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# Rolling instability of closed elastic ribbons

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## Résumé

The stationary shape of a rolling, circularly-closed elastic ribbon has been studied at relatively high speeds (1). However, at lower speeds, the ribbon undergoes a periodic movement that breaks this stationary shape.

This instability appears to be triggered by curvature imperfections on the ribbon, which induces a parametric forcing on the rolling dynamics.

The phenomenon has been captured using numerical simulations of 2D rods with frictional contact (2), and analytical and experimental comparisons are also provided.

(1) P.S. Raux, P. M. Reis, J. W. M. Bush, and C. Clanet. "Rolling Ribbons." *Physical Review Letters* 105, no. 4 (2010): 044301. <https://doi.org/10.1103/PhysRevLett.105.044301>.

(2) E. Hohnadel, T. Métivet, and F. Bertails-Descoubes. "Mixed Super-Circles." *Computer Graphics Forum*, to appear in 2026 (Proc. of Eurographics'26). Source code freely available at <https://gitlab.inria.fr/elan-public-code/circonflex>.

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\*Intervenant