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Segregating photoelastic particles in free-surface granular flows. AMALIA L. THOMAS, NATHALIE M. VRIEND, University of Cambridge — We experimentally investigate bimodal avalanches of photoelastic discs between two narrow side-walls. We visualize the physical phenomena that occur during segregation and quantify the dynamic appearance of force chains within the bulk of the flow from fringe patterns using photoelastic theory. The photoelastic technique has been used in granular research for almost half a century and has been applied in a variety of quasi-steady systems. We have now adapted the technique to perform well within dynamic granular flows where collisions are short-lived and force chains are formed and broken continuously. Our photoelastic urethane discs are cast in-house to provide high-resolution fringe patterns and a high stress-optic coefficient. In addition we carried out stress relaxation tests to study the viscoelastic properties of the photoelastic material, and measured the speed of force transmission and dampening from a moving particle onto a static chain of particles. In our avalanche experiments, we also employ particle tracking and particle velocimetry techniques to measure the general flow field within the avalanche. The overall goal of our work is to investigate and quantify the influence of the distribution of forces on the fundamental processes that drive segregation.

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