jones et al. 2017)[3] dust grain models (Chastenet et al. 2017)[4]. We use *Spitzer* and *Herschel* infrared observations of the clouds to derive the spatial distribution of the dust properties, in particular the abundance of the small carbonaceous grain (or polycyclic aromatic hydrocarbons; PAH) component. Overall, the average PAH fraction is smaller in the SMC than in the LMC, which is lower than that of the Milky Way. In particular, we find an anti-correlation between the DL07 q_{PAH} fraction and the Hα intensity (Figure 1). This is an indication that the smallest dust grains could be destroyed in high-ionization regions. We provide maps of the q_{PAH} fraction at resolved scales (16 pc in the SMC, 13 pc in the LMC). We also compare our final maps with previous modeling (LMC: Paradis et al. 2009[5], using the Désert et al. 1990[6] model; SMC: Sandstrom et al. 2010[7], using the DL07 model). This helps us identifying the most model-dependent dust properties, and how they vary with resolution and wavelength coverage. We use these results to constrain the drivers of the PAH lifecycle in low metallicity environments.

Références

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