

# **Environmental impacts of the irradiated shocks in the W28 A2 massive star-forming region**

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The formation of massive stars plays a crucial role in the interstellar medium of galaxies from numerous points of view. They are a critical source of energy and momentum input: they send shock waves propagating in their environment through their ejection structures (jets and bipolar outflows), and the energetic radiation field emitted by the central object is likely to cause dissociation and ionization in its surroundings. In this talk, I will illustrate the propagation of so-called 'irradiated shocks' in the W28 A2 star-forming region, corresponding to outflows that are illuminated by the radiation field of the forming proto-star. I will present observations from the APEX, Herschel, and IRAM 30m telescopes, and use them to characterize the chemical (carbon-bearing species: CO, C, C<sup>+</sup>, CH<sup>+</sup>, but also SiO) and energetic (mass, energy, momentum, ejection rates) impact of such outflows. Additionally, in W28 A2, strong fluxes of high-energy photons have been detected by the gamma-ray telescopes HESS and Fermi, hinting at the presence of energetic cosmic rays in the region. I will show to which extent our precise sub-mm dataset can provide a contribution to the study of their possible origin in W28 A2, in relation with the presence of the strong shocks powered by the massive forming star.