

Progress in Measuring Coronal Magnetic Fields and Energies

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Magnetic energies contained in solar active regions or dissipated in flares can now be calculated from coronal images (such as from AIA/SDO) and line-of-sight magneto grams (such as from HMI/SDO). The magneto gram provides a potential field solution, while automated tracing of coronal loops in different EUV wavelengths provide the misalignment angles between potential and non-potential field lines. We present an automated code that uses data from AIA and HMI to calculate the free energy and dissipated energy in solar flares, based on a nonlinear force-free field approximation in terms of vertical currents that produce helical twist of coronal loops. We study the time evolution of free energy and energy dissipation during some 200 solar flares and compare it with the global energetics of flare and CME energies. The occurrence frequency distributions of dissipated magnetic energies follow closely the predicted power law distribution functions of self-organized criticality models. The presented results provide for the first time statistics on magnetic energies dissipated in solar flares.