M37a Magnetodynamic Driving of loop-type Coronal Mass Ejections

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Coronal Mass Ejections (CMEs) involve the ejection of material from the solar surface with much higher densities than that of the ambient solar wind. The material travels out past into interplanetary space usually as a coherent structure. They have been observed with a frequency of up to two per day (Sheeley et al 1982).

The class of CMEs we are interested in here are loop type CMEs, those associated with filament eruptions. In this investigation we modeled the effect of the eruption mechanism as the injection into an extended coronal loop structure of a large amplitude torsional Alfvén wave (TAW) packet into an extended coronal magnetic structure. The TAW progresses along the loop with a "sweeping pinch" effect which drives the gas.

Since CMEs extend into interplanetary space we have modeled the sun as a globe of plasma. The effect of the flare is, as stated above, modelled as an ejection of a TAW packet (this prevents the need to resolve the small sizes associated with flares). We show that this model reproduces the observed rhombic-shaped features of loop-type CMEs associated with strong arcade flares.