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A high performance computing approach to cosmic-ray modulation.

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The transport of cosmic-rays highly energetic charged particles originating from astrophysical sources, in the heliosphere, the region dominated by plasma of solar origin, can be modelled using the Parker transport equation (TPE). We solve this equation using a 3D time-dependent stochastic numerical solver, taking into account the various processes that modulate the intensities of these cosmic rays on their way to the inner heliosphere and thus to Earth. Where they can pose significant radiation hazard to, e.g. astronauts. This numerical technique lends itself to large-scale parallel computing. Preliminary results of cosmic-rays intensities computed using the CHPC cluster will be presented.

HPC content

This project relies on a custom built FORTRAN code. The project is based on large scale simulations and to this end employs the MPI algorithm. The code has been shown to have a more the 90% scaling efficiency. Typical simulations can take up to 44 hours to run on 1200 cores.

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