# MHD simulations of photospheric cancelling magnetic features causing coronal X-ray bright points

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Discovering the mechanisms for heating the solar corona represents one of the major challenges in astronomy at the present time. Long-period MHD waves have now been ruled out as a mechanism and so the main focus is on various ways in which magnetic reconnection can heat the three main elements of the Sun's corona, namely, X-ray bright points, coronal loops and coronal holes.

Coronal X-ray bright points (XBPs) have been observed to account for about 20 to 30 percent of the heating of the quiet-Sun corona, releasing energies ranging from $10^{27}$ to $10^{29}$ erg. About two thirds of XBPs are located above sites of cancelling magnetic bipoles, so-called cancelling magnetic features (CMFs). The analytical converging flux model of Priest et al. (1994, ApJ, 427, 459) is now recognised as a likely explanation of the heating of these XBPs, where the heating takes place in response to the approach and cancellation of underlying photospheric magnetic fragments of opposite polarity, to which the coronal magnetic loops are linked. The CMFs trigger coronal magnetic reconnection and the associated coronal heating in form of XBPs. Magnetic cancellation itself is driven by converging photospheric footpoint motions of the bipolar sources, and involves flux submergence.

Building upon this model, von Rekowski et al. (2006, MNRAS, 366, 125 and 2006, MNRAS, in press) have recently begun to develop a greatly improved numerical MHD model that investigates the dynamical behaviour of CMFs and the associated reconnection and coronal heating through XBP formation. Further important steps have been undertaken to extend significantly these MHD simulations by including various heating and cooling mechanisms such as adiabatic heating and cooling, viscous heating, Ohmic heating, radiative cooling and thermal conduction. In addition, a realistic, stratified lower atmosphere links the corona to the solar surface, so that the rôle of magnetic coupling between solar corona and the Sun's surface is studied in the process of the formation of coronal XBPs above photospheric CMFs.