

Rethinking the solar flare paradigm

Don Melrose, University of Sydney, Australia

Solar flares are magnetic explosions: magnetic energy that is stored in the corona over a long time is released as kinetic energy, in mass motions and energetic particles, on a much shorter time. To be useful as an archetype for other magnetic explosions, such as super flares on solar-type stars and outbursts on magnetars, we need a flare model that can be scaled appropriately. Existing flare paradigms do not include essential electrodynamic ingredients, are based on outdated concepts (e.g., 2D reconnection, photospheric dynamo, current interruption), and cannot be scaled appropriately. An alternative paradigm is discussed, based on the intrinsic time-dependence of the changing magnetic field, and release of magnetic energy through redirection (rather than dissipation) of large-scale currents from longer to shorter paths. It is shown how the parameters in the model can be scaled.