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Shuttle radar DEM hydrological correction for erosion modelling in small catchments

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Digital Elevation Models (DEMs) that accurately replicate both landscape form and processes are critical to support modelling of environmental processes. Catchment and hillslope scale runoff and sediment processes (i.e. patterns of overland flow, infiltration, subsurface stormflow and erosion) are all topographically mediated. In remote and data-scarce regions, high resolution DEMs (LiDAR) are often not available, and moderate to course resolution digital elevation models (e.g., SRTM) have difficulty replicating detailed hydrological patterns, especially in relatively flat landscapes. Several surface reconditioning algorithms (e.g., Smoothing) and "Stream burning" techniques (e.g., Agree or ANUDEM), in conjunction with representation of the known stream networks, have been used to improve DEM performance in replicating known hydrology. Detailed stream network data are not available at regional and national scales, but can be derived at local scales from remotely-sensed data.
This research explores the implication of high resolution stream network data derived from Google Earth images for DEM hydrological correction, instead of using course resolution stream networks derived from topographic maps. The accuracy of implemented method in producing hydrological-efficient DEMs were assessed by comparing the hydrological parameters derived from modified DEMs and limited high-resolution airborne LiDAR DEMs. The degree of modification is dominated by the method used and availability of the stream network data.
Although stream burning techniques improve DEMs hydrologically, these techniques alter DEM characteristics that may affect catchment boundaries, stream position and length, as well as secondary terrain derivatives (e.g., slope, aspect). Modification of a DEM to better reflect known hydrology can be useful, however, knowledge of the magnitude and spatial pattern of the changes are required before using a DEM for subsequent analyses.