Article title	Landform pattern recognition and classification for predicting soil types of the Uasin Gishu Plateau, Kenya
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Abstract	Information obtained from landform classification is fundamental for understanding physical, chemical, and biological soil processes. Digital elevation models (DEMs) can be used for landform classification using a geomorphic pattern recognition and classification approach such as geomorphons. In this study, we used geomorphons to predict soil types of the Uasin Gishu Plateau in western Kenya with the aim of improving the existing soil type maps. We ran the geomorphons classification on the 30 m Shuttle Radar Topographic Mission (SRTM) DEM using the module *r.geomorphons* "add-on" in GRASS GIS with look up distance (*L*) values of 10, 20, 30, 40, 50, 60, 70, 80, 90 and 100 cells (300 m to 3,000 m) and flatness threshold values of 2, 0.5 and 0.01 degrees. We grouped the resulting geomorphons into three classes: upland summits, upland midslopes, and bottomlands. We then assigned soil types according to the World Reference Base soil classification system to these three landscape positions after dividing the study area into the Lower Plateau and the Upper Plateau based on elevation and geomorphology. The predicted soil types were quantitatively evaluated against 50 soil point observations based on overall accuracy, precision, recall and Cohen's kappa coefficient (*k*) metrics. Evaluation results showed that an *L* value of 20 cells performed best ($k = 0.52$; overall accuracy = 0.62) followed by an *L* value of 30 cells ($k = 0.50$; overall accuracy = 0.58). *L* values of 60, 70 and 80 cells performed worse ($k = 0.35$; overall accuracy = 0.48). Although an *L* value of 20 cells performed slightly better than an *L* value of 30 cells, the *L* value of 30 cells better captured the geomorphology and soil-landscape relationships based on our own expert knowledge, legacy data, and the fact that the bottomlands pattern was more continuous for an *L* value of 30 cells than for an *L* value of 20 cells. Upland summits occurred over ~ 32% of the plateau and were occupied by Nitisols on the Upper Plateau and Ferralsols on the Lower Plateau. Upland midslopes occurred over ~ 42% of the plateau and were occupied by Acrisols on the Upper Plateau and Acrisols/Ferralsols on the Lower Plateau. Bottomlands occurred over ~ 26% of the plateau and were occupied by Luvisols/Gleysols on both the Upper and Lower Plateau. Geomorphons, as a method of landform classification, correlated to geomorpho-pedological processes and captured soil variations and differences in the study area. The approach is computationally efficient and can be used for large areas, but is limited in that it only classifies landscapes according to shape. This means that the algorithm does not separate or identify soil types with different parent materials occurring within one landform class. Thus, Regosols and Cambisols on very steep slopes and Acrisols and Ferralsols on gentle slopes could not be separated.
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