Validating coronal magnetic field reconstruction methods using solar wind simulations and synthetic imagery

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We present an ongoing effort within the ESA Modeling and Data Analysis Working Group (MADAWG) to determine automatically the magnetic connectivity between the solar surface and any point in interplanetary space. The goal is to produce predictions of the paths and propagation delays of plasma and energetic particle propagation. This is a key point for the data exploitation of the Solar Orbiter and Solar Probe Plus missions, and for establishing connections between remote and in-situ data.

The background coronal magnetic field is currently determined via existing surface magnetograms and PFSS extrapolations, but the interface is ready to include different combinations of coronal field reconstruction methods (NLFFF, Solar Models), wind models (WSA, MULTI-VP), heliospheric models (Parker spiral, ENLIL, EUHFORIA). Some model realisations are also based on advanced magnetograms based on data assimilation techniques (ADAPT) and the HELCATS catalogue of simulations. The results from the different models will be combined in order to better assess the modelling uncertainties. The wind models provide synthetic white-light and EUV images which are compared to coronographic imagery, and the heliospheric models provide estimations of synthetic in-situ data wich are compared to spacecraft data.