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Connecting streamlined subglacial bedforms with the geological/geographical environment in which they are located.

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Much work has qualitatively shown that there appears to be a relationship between the morphology of streamlined subglacial bedforms (drumlinoids) and the geological/geographical environment in which said bedforms are located upon, particularly in terms of bedrock influence. However, the one quantitative study that has been carried out on this connectivity (Greenwood and Clark, 2010) found that there appears to be a connection between bedrock type and morphology only at a local scale. At a regional scale the most important geological factor seemed to be the properties of the substrate, usually till.
In order to investigate these connections further, self-organising maps (SOM) are used to investigate the role of contextual geology/geography in drumlinoid morphology. The SOM method allows the statistical exploration of data that cannot normally be evaluated by traditional means; categorical data (e.g. bedrock type) can be used in the same analysis as continuous/vector data (e.g. drift depth). Here, three large morphological data sets from Sweden (20 041), Britain (36 104) and Ireland (13 454) are combined with bedrock type, drift depth, basal elevation and distance to esker to see if there are any relationships to be found between them. The results indicate that there are pervasive, statistically significant, and weak to very weak correlations between contextual geological/geographical factors and drumlinoid morphology. The most important contextual factor appears to be ‘drift depth’, followed by ‘distance to esker’. Therefore, models of drumlinoid formation and any efforts to use such features for palaeo-ice reconstruction must take into account the geological and geographical environment in which they are situated. The logical extension of this is that models of ice-sheet growth and retreat must also take into account and be sensitive to the type of substratum present beneath the ice. Further research into the effect of drift properties on the flow of ice is needed.