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Magnetic modelling for the STEREO-mission

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The advent of the STEREO mission (launch 2006) has produced an increased interest of the solar physics community in stereoscopic and tomographic techniques used in other branches of physics, image and information sciences. However, unlike many of the experiments conducted in the latter disciplines, the STEREO mission does not provide sufficient control over many of the parameters which determine the conditions for an optimal 3D reconstruction. Despite these difficulties the coronal plasma has one very useful property:

The structure of the corona plasma is dominated by the magnetic field because the magnetic pressure is about four orders of magnitude higher than the plasma pressure. Due to the high conductivity the emitting coronal plasma (visible e.g. in SOHO/EIT) outlines the magnetic field lines. The gradient of the emitting plasma structures is significantly lower parallel to the magnetic field lines than in the perpendicular direction.

We use this property and demonstrate how magnetic field information can be used for the interpretation of coronal plasma structures. We extrapolate the coronal magnetic field from photospheric magnetic field measurements into the corona with the help of force-free coronal magnetic field models. We test our method with data from SOHO and the Tenerife Infrared Polarimeter mounted at the German Vacuum Tower Telescope (VTT)