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INVITED SPEAKER: Computational modeling of cosmic rays in the neighbourhood of the Sun

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Abstract content
   (Max 300 words)
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The heliosphere is defined as the plasmatic influence sphere of the Sun and may stretch far beyond the solar system. Cosmic rays, as charged particles with energy between 1 MeV and thousands of GeV, arriving from our own Galaxy and beyond, penetrate the heliosphere and encounter the solar wind and imbedded magnetic field so that when observed they contain useful information about the basic features of the heliosphere. In order to interpret these observations, measured on and close to the Earth and farther away by several space missions, and to gain understanding of the underlying physics, we need to simulate the heliosphere and the acceleration, propagation and transport of these cosmic rays with numerical models. These types of models vary from magnetohydrodynamic (MHD) based approaches for simulating the heliospheric geometry to using standard finite-difference numerical schemes to solve transport-type partial differential equations with a varying complexity. How these models have been developed locally to do internationally competitive research and as a major training tool for human capacity development will be discussed. How they are applied to various astrophysics, cosmic ray and heliospheric space physics issues with interesting examples will be illustrated.

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