# Particle heating and acceleration inside the turbulent Solar Corona

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The links between turbulence, reconnection and shocks in unstable plasmas will be discussed briefly. All three processes co-exist in explosively unstable plasmas, forming a new electromagnetic environment which we will call here **turbulent reconnection**, where spontaneous formation of current sheets inside turbulence appear. The heating and the acceleration of particles will be the result of the synergy of the stochastic (second order Fermi) and the systematic acceleration (first order Fermi). The solar atmosphere is magnetically coupled with a turbulent driver (the convection zone) therefore the formation of turbulent reconnection in the solar atmosphere is externally driven. The magnetic topologies observed in the solar atmosphere are generated and driven by the convective motions bellow the solar surface and leading to spontaneous generation of reconnecting current sheets and small and large scale eruptions which reinforce the turbulent reconnection state. It is shown that long term heating and impulsive heating of the plasma up to 10's of million degrees and generation of Solar Energetic Particles is a natural consequence of the turbulent state of the solar atmosphere. The observed small or large scale eruptions are the signatures of the turbulent solar atmosphere. For the purpose of this review we can split the solar atmosphere in two broad classes of magnetic topologies (1) the quiet sun, where the magnetic field is weak and chaotic and (2) the active regions, where the magnetic fields are stronger and complex but we can have a rough estimate of their topology from the Non-Linear Force Free Extrapolations. The large eruptions which are related with large scale magnetic reconstructions (Flares, Coronal Mass Ejection) appear in active regions were heating (stochastic) and particle acceleration (systematic) of the high energy tail of the distribution function co-exist almost in equal footing. In the quite sun or the active regions during the non-eruptive phase, the small scale explosions (microflares, nanoflares) dominate and the stochastic heating overpower particle acceleration. Turbulent reconnection, once it is established in the solar corona, drives corona heating and particle acceleration in all explosions in the solar surface from nanoflares to CMEs.