30 Years of Photodissociation Regions:

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EUV/FUV-driven photo-evaporation flows

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Spitzer, *Herschel*, and WISE have revealed that interstellar bubbles, cavities, and H II regions often show infrared dust arcs near the star. These arcs, which we term as *dust waves*, trace the effects of radiation pressure acting on the dust component of photo-evaporation flows. Dust waves provide a natural explanation for the long-standing problem on the presence of dust inside H II regions, and offer a new method to study interstellar dust.

We have performed a thorough analysis of the dust emission from the Orion IC 434 H II region. Dust in the ionized gas from the IC 434 is very much different from that observed in the diffuse ISM, and bears the marks of the molecular cloud phase from which they are 'freshly' evaporated by EUV radiation of σ Ori AB. Coulomb interactions between gas and dust in the flow are less efficient than predicted by theory, and questions our understanding on grain charging. PAH emission is observed from *within* the ionized gas. Similar configurations, where photo-evaporation flows eventually culminate in infrared arc-like structures may be discerned within well-known reflection nebulae such as NGC 2023 and NGC 7023, revealing the importance of dynamics in both EUV- and FUV dominated regions.

Photo-evaporation flows and thermal conduction gradually erode molecular clouds and may limit their star formation efficiency. For the Orion Molecular Clouds, we have inferred a total evaporation rate of 10^{-2} $M_\odot$ yr^{-1}, a 3×10^5 $M_\odot$ mass for the 'proto-Orion' cloud, and a cloud lifetime of 20 - 30 Myr (Ochsendorf et al. 2015, in press). The evaporation from the clouds fuels the expansion of the Orion-Eridanus superbubble. However, it is not clear what the relative contributions from EUV photons, FUV photons, and thermal conduction are to the evaporation rate of the molecular clouds. Stars of spectral type B2 and later are far more numerous compared to their ionizing siblings, and the resulting FUV field may induce large mass-losses from the OMCs. Large-scale mapping of PDRs and comparison with tracers of ionized gas may constrain the relative importance FUV irradiation in the evaporation of molecular clouds.

REFERENCES