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Mega-scale glacial lineations and drumlins: a morphological continuum?

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Mega-scale glacial lineations (MSGL) are highly elongate ridges that maintain a parallel conformity over length of 10s of km. Investigation of relict MSGL suggests that they form under fast flowing ice streams. This has now been verified by direct imaging of the bed of Rutford ice stream, West Antarctica. However, the mechanism(s) of MSGL formation is rather poorly understood, although some divergent theories and models have been suggested. Some of these theories have developed from concepts and models initially proposed to explain the formation of another glacial bedform, the drumlin. This would support the idea of a subglacial bedform continuum, i.e. that a distinction amongst related bedforms is artificial because each 'type' of landform gradually evolves into the other and they are the expression of the same fundamental process of formation. To date, very few (if any?) studies have attempted to systematically quantify the morphometric (size and shape) differences and similarities between drumlins and MSGL using a large database. In this paper, we present the result of an extensive analysis of drumlins and MSGL that are found within a single flow-set formed by the Dubawnt lake palaeo-ice stream on the central Canadian Shield. Thousands of MSGL and drumlins have been mapped there for analysis of bedform length, width, elongation, shape (planar asymmetry) and spatial distribution. Results are also compared to other published studies. Altogether, they strongly suggest that the morphometric difference between a 'drumlin' and 'MSGL' is subtle and that, for most variables, the frequency distribution of one landform population largely overlap with that of the other. This supports the idea that the same process might indeed be responsible for the formation of both.