A tool to delineate watersheds and river network for multiple sites spread over large Digital Elevation Models

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Abstract. Geographic Information Systems (GIS) methods for watershed and stream network delineation are based on the derivation of flow direction and flow accumulation from Digital Elevation Models (DEM). This method can be laborious when the number of watersheds to be delineated is large, as one has to fill sinks in DEMs, process flow direction and flow accumulation for each site being delineated. Further, if the site location is not exactly on the digital representation of the stream, GIS based methods will result in the wrong watershed boundary. Additionally, when the sites are spread over relatively large geographical area, DEMs and other raster datasets necessary for watershed delineation, because of the chosen resolution, can be large and are not handled well by the currently available watershed delineation tools. This work will present a standalone Windows program based on the functionalities of ArcGIS and TauDEM that is specifically designed to delineate multiple watersheds spread over large raster data sets, and has functionalities to move the site locations to the nearest streams based on the flow direction grid, if they are not already present on the stream. This tool uses the USGS' hydrologic units as regional watersheds to sample the grids and then delineate watersheds draining to sites located within each regional watershed in a batch process. This tool also provides options to delineate watershed based on contributing area or a curvature approach that better reflects variable geomorphology, and can objectively choose the appropriate threshold to delineate stream networks based on the constant drop test. Additional capabilities of this program include the computation of geomorphic variables such as hypsometric curve indices, shape factors, stream network geomorphology attributes, and average watershed properties from input grids. This tool is useful in deriving watersheds, stream networks and watershed attributes of importance to a variety of problems in hydrology, stream ecology and geomorphology.