Adding Value to the United States National Hydrography Dataset through Automated Comparison with Elevation-Derived Channels

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ABSTRACT

The U. S. Geological Survey (USGS) is researching methods to extract elevation-derived channels that reflect natural drainage variations caused by different landscape contexts based on climate and terrain. Methods involve development of a raster-based weighted flow accumulation model that accounts for natural variations through estimates of slope, runoff, soil permeability, soil depth, and ground water contributions to streams. Results may be applied to eliminate compilation inconsistencies in the high-resolution National Hydrography Dataset (NHD) and to identify places where additional content, specifically first-order channels, could be added to the NHD. Channels derived from the weighted flow accumulation model are statistically compared to vector NHD flowlines through an automated raster line-density differencing approach that computes a Coefficient of Line Correspondence (CLC). Line-density differences are important because they reflect spatial variations of drainage density patterns between the two datasets. The CLC metric measures conflation of the two vector datasets and identifies matching features, as well as omission and commission flowlines between the two datasets.

Testing was performed on 30 NHD subbasins characterized by different climate (dry, humid, transitional) and slope (flat, hilly, mountainous) conditions. Preliminary results show elevation-derived channels match NHD flowline vectors very well, except for first-order tributaries. Examples will demonstrate these results for the various landscape conditions. The primary difference between the two datasets may be explained by the different data capture criteria. Headwater (or first-order) tributaries derived from the elevation model are captured more comprehensively through drainage area and terrain conditions imbedded in the model, whereas capture of headwater features in the NHD is cartographically constrained by feature length. Headwater features provide significant input to hydrologic analyses and the addition of missing headwaters to the NHD, as guided by the elevation-derived channels, can substantially improve hydrologic modeling and the scientific value of the NHD.

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