Viscoelastic Elliptic Membrane Shells on Bilateral Frictional Contact: an Asymptotic Approach

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Abstract: We consider a family of linearly viscoelastic shells, all sharing the same middle surface, with thickness 2ε, clamped along their entire lateral face and on frictional, bilateral contact with an obstacle along its lower face. Friction is modeled with a Tresca condition and tractions may act on the upper face of the shell. By using asymptotic analysis, we show that, if the shell is an elliptic membrane, the solution of the three-dimensional scaled variational contact problem, in curvilinear coordinates, $u(\varepsilon)$, converges to a limit function, u, which is independent of the transverse variable and can be identified with the solution of a limit two-dimensional variational problem, describing tangential deformations of the middle surface, giving us a two-dimensional model.