A comparison of indices for delineating valleys with DEMs in different terrain

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Many valley delineation indices have been developed with digital elevation models (DEMs). These indices can be classified into two categories: (1) drainage routing (e.g. D8 algorithm) and (2) local filtering (e.g. curvatures, Laplacian, topographic openness, elevation percentile, and elevation difference). The purpose of this study was to compare drainage routing and local filtering indices in order to understand the better indices for delineating valleys in different terrain. This study was conducted in the southern Yamizo Mountains and the surroundings in Ibaraki prefecture, where different sizes and shapes of valleys dissect into uplands, hills and mountains. Drainage routing can delineate drainage networks but cannot delineate large valley-floors or shallow hollows in gently-sloping areas. On the contrary, local filtering cannot delineate drainage networks, but can detect large valley-floors and shallow hollows with different sizes of filters. Among them, elevation percentile was particularly effective for delineating shallow valleys or hollows. However each index has different weaknesses for measuring the shapes and sizes (e.g. width, depth and gradient) of valleys that are important for understanding landscape processes of valleys. By using different indices together, it is possible to delineate valleys as well as measuring their shapes and sizes.