

Coupling of photospheric and coronal magnetic fields

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Information regarding the magnetic field are essential to understand the coupling of the solar interior with the photosphere and atmosphere. The photospheric magnetic field is measured routinely with line-of-sight and vector magnetographs. Direct measurements of chromospheric and coronal magnetic fields are usually not available, except for a few individual cases. We can, however, extrapolate the photospheric magnetic field into the corona. This is by no means an easy task as the extrapolated magnetic field depends on assumptions regarding the coronal plasma, e.g. force-freeness. Force-free means that all non-magnetic forces, e.g. pressure gradients and gravity are neglected. While this assumption is well justified in the solar corona due to the low plasma beta, the magnetic field is not force-free on the photosphere. Ambiguities and noise in the transversal magnetic field measurements are an additional complication for reliable coronal magnetic field extrapolations. A helpful property is that the emitting coronal plasma outlines the magnetic field lines. As a consequence we can test and improve coronal magnetic field models by a comparison with coronal EUV-images. This approach is in particular attractive if EUV-images from different viewpoints as provided by STEREO are available. Photospheric magnetic field measurements and EUV-images are combined for a consistent 3D reconstruction of coronal magnetic fields and the coronal plasma.