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Fold amplification rates and dominant wavelength selection in multilayer stacks

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A combination of thin- and thick-plate theories, and finite element models is used to systematically analyse folding in multilayer stacks. We show that if the interlayer spacing is large, individual layers fold as single layers, if the spacing is small the entire stack folds as one effective single layer. In between, a third folding mode exists that is characterised by a dominant wavelength that scales with nˆ(1/3), irrespective of total number of layers, n. The maximum growth rates in the true multilayer-folding mode are higher than the corresponding single layer growth rates, increase with n and are bounded by a saturation value that is directly proportional to the viscosity contrast. This growth rate saturation as well as the applicability of the true multilayer-folding mode with respect to interlayer spacing can be explained by the normal and inverse contact strain theory. The true multilayer-folding mode is expected to be the most frequent mode in nature, because it exhibits the highest growth rates and has a relatively large applicability range with respect to interlayer spacing. The increased growth rates in multilayer folding are especially important for systems where the corresponding single layer values are not sufficient to drive the folding instability, such as folding in low-viscosity contrast layers and detachment folding.