3.3 micron feature variations in AKARI data

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Archived data from AKARI were analysed in the 2.5–5 μm region were analysed to investigate variations in the 3.3 μm PAH feature and related hydrocarbon emission bands. PAHs (and/or related carbonaceous molecular species) comprise a substantial fraction of the carbon budget in the Universe, making the study of their formation and evolution an important means of understanding the behaviour and lifecycle of carbon in our galaxy and beyond.

The data were investigated in the context of the interpretation that the 3.3 μm feature can be decomposed into two closely spaced sub-features at 3.28 μm and 3.30 μm[1,2], in order to explain the observed asymmetry and profile variation of the overall emission band. Our findings indicate that this feature is universally well described by these two components in data recorded using AKARI grism spectroscopy. The cause for these components is discussed in terms of the structure of the emitting molecular carriers, and their relative abundance in different astrophysical environments. Further, a correlation is found between the 3.28 μm sub-feature and the aliphatic hydrocarbon band at 3.4 μm, implying similar environmental conditions for the formation of these molecular carriers. Possible interpretations are discussed in terms of molecular stability and destruction pathways of carbonaceous interstellar species.

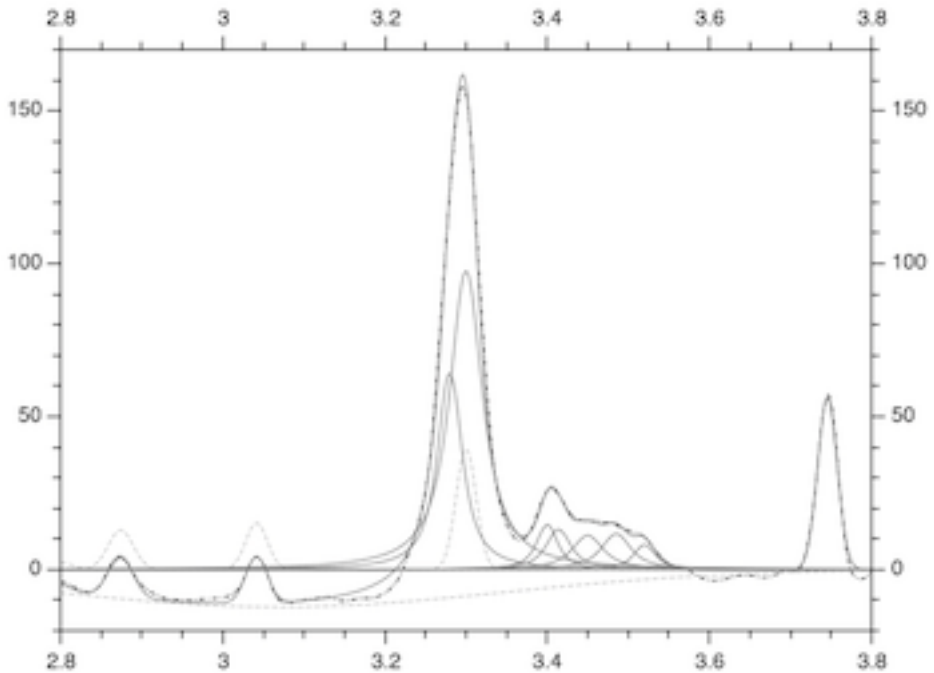

Figure 1: Spectroscopic fitting used in this work. Original data is shown as a solid gray line, and the overall fit is shown by the black dot-dashed line. Note the inclusion of two sub-features (shown in gray) to match the profile of the 3.3 μm band.

References

[1] Song, I.-O., Kerr, T. H., McCombie, J., & Sarre, P. J. 2003, MNRAS, 346, L1
[2] Candian, A., Kerr, T. H., Song, I.-O., McCombie, J., & Sarre, P. J. 2012, MNRAS, 426, 389