

Spatial variations of PAH properties in M17 revealed by Spitzer/IRS spectral mapping

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PAH (polycyclic aromatic hydrocarbon) emission features in mid-infrared spectra (e.g., 6.2, 7.7, 8.6, 11.3, 12.7 μm) are characteristic of PDRs (photo-dissociation regions). Past studies have shown that the PAH interband ratios are useful probes of the PAH properties (e.g., degree of ionization, size, and edge structure). The PAH properties have been discussed based on pencil-beam observations for many objects. In order to examine the effects of the surrounding interstellar environment on the PAH properties in detail, however, spatially-resolved observations are essential.

We analyzed Spitzer/IRS mid-infrared (5.5-14.5 μm) spectral mapping data of the Galactic star-forming region M17 as well as the IRSF Bry and Nobeyama 45-m ^{13}CO (J=1-0) maps. We decomposed the mid-infrared spectra using PAHFIT[1], and obtained spectral maps of the PAH features. As a result, we find that the PAH emission features are bright in the region between the HII region traced by Bry and the molecular cloud traced by ^{13}CO , supporting that the PAH features originate from PDRs. We also find that the PAH7.7/PAH11.3 ratios are independent to the distance from the M17 center (Fig.1), suggesting that the degree of PAH ionization is mainly controlled by the local interstellar environment. Based on these results, we examine the effects of the intense star-forming activity on the PAH properties in detail.

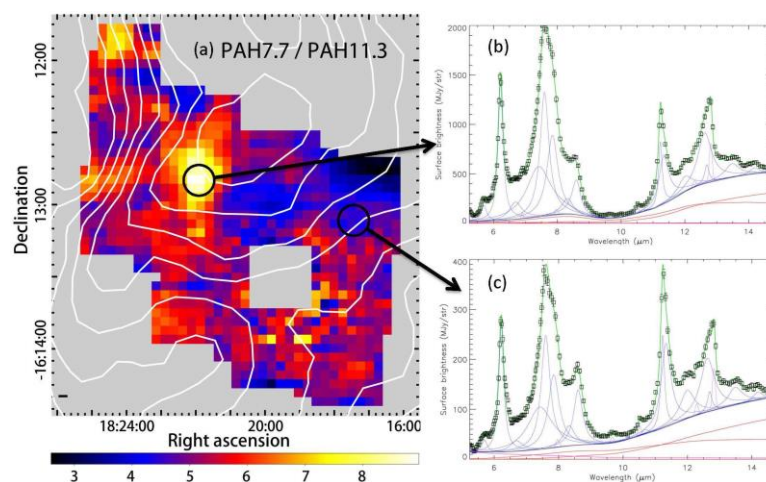


Figure 1: (a) PAH7.7/PAH11.3 interband ratio map. Contours are the ^{13}CO integrated intensity. (b,c) Examples of the mid-infrared spectra. The green, blue, and red curves indicate the best-fit models using PAHFIT.

References

[1] Smith, J. D. T., Draine, B. T., Dale, D. A., et al. 2007b, ApJ, 656, 770.