Testing a new flux rope model using the HELCATS CME catalogue

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We present a magnetically-driven flux rope model that computes the forces acting on a twisted magnetic flux rope from the Sun to 1AU. This model assumes a more realistic flux rope geometry than assumed before by these types of models. The balance of force is computed in an analogous manner to the well-known Chen flux-rope model. The 3-D vector components of the magnetic field measured by a probe flying through the flux rope can be extracted for any flux rope orientation imposed near the Sun. We test this model through a parametric study and a systematic comparison of the model with the HELCATS catalogues (imagery and in situ). We also report on our investigations of other physical mechanisms such as the shift of flux-surfaces associated with the magnetic forces acting to accelerate the flux rope from the lower to upper corona. Finally, we present an evaluation of this model for space-weather predictions. This work was partly funded by the HELCATS project under the FP7 EU contract number 606692.