Homogenization of nonlinear shell models in elasticity

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We discuss the derivation of the shell models (bending and von Karman) from three-dimensional nonlinear elasticity by doing simultaneous homogenization and dimensional reduction and by means of Γ-convergence. We discuss different models depending on the ratio between the thickness of the body and the oscillations of the material. In the case of bending shell we are able to obtain the limit model only for the convex shells in the following regimes: $\varepsilon(h) \ll h$, $\varepsilon(h) \sim h$, $\varepsilon(h)^2 \ll h \ll \varepsilon(h)$. In the case of von Kármán shell we obtain the models for the generic shell additionally in the regime $h \sim \varepsilon(h)^2$, while for the convex shell we completely recover the case $h \ll \varepsilon(h)$. Here h is the thickness of the body and $\varepsilon(h)$ is the period of the oscillations of the material.

References:

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