Inference of magneto-hydrostatic equilibrium in the chromosphere

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One of the major open questions in solar physics is the coronal heating problem, which refers to the fact that from the chromosphere upwards the temperature is higher than what can be expected if radiation was the main heating process. The inference of depth-stratified atmospheric models from spectropolarimetric data through inversion methods provides the most detailed characterization of the physical conditions of the solar atmosphere. However, most of the methods, with a few exceptions for the photosphere, use the assumption of hydrostatic equilibrium in a 1D (where each pixel is treated independently of the others) when calculating the gas pressure and density, which leaves out the magnetic forces in the force balance Including these in the balance requires the estimation of electric currents, which relies on spatial derivatives of the magnetic field. In this contribution we present the implementation of a magneto-hydrostatic equilibrium equation solver into the inversion code STiC in order to account for the magnetic forces in the photosphere and chromosphere. We consider some ideal cases in which we avoid the intricacies of the solution of the radiative transfer equation. Using finite differences for the derivatives, we can solve the magneto-hydrostatic equation by solving a system of linear equations. We then use an iterative approach including an equation of state in order to converge to a stable solution. We then test this method taking parameters from r-MHD simulations. In doing so, we assess the accuracy to which this approach can retrieve electric currents as well as some heating terms such as ohmic or ambipolar dissipative terms. Finally, we will present the impact that this approach in the estimation of the gas pressure and the density has on the final ability to estimate accurate radiative losses in some of the main spectral lines of atoms that usually contribute to the radiative losses: CaII, MgII and HI.