1096-70-2512 **Nebojsa Murisic*** (nmurisic@princeton.edu), Lewis-Sigler Institute, for Integrative Genomics, Princeton University, Princeton, NJ 08544, **Basile Audoly** (audoly@lmm.jussieu.fr), CNRS and, Institut de mecanique d'Alembert, Place Jussieu, 75252 Paris, Cedex 05, France, **Yannis G. Kevrekidis** (yannis@arnold.princeton.edu), Chemical and Biological Engineering, Princeton University, Princeton, NJ 08544, and **Stanislav Y. Shvartsman** (stas@princeton.edu), Lewis-Sigler Institute, for Integrative Genomics, Princeton University, Princeton, NJ 08544.
Buckling in vertex models of epithelial sheets.

Recent studies of Drosophila (fruit fly) show that buckling plays a critical role in development of eggshell respiratory tubes. Cells within a 2D epithelial sheet locally secrete motor protein myosin giving rise to in-plane embedded stress. Complex 3D structures result. We consider a simplified system where the epithelium is represented by a 2D axisymmetric sheet of hexagonal cells. Our vertex model accounts for cell-cell adhesion and tissue elasticity. We study buckling in this discrete model. We calculate equilibrium shapes under stress and study their stability. We show that a 2D sheet subjected to embedded closed line compressive cable undergoes a buckling transition: a flat solution loses stability giving rise to a pair of stable 3D solutions. A supercritical pitchfork bifurcation results, typical to buckling in the continuum elasticity theory. The influence of material and geometrical parameters is also studied. We employ asymptotics to derive effective bending and stretching moduli, the balance of which determines the buckling threshold. A continuum system equivalent to our discrete setup is also derived. We provide a novel way to study buckling in biological systems, allowing for a high level of biological realism and computational tractability. (Received September 17, 2013)