The scaled energy of the maximizing path that moves in scaled coordinates between $x, s \in R$ and $y, t \in R$ with $s < t$ of unit order quantities $W_n(x, s; y, t)$ specifying the scaled energy of the maximizing path that moves in scaled coordinates between $(x, s)$ and $(y, t)$. The space-time Airy sheet is, after a parabolic adjustment, the putative distributional limit $W_\infty$ of this system as $n \to \infty$. The Airy sheet has recently been constructed in [D. Dauvergne et. al., “Basic properties of the Airy line ensemble”, Preprint, arXiv:1812.00311] as such a limit of Brownian last passage percolation. In this article, we initiate the study of fractal geometry in the Airy sheet. We prove that the scaled energy difference profile given by $R \to R: z \to W_\infty(1, 0; z, 1) - W_\infty(-1, 0; z, 1)$ is a nondecreasing process that is constant in a random neighbourhood of almost every $z \in R$; and that the exceptional set of $z \in R$ that violate this condition almost surely has Hausdorff dimension one-half. Points of violation correspond to special behaviour for scaled maximizing paths, and we prove the result by investigating this behaviour, making use of two inputs from recent studies of scaled Brownian LPP; namely, Brownian regularity of profiles, and estimates on the rarity of pairs of disjoint scaled maximizing paths that begin and end close to each other.

MSC:
82B43 Percolation
82D60 Statistical mechanics of polymers
60K35 Interacting random processes; statistical mechanics type models; percolation theory
60H15 Stochastic partial differential equations (aspects of stochastic analysis)
28A80 Fractals
60J65 Brownian motion

Keywords:
Brownian last passage percolation; geodesics; polymers; Airy sheet; disjointness; fractal geometry

Full Text: DOI Euclid

References:


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