Highlights on Spanish Astrophysics X, Proceedings of the XIII Scientific Meeting of the Spanish Astronomical Society held on July 16 – 20, 2018, in Salamanca, Spain. B. Montesinos, A. Asensio Ramos, F. Buitrago, R. Schödel, E. Villaver, S. Pérez-Hoyos, I. Ordóñez-Etxeberria (eds.), 2019

Widespread FUV-irradiated warm and dense gas in Orion Molecular Cloud (OMC-1).

Miriam G. Santa-Maria[1], Javier R. Goicoechea[1], Emeric Bron[1], David Teyssier[2], Nuria Marcelino[1], Jose Cernicharo[1] and Sara Cuadrado[1]

[1] Instituto de Física Fundamental (CSIC). Calle Serrano 121, E-28006 Madrid, Spain.
[2] Telespazio Vega UK Ltd for ESA/ESAC. Urbanización Villafranca del Castillo, Villanueva de la Cañada, E-28692 Madrid, Spain.

Abstract

Young massive stars ($> 8\,M_\odot$, OB stars) regulate the evolution of their parental molecular cloud, dominating the injection of radiative energy, through far ultraviolet (FUV) photons; and mechanical energy, through stellar winds, supernovae and/or merger explosions, into the interstellar medium (ISM). It is important to find tracers that help to quantify the stellar feedback processes that take place at different spatial scales. In this contribution we report velocity-resolved maps of the central 0.85 arcmin^2 ($\sim$0.9 pc $\times$ $\sim$1.4 pc) of the Orion molecular cloud (OMC-1), the closest high-mass star-forming region, in several submillimeter lines that can hardly be observed from ground-based radiotelescopes: CH^+(J=1-0), CO (J=10-9), HCO^+ (J=6-5) and HCN (J=6-5). The maps reveal an extended but thin component of warm molecular gas associated with the FUV irradiated skin of OMC-1. We find that the CH^+ (J=1-0) emission spatially correlates with the strengh of the flux of FUV photons arising from the Trapezium cluster and impinging the cloud. The CH^+ (J=1-0) emission also correlates with the widespread infrarred emission from FUV-pumped, vibrationally excited, H_2 ($v \geq 1$), and with that of [CII] 158 μm, both emerging from FUV-irradiated gas. The correlation of the extended CH^+ (J=1-0) and narrow-line mid-J CO emissions from OMC-1 implies that both emerge from gas in the photodissociation region (PDR), the skin of the molecular cloud, and not from shocked gas. These line tracers probe the radiative feedback from young massive stars at large cloud spatial scales.