

Project Title:

Supernova remnants: from the explosion to the interstellar medium

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Background and purpose: Supernova remnants (SNRs) are key in the cycle of matter in the Galaxy. The purpose of my research is to reveal the mechanisms that shape SNRs, from their generation in a supernova explosion to their dilution in the interstellar medium. I want to elucidate how different explosion engines produce different SNRs, and how SNRs interact with their environment – and how these effects play together, including efficient particle acceleration, to reach a complete understanding. Because of the complex multi-scale physics involved, this study requires the use of state-of-the-art numerical simulations. I will build upon a framework I have already developed. I will run 3-dimensional time-dependent simulations to properly reproduce the SNR geometry.

Usage: This quick use project was just meant to learn how to use the MPC supercomputer, and assess the performance of my code. I got access to the machine only 2 months ago and I have done a limited number of test runs, totaling about 84,000 CPU hours. I have measured the execution time and parallelization scaling from 32 to 512 cores, and the memory use, for a typical SNR setup that I had studied in the past, with varying spatial resolutions up to 1024^3 . This will allow me to efficiently design the new simulations.