



3D deforming bed instabilities: an explanation for drumlins?

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A theory of sub-glacial till deformation which predicts the correct wavelength for ribbed moraine formation has emerged over the past few years. Until now the theory has only been able to explain plane waves (ribbed moraine). The introduction of extra physics, principally the upper surface of the ice rather than the assumption of infinitely deep ice, allows three-dimensional instabilities to be explained. Three dimensional forms with typical drumlin horizontal dimensions are predicted to be formed. This is conditional - under some parameter regimes the preferred form is ribbed moraine, but beneath for example thinner ice, drumlins grow faster than ribbed moraine.

The theory may have some difficulties in explaining the relative thicknesses of till carapaces and stratified cores, if these phenomena are associated with instabilities rather than drumlinisation of pre-existing features. In this paper, a recent version of the theory is presented and its successes and difficulties are discussed.