Multi-Scale Modelling of Thermal Wrinkling of Thin Membranes

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Abstract : The thermal wrinkling behavior of thin membranes is investigated. The Fourier double scale series are used to deduce the macroscopic membrane wrinkling equations. The obtained equations account for the global and local wrinkling modes. Numerical examples are conducted to assess the validity of the approach developed. Compared to the finite element full model, the present model needs only few degrees of freedom to recover accurately the bifurcation curves and wrinkling paths. Different parameters such as membrane's aspect ratio, wave number, pre-stressed membranes are discussed from a numerical point of view and the properties of the wrinkles (critical load, wavelength, size and location) are presented.