

EGU22-8908

<https://doi.org/10.5194/egusphere-egu22-8908>

EGU General Assembly 2022

© Author(s) 2022. This work is distributed under the Creative Commons Attribution 4.0 License.



## The impact of the spheromak tilting in space weather modelling

**Eleanna Asvestari**<sup>1</sup>, Tobias Rindlisbacher<sup>2</sup>, Jens Pomoell<sup>1</sup>, and Emilia Kilpua<sup>1</sup>

<sup>1</sup>Faculty of Science, University of Helsinki, Helsinki, Finland (eleanna.asvestari@helsinki.fi)

<sup>2</sup>Albert Einstein Center for Fundamental Physics, Institute for Theoretical Physics, University of Bern, Bern, Switzerland

Accurate reconstruction of the magnetic field topology of coronal mass ejections (CMEs) is essential in space weather forecasting and thus in the spotlight of modelling efforts. The spheromak, a force-free, axisymmetric configuration within which plasma is confined by a twisted magnetic field that fills a spherical volume, is at the moment the most commonly employed flux rope model, which has entered numerous published event studies. Despite its widespread application, not much attention has been paid to the spheromak tilting, which not only affects the spheromak's orientation in the modelling domain, but also its direction of propagation. This can lead to implications when comparing simulation output to observations. The tilting of the spheromak occurs when its magnetic moment is at an angle with the ambient magnetic field. In this case a torque is exerted on the spheromak, forcing it to rotate, so that its magnetic moment aligns to the ambient magnetic field. In our study we used EUHFORIA to investigate the spheromak tilting under different conditions. We developed a method to monitor the spheromak's position and orientation in the EUHFORIA simulation output, and we quantified how the spheromak's total drift and rotation angle depend on various input parameters. We find that the spheromak experienced tilting in all studied scenarios resulting often in a significantly changed orientation to that which it had during insertion. We emphasize that in space weather modelling it is crucial to take into consideration the spheromak tilting, in particular when comparing the model output to observations.