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Spatial distribution of subglacial landform elongation in the New York Drumlin Field

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The New York Drumlin Field is comprised of more than 10,000 landforms that display considerable variation in elongation and orientation. It has been suggested that morphometric parameters of subglacial bedforms can be used to reconstruct the relative magnitude of velocity within an ice sheet in some settings. Spatial autocorrelation of attenuated features may indicate zones of relatively fast ice flow and, when analyzed spatially in significant number, can yield critical information regarding ice-bed interactions and the resulting distribution of velocity. Others have suggested additional factors may be responsible for the formation of attenuated bedforms such as the physical properties of the glacier bed, pore water pressure of the underlying sediment, availability of deformable material, and duration of influence by an ice sheet.

In this study, we map regions of attenuated bedforms by applying statistical measures of spatial autocorrelation to drumlin morphometry. Several thousand features have been digitized in the GIS environment and their respective length, width, and orientation have been recorded in a geodatabase. A prediction surface of bedform elongation created by applying an ordinary kriging analysis shows multiple large-scale zones of relatively high elongation. These regions contain highly elongate bedforms closely bounded by less attenuated features of similar orientation, elevation, and composition. These discontinuities suggest the presence of spatially-variable velocity within the overlying ice as the landforms were constructed.