The effects of pressure loads in the dimension reduction of elasticity models

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We study the dimensional reduction from three to two dimensions in hyperelastic materials subject to a live load, modeled as a constant pressure force. Our results demonstrate that this loading has a significant impact in higher-order scaling regimes, namely those associated with von Kármán-type theories, where a nontrivial interplay arises between the elastic energy and the pressure term. In contrast, we rigorously show that in lower-order bending regimes, as described by Kirchhoff-type theories, the pressure load does not influence the minimizers. Finally, after identifying the corresponding Γ-limit, we conjecture that a similar independence from the pressure term persists in the most flexible membrane regimes. This is a joint work with F. Riva (Prague).