

Abstract Submitted
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Buckling of a Flexible Strip Sliding on a Frictional Base ALEXAN-
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sity of Minnesota — The main motivation for this contribution is the buckling of
a drillstring sliding on the bottom of the horizontal section of borehole. The open
questions that remain today are related to the determination of the onset of insta-
bility, and to the conditions under which different modes of constrained buckling
occur. In this presentation, we are concerned by a two-dimensional version of this
problem; namely, the sliding of a flexible strip being fed inside a conduit. The rib-
bon, which has a flexural rigidity EI and a weight per unit length w , is treated
as an inextensible elastica of negligible thickness. The contact between the ribbon
and the wall of the conduit is characterized by a friction coefficient μ . First, we
report the result of a stability analysis that aims at determining the critical inserted
length of the ribbon $\ell_*(\mu)$ (scaled by the characteristic length $\lambda = (EI/w)^{1/3}$) at
which there is separation between the strip and the conduit bottom, as well as the
buckling mode. Next, the relationship between the feeding force F and the inserted
length ℓ after bifurcation is computed. Finally, the results of a “kitchen table” ex-
periment involving a strip of silicon rubber being pushed on a plank are reported
and compared with predictions.

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