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Mapping PAH emission in NGC 7023 with SOFIA

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NGC 7023 is a well-known reflection nebula which shows strong emission from Polycyclic Aromatic Hydrocarbon (PAH) molecules in the form of Aromatic Infrared Bands (e.g. Berné at al., 2007; Boersma, Bregman and Allamandola, 2013). The spectral variations of the AIBs in this region are connected to the chemical evolution of the PAH molecules which, in turn, depends on the local physical conditions.
We exploited the unique capabilities of The Stratospheric Observatory for Infrared Astronomy (SOFIA) to image a 3.2' x 3.4' region of this nebula in the PAH bands with high spatial resolution (2.7"). Specifically, we look at the 3.3 μm and 11.2 μm emission in the north and south PDR using the PAH filter ($\lambda_c = 3.3\mu$m, $\Delta\lambda$=0.09 μm) of FLITECAM and the LWC filter ($\lambda_c = 11.1\mu$m, $\Delta\lambda$=0.95 μm) of FORCAST (PI Berné).
We compare the SOFIA images with existing images of other PAH bands (Spitzer 8.0 μm), the Extended Red Emission (Hubble and Canadian French Hawaiian Telescope) and H_2 (2.12 μm). We create maps of the 3.3/11.2 ratio to probe the PAH size distribution and of the 8.0/11.2 to probe the PAH ionization.
We analyze our maps with a emission model based of spectra from the NASA Ames PAH database (Boersma et al, 2014) to determine the physical conditions in the emitting regions and to understand the chemical evolution of PAH molecules in region.

REFERENCES

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