The Lack of Spectral Diversity of the Aromatic Infrared Bands: Implications for the PAH Hypothesis

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The emission profiles from the main Aromatic Infrared Bands (AIBs) at 3.3, 6.2, 7.7, 8.6, 11.3, and 12.7 μm show a notable lack of spectral diversity. These strong emission bands are assumed to arise from polycyclic aromatic hydrocarbons (PAHs). Both *JWST* and *ISO SWS* spectra show only small variations in the red wing of the 3.3 μm AIB and the blue wing of the 11.2 μm AIB, regardless of excitation conditions or whether the AIB carrier was recently produced in a planetary nebula or was highly processed in the diffuse interstellar medium. Examples are shown in Fig. 1 and 2. This suggests that there is a uniform set of PAHs and a uniform excitation temperature of the PAHs in all sources, and we critically examine the consequences of this for the PAH Hypothesis.

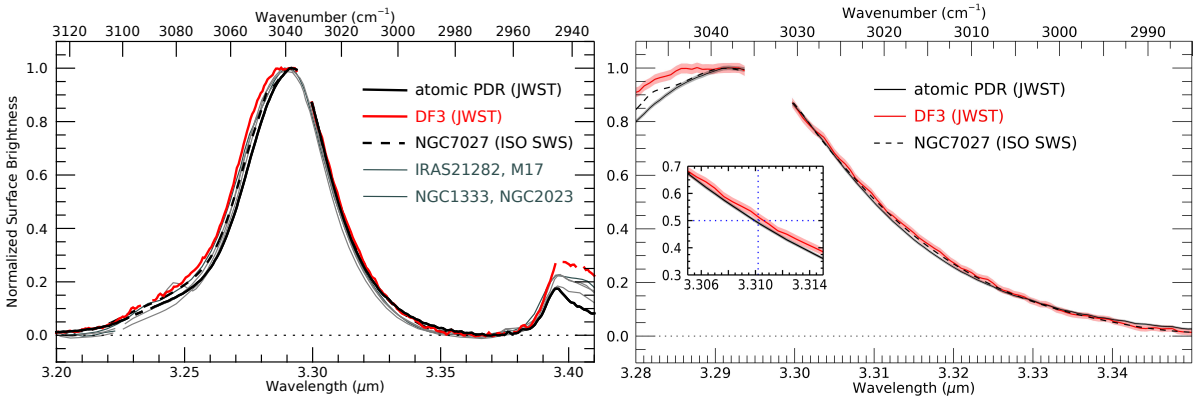

Figure 1: (left) Comparison of the 3.3 μm AIB *JWST* Orion Bar spectrum of the atomic PDR and DF3 regions to the *ISO SWS* spectra of NGC 7027, IRAS 21282+5050, M17, NCG 1333, and NGC 2023. The continuum, plateau, and emission lines have been removed. (right) Expanded view of the red wing of the 3.3 μm AIB.

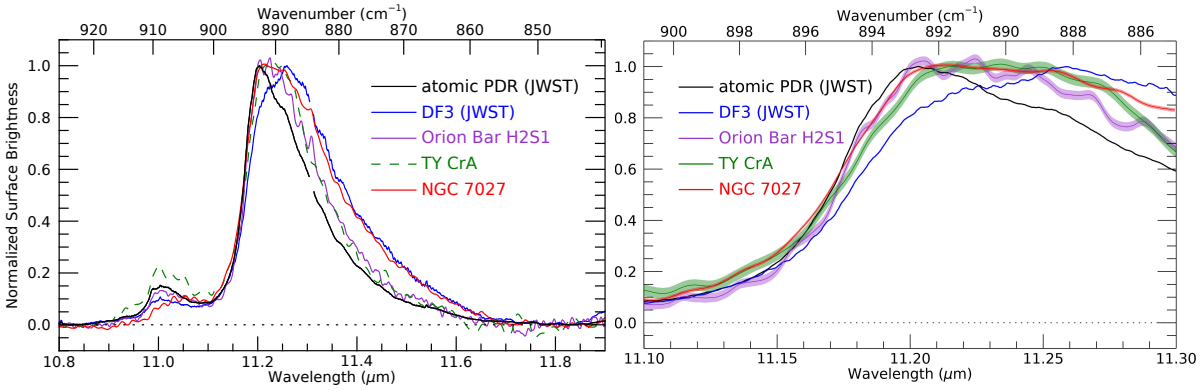

Figure 2: (left) Comparison of the 11.2 μm AIB *JWST* Orion Bar spectrum of the atomic PDR and DF3 regions to the *ISO SWS* spectra of the Orion Bar H2S1, TY CrA, and NGC 7027. The continuum, plateau, and emission lines have been removed. (right) Expanded view of the blue wing of the 11.2 μm AIB. The DF3 spectrum has an 11.25 μm component that affects the blue wing when normalized as shown in this plot.