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THE GEOMETRICAL AND TOPOLOGICAL DESCRIPTION OF MAGNETIC FIELDS

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Abstract.

Magnetic fields have a strong influence on the behaviour of the solar interior and atmosphere, and the solar wind. Magnetic fields are important in planetary cores, in accretion disks and in interstellar space. An important part of magnetic field studies lies in understanding and quantifying their geometry and topology.

In this talk I will review various methods of describing magnetic field geometry. The magnetic field lines within a 3-D region can be divided into subregions where the field lines do not diverge; these subregions are separated by separatrices or quasi-seperatrix layers. The twist and writhe of the field lines with a region add to its self-helicity. The linking and winding of fieldlines in different regions about each other leads to mutual helicity. Complex magnetic field structures can sometimes be further described using concepts from braid theory.

I will discuss some applications to solar coronal heating and to the characterization of magnetic clouds in the solar wind.