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A hydrologically explicit, spatially exact, classification of landforms for Canada at 1:500,000 scale.

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A new approach for classifying landform types has been developed and applied to all of Canada using a 250 m DEM. The resulting LandMapR classification has been designed to provide a stable and consistent spatial fabric to act as initial proto-polygons to be used in updating the current 1:1 M scale Soil Landscapes of Canada map to 1:500,000 scale. There is a desire to make the current SLC polygon fabric more consistent across the country, more correctly aligned to observable hydrological and landscape features, more spatially exact, more detailed and more interpretable. The approach is essentially a modification of the Hammond (1954) criteria for classifying macro landform types as implemented for computerized analysis by Dikau (1989, 1991) and Brabyn (1998). The major modification is that the key input variables of local relief and relative position in the landscape are computed for specific hillslopes that occur between individual, explicitly defined, channels and divides. While most approaches, including Dikau et al., (1991) and SOTER (Dobos et al., 2005) compute relative relief and landscape position within a neighborhood analysis window (NAW) of some fixed size (9,600 m and 1 km respectively) the LandMapR method assesses these variables based on explicit analysis of flow paths between locally defined divides and channels (or lakes). We have modified the Hammond criteria by splitting the lowest relief class of 0-30 m into 4 classes of 0-0 m, 0-1 m, 1-10 m and 10-30 m) in order to be able to better differentiate subtle landform features in areas of low relief. Essentially this enables recognition of lakes and open water (0 relief and 0 slope), shorelines and littoral zones (0-1 m), nearly flat, low-relief landforms (1-10 m) and low relief undulating plains (10-30 m). We also modified the Hammond approach for separating upper versus lower landform positions used to differentiate flat areas in uplands from flat lowlands. We instead differentiate 3 relative slope positions of channel valley, toe slope and upper slope consistently and exhaustively and so can identify any flat areas that occur in any of these three landform positions. We did not find it necessary to use slope gradient as a criteria for defining and delineating classes because relief acts as a surrogate for slope and each relief class exhibits a narrow and definable range of slope gradients. Dominant slope gradient (or other attributes) can be computed, post classification, for each defined polygon, if there is a need to further classify by slope or other attribute. This simplifies classification and also reduces pixilation in the classification arising from considering too many local criteria in the class definitions. The resulting polygons provide an extremely detailed classification of relief and landform position at the level of individual hillslopes across all of Canada. The polygon boundaries explicitly follow major identifiable drainage networks and work their way upslope to delineate interfluves that occupy upslope positions at all levels of relief. The detailed LandMapR polygon classifications nest consistently within more general regions defined by the original Hammond-Dikau procedures. Initial visual analysis reveals a strong and consistent spatial relationship between observable changes in slope, vegetation and drainage regime and LandMapR landform polygon boundaries. More detailed quantitative assessment of the accuracy and utility of the LandMapR polygon classes is planned.