

Models of shallow viscoplastic flows: blocking, diverting and inference

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In this talk, I'll present some recent work on shallow viscoplastic flows and their interaction with topography and obstructions. A major focus will be on how the magnitude of the yield stress can qualitatively alter the dynamics. For example, there can be a significant change in the ponding of material upstream of an obstruction. I will also discuss the existence, size and shape of kīpukas (lava-free regions) and their dependence on the characteristics of the obstruction. The ideas will be extended to more general rheology, which then provides a method for inferring rheological properties by observing the interactions of flows with topography. Finally, the theory will be compared with recent laboratory experiments using hair gel on an inclined plane.