

Development of a Modern Open Source Magnetospheric Computation Tool

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The study of how cosmic rays (CRs) interact with the Earth's magnetic environment is heavily reliant on simulations of CRs trajectories within the Earth's magnetosphere. These simulations are computationally taxing and require the use of sophisticated programs, with MAGNETOCOSMICS being the most used tool currently. MAGNETOCOSMICS, while functional, fast, and reliable, is outdated (requiring software that is no longer supported to function) and offers limited flexibility for experimentation beyond its initial parameters. The development of a new open access magnetospheric tool benefits the CR research community greatly, allowing for easier testing of new models. Using freely available pre-made code and magnetic field models for the magnetosphere a more user-friendly tool for magnetospheric computations was created. The FORTRAN and Python computing languages are used as the basis of the tool .

The tool can conduct large scale computations of particle trajectories, cut-off rigidities, and asymptotic cones of acceptance. The calculations conducted by the new tool have a good agreement with previous results obtained by MAGNETOCOSMICS. The close agreement between prior tools and this modern code shows clear promise in the new program. The future open access nature of the tool will also allow further improvements to the computational accuracy and speed as more researchers add to the existing code. Ideally the tool will provide the groundwork for a community driven magnetospheric tool that will be used throughout the community.

Primary author: LARSEN, Nicholas (Sodankyla Geophysical Observatory)

Co-authors: MISHEV, Alexander (University of Oulu); USOSKIN, Ilya (University of Oulu)

Presenter: LARSEN, Nicholas (Sodankyla Geophysical Observatory)

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