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Numerical Simulation of Sunspot Rotation

The study of sunspot rotation is a mature subject that has been investigated both theoretically and observationally. Sunspot rotation is recognised as an important mechanism for depositing energy into the Sun's atmosphere. An understanding of the characteristics of this energy input is important, because this energy may be transported and stored in the solar atmosphere, effectively enhancing the free magnetic energy above sunspots and in the larger systems in which they reside. This additional source of free energy may provide, or contribute to, the energy budget for space weather phenomena like solar flares, coronal mass ejections and solar energetic particles. We present a parametric investigation that deconvolves the complex real-world phenomenon of sunspot rotation into its components. This project uses the Lare3D numerical code to model an idealised rotating sunspot; the influence this rotating sunspot has on itself and its environment is investigated. Key physical parameters of the sunspot and its environment are varied to determine the mechanisms responsible for energy production, transport and release. A unique feature of this work is that the penumbra forms an important component of our idealised sunspot. Preliminary results find that the penumbra makes a significant contribution to the storage and transport of energy injected by sunspot rotation.

Apply to be considered for a student ; award (Yes / No)?

Yes

Level for award;(Hons, MSc, PhD, N/A)?

PhD

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