



Using magnetic helicity to characterise complex magnetic fields: scope and limitations.

Gunnar Hornig (1) and Anthony Yeates (2)

(1) University of Dundee, School of Science and Engineering, Dundee, United Kingdom (ghornig@dundee.ac.uk), (2) University of Durham, Department of Mathematical Sciences, Durham, United Kingdom

Magnetic helicity is widely used to describe the structure and dynamics of solar magnetic fields. However, while the mathematical concept of magnetic helicity is very elegant and fundamental, i.e. it is applicable to any magnetic field, there are a number of difficulties which hamper the use of this quantity in many applications. Some of these difficulties are due to our lack of knowledge of the correct boundary data, other problems are related to the non-local nature of magnetic helicity. In this talk I will concentrate on the later problems, highlight the pitfalls of this quantity with a few intriguing examples, and show how far one can push the realm of applicability of magnetic helicity by introducing a “field line helicity” and describe how one can use this quantity to gain a more detailed understanding of the structure and dynamics of magnetic fields in plasmas.