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Washboard Road JIM MCELWAINE, STUART DALZIEL, NICOLAS TABERLET, DAMTP, University of Cambridge, STEPHEN MORRIS, Dept. of Physics, University of Toronto — The tendency of unpaved road surfaces to develop lateral ripples ("washboard" or "corrugated" road) is annoyingly familiar to drivers on dry gravel roads. Similar ripples are well known on railroad tracks and many other rolling or sliding, load bearing surfaces. Our approach combined laboratory experiments, soft-particle direct numerical simulations and simple nonlinear dynamics models. The experiment consisted of a rotating table 60 cm in radius with a thick layer of sand forming a roadbed around the circumference. A 6 cm radius hard rubber wheel, with a support stationary in the lab frame, rolled on the sand layer. We varied the speed of the table and the details of the suspension of the wheel. The onset of the ripple pattern exhibits a sharp threshold and was strongly subcritical with a large hysteresis as a function of the speed of the table. The ripple pattern appears as small patches of travelling waves which eventually spread to the entire circumference. The ripples move slowly in the driving direction. Interesting secondary dynamics of the saturated ripples were observed. All of these effects are captured qualitatively by a 2D soft particle simulations. The simulations clearly indicate that neither compaction nor particle size segregation are crucial for the appearance of the ripples, and we present a simple model to describe the wavelength and amplitude of the ripples.

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