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## Magnetic field extrapolation using analytical 3D MHS equilibrium solutions

With current observational methods it is not possible to directly measure the magnetic field in the solar corona with great accuracy. Therefore, coronal magnetic field models have to rely on extrapolation methods using photospheric magnetograms as boundary conditions. In recent years, due to the increased resolution of observations and the need to resolve non-force-free lower regions of the solar atmosphere, there have been increased efforts to use magneto-hydrostatic (MHS) field models instead of force-free extrapolation methods. Although numerical methods to calculate MHS solutions can deal with non-linear problems and hence provide more accurate models, analytical three-dimensional MHS equilibria can also be used as a numerically relatively “cheap” complementary method [T. Wiegmann et al.(2015), T. Wiegmann et al.(2017)]. We present an extrapolation method based on a family of analytical MHS equilibria that allows for a transition from a non-force-free region to a force-free region [T. Neukirch and T. Wiegmann (2019)]. In a subset of cases, asymptotic solutions can be used to make the method numerically more efficient. We shall present some examples of applications of the method.

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