PARTICLE ACCELERATION AND HEATING IN REGIONS OF MAGNETIC FLUX EMERGENCE

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Emerging magnetic flux into preexisting magnetic fields drives the formation of reconnecting magnetic fields in tens of minutes and can be the source of several dynamic solar phenomena. Numerical simulations suggest that a key element for the explosive phenomena following the formation of the large scale current sheet is its fragmentation and the formation of a strongly turbulent environment. We show that the statistical properties of the spontaneously formed fragmented electric fields are responsible for the efficient heating and acceleration of the charged particles, which form a super-hot component and a power law high energy tail on sub-second time scales. A small fraction of the energized particles escapes the acceleration volume with a super-hot component, with temperature close to 4.5 MK, and a power law high energy tail with index close to 3. We estimate the transport coefficients from the dynamics of the charged particles inside the fragmented and fractal electric fields, and the solution of the appropriate fractional transport equation for a strongly turbulent plasma agrees with our test particle simulations. Our results confirm the observations reported for the high energy particles (Hard X-rays, Type III bursts and Solar Energetic Particles) during standard and blow up jets.