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Solitary granular avalanches: stability, fingering and theoretical modeling FLORENT MALLOGGI, BRUNO ANDREOTTI, ERIC CLÉMENT, ESPCI - University of Paris 6, Paris, France, IGOR ARONSON, Argonne National Laboratory, USA, LEV TSIMRING, INS-University of San Diego, USA —
Avalanching processes do not only occur in the air as we know of snow avalanches, mud flows and land-slides. Such events frequently happen below the see level as they take many forms from turbidity currents to thick sediment waves. In this study we report results on laboratory scale avalanche experiments taking place both in the air and under-water. In both cases a family of stable solitary erosion/deposition waves is observed [1]. At higher inclination angles, we show the existence of a long wavelength transverse instability followed by a coarsening and the onset of a fingering pattern. While the experiments strongly differ by the spatial and time scales, the agreement between the stability diagrams, the wavelengths selection and the avalanche morphology suggest a common erosion/deposition scenario. We also use these erosion/deposition waves to investigate the dynamics of granular flow and jamming in the frame work of the Partial Fluidization Theory (PFT) proposed by Aronson et al. to describe the dynamics of granular matter near jamming [2]. [1] F. Malloggi et al. Europhysics Letters, 2006, Erosion waves: Transverse instabilities and fingering 75, 825-831 [2] I. S. Aranson et al.. Transverse instability of avalanches in granular flows down an incline. Physical Review E, 2006, 73, 050302; I.S.Aronson et al., Non rheological properties of granular flows: exploring the near jamming limit, preprint (2007).

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