

Sunspot Statistical Properties in the Cycle 23 and the Constraints on the Solar Dynamo Theory

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The statistical analysis of sunspot area and their magnetic field distributions are presented for the 1996-2004 data in the Solar Feature Catalogues (SFC) automatically extracted from the SOHO/NDI white light solar images (4 per day) and magnetograms (15 per day). The number of sunspots is found to increase exponentially with the area decrease with a slightly increasing index from the solar minimum to its maximum. The N-S asymmetry in sunspot area distributions and its periodicity for different phases of the solar cycle and hemispheres is investigated with the period deduced. Longitudinal sunspot distributions also reveal a strong North-South asymmetry in active longitude appearance and relation to the latitudinal distributions that depends on the phase of the solar cycle. The magnetic field distributions on the sunspot heliospheric longitude and latitude are also presented for the total and excess fluxes and different phases of the solar cycle. These statistical properties of sunspots and their magnetic field are tested versus those predicted by the turbulent dynamo theory.