Providing Customized Magnetic Inner Boundary Condition Maps for Coronal And Solar Wind Models using AFT

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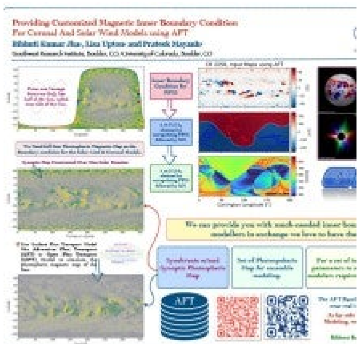
Poster

The Surface Flux Transport (SFT) model provides essential photospheric magnetic field data, which can serve as the inner boundary condition for most coronal and solar wind models. These models typically utilize photospheric magnetic field maps to propagate the radial magnetic field into the heliosphere using potential field solvers. However, since only one hemisphere of the Sun is observable from a single vantage point, these models often rely on synoptic photospheric maps. These maps are 360-degree constructions of the photospheric magnetic field, created by combining observations over an entire solar rotation. This approach fails to capture the Sun's full dynamics at any given time, limiting its ability to represent the transient processes that are crucial for space weather predictions, such as coronal mass ejection (CME) forecasts. To address this limitation, we use the Advective Flux Transport (AFT) model, which incorporates realistic surface flows and observed magnetic field data to simulate the Sun's photospheric magnetic field. The AFT model can generate ensembles of photospheric magnetic fields, providing the necessary inner boundary conditions for coronal and heliospheric models. The AFT is fully customizable, in terms of spatial and temporal resolution, data assimilation, small scale flux etc. to fulfill the need of coronal and heliospheric modellers. Additionally, AFT-simulated data are publicly available for the research community, accompanied by a Python package called AFTpy. This package offers a streamlined, one-step approach to analyze and visualize AFT data.



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