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Secondary Bifurcations and Localisation of Buckle Patterns

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The phenomenon of localisation is reasonably well understood in quantum physics or fluid mechanics but less so in the area of structural mechanics. In this contribution we revisit the effect of secondary bifurcations on the post-buckling response of a simple 3D system of elastically restrained beams. Our objective is to construct a uniform asymptotic expression for the localised buckling patterns experienced by this model. The main ingredients responsible for localisation here are the presence of a non-homogeneous pre-critical state together with the existence of certain turning points in the linearised buckling equation. This equation is formulated as a fourth-order eigenvalue problem with non-constant coefficients, and then a WKB technique is employed to construct the localised instability patterns.Numerical simulations supporting the analytical findings are included as well.

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