A GENERALIZED ANALYTICAL FLUX-ROPE MODEL: A New Era in ICME Fitting

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In the last 30 years, in-situ analytical models and techniques have done considerable advances to determine the ICME (Interplanetary CME) local topology (as Flux-Rope, FR). However, there remain serious discrepancies between the interpretation of the remote sensing and in-situ observations, which prevent us from creating a common scenario for both.

In this talk, we will present a family of models with realistic physics; no force–free restriction is applied in the formulation. Initially using circular cross-section and the cylindrical approximation (first paper in 2000), the model has been under development since with progressive inclusion of FR features from in-situ observations. The first significant improvement was the implementation of the distortion in the cross-section, a consequence of the CME evolution, as an elliptical shape (called Elliptical model, 2002).

The recent development, which we present in this talk, constitutes the pinnacle of this modeling effort. In addition to the distortion of the cross section, we can now model the deformation of the CME front. We believe that this capability will finally bring consistency between the ICME reconstructions from remote-sensing and in-situ observations.