Pinning of interfaces by localized dry friction

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We consider a differential inclusion to model the propagation of an interface, e.g., a phase boundary, in an environment with obstacles. The interaction of the interface with the obstacles is governed by a localized dry friction. The model implies that energy has to be expended to pass across an obstacle. Hence, the interface becomes arrested until enough curvature is accumulated such that it is energetically more favorable to pass across the obstacle. The treatment of our model in the context of pinning and depinning requires a comparison principle. We prove this property and hence the existence of viscosity solutions. Moreover, under reasonable assumptions, they are equivalent to weak solutions. Our main results asserts that for obstacles distributed according to a Poisson point process, interfaces become pinned, leading to the emergence of a rate-independent hysteresis. This is joint work with Luca Courte and Ulisse Stefanelli.