Avalanche frontiers in dissipative abelian sandpile model as off-critical SLE(2)

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Avalanche frontiers in Abelian Sandpile Model (ASM) are random simple curves whose continuum limit is known to be a Schramm-Loewner Evolution (SLE) with diffusivity parameter $\kappa = 2$. In this paper we consider the dissipative ASM and study the statistics of the avalanche and wave frontiers for various rates of dissipation. We examine the scaling behavior of a number of functions such as the correlation length, the exponent of distribution function of loop lengths and gyration radius defined for waves and avalanches. We find that they do scale with the rate of dissipation. Two significant length scales are observed. For length scales much smaller than the correlation length, these curves show properties close to the critical curves and the corresponding diffusivity parameter is nearly the same as the critical limit. We interpret this as the ultra violet (UV) limit where $\kappa = 2$ corresponding to $c = -2$. For length scales much larger than the correlation length we find that the avalanche frontiers tend to Self-Avoiding Walk, the corresponding driving function is proportional to the Brownian motion with the diffusion parameter $\kappa = 8/3$ corresponding to a field theory with $c = 0$. This is the infra red (IR) limit. Correspondingly the central charge decreases from the IR to the UV point.