Global 2D Axisymmetric MHD
Solutions of Coronal Streamers

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Coronal streamers are long-lived regions of closed magnetic fields in the solar corona which can erupt into CMEs. In order to better understand the properties of theses streamers, and their interaction with the solar wind we construct 2D axisymmetric global MHD solutions of global streamers and the solar wind, assuming an ideal polytropic gas with gamma = 1.1. We treat a dipolar normal magnetic flux distribution on the solar surface (representative of a solar minimum configuration), associated with an equatorial streamer sandwiched between two polar coronal holes. We vary the boundary conditions (temperature and polar field strength) to study their effects on the streamer properties. Presented here are the preliminary results of this model. The code successfully solves the MHD equations, with magnetic flux, mass flux, entropy and Bernoulli's Law all being conserved to good quantitative accuracy. Steady state solutions qualitatively reproduce the morphology of the global solar corona. Quantitatively, modelling with a uniform base density and pressure fails to achieve the observed density contrasts between streamer and coronal hole, and the solar wind velocity in the coronal hole is significantly smaller than expected from observations. By dynamically adjusting the base density, with higher base values in closed field region, we obtain better density contrasts. They do not match the levels observed, but this limitation is known and understood. Comparing with observations made during the Whole Sun Month it is clear that the model is unable to reproduce the observed steep decline of density with radius in the coronal hole, but is able to reproduce a good equatorial density profile. The reason is that the polytropic model is unable to reproduce the fast-wind flows in open-field regions, the latter requiring additional energy deposition via Alfven or magneto-acoustic waves. However, despite these limitations, this model is well placed to move onto studying the eruption of CMEs via the introduction of a twisted flux tube into the closed-field region, and successfully illustrated the interaction of streamers with the solar wind.