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Multiwavelength studies of the interstellar contents of gamma-ray bright supernova remnants

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In the era of the Cherenkov Telescope Array, gamma-ray observations of supernova remnants (SNRs) will be performed with increased sensitivity and angular resolution, resulting in an unprecedented volume of data. Thorough interpretations of these new gamma-ray spectra will require to accurately quantify the interaction of cosmic rays with the complex interstellar environment of SNRs. Our goal is to provide as many constraints as possible on the interstellar contents of SNRs (mass, density, kinematics, ionization fraction, magnetic field) in order to pin-point the origin of gamma-ray photons and to disentangle the contributions of the different mechanisms of gamma-ray emission (synchrotron, bremsstrahlung, pion decay and inverse compton scattering). In addition, we want to track possible sources of fresh cosmic rays (embedded protostars, HII regions, shocks). In this talk, I aim to review several methods of detection of the molecular and dust phases in the environment of SNRs, and the corresponding tools used to infer physical parameters from multiwavelength observations. To illustrate the level of description that can be achieved with these methods, I will present our study of the evolved SNR IC443, based on new millimeter observations with the IRAM 30m and APEX telescopes.

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