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Critical Dynamics Near the Erosion Onset LE YAN, Kavli Institute for Theoretical Physics, UCSB, MATTHIEU WYART, Ecole Polytechnique Federale de Lausanne, Switzerland — Erosion shapes the Earth's landscape. Experiments reveal that there is an erosion threshold of a granular bed sheared by a viscous fluid. The granular particles start to flow when the shearing force is above the threshold θ_c. Near θ_c, the particle flux grows linearly $J \sim \theta - \theta_c$. The stationary state is reached after a transient time $t_{\rm conv}$, which diverges as $t_{\rm conv} \sim |\theta - \theta_c|^{-z}$. We theoretically study this dynamical transition by introducing a model capturing both the drainage effect of the disordered landscape and the interactions among the granular particles. Based on the model, we make the first time quantitative testable predictions for the drainage pattern – how the granular flux is spatially distributed and correlated. Our model enables us to rationalize the critical dynamics of erosion, which may also apply to the plastic depinning transition of vortex lattices in dirty superconductors.

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