Digital maps of synthesized from 50m-mesh DEM: (1) Extraction of topographical features using overground and underground openness

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Overground and underground-openness were defined for a grid point on
digital elevation model. The former is a characteristic quantity to
describe sky extent over the point within a specified distance L and takes large values at convex landforms. The latter is to describe underground extent and takes large values at concave landforms. These concepts were applied to 50m-mesh DEM and openness maps of L=5km and L=0.5km were synthesized. In those maps, ridge and valley-lines were relevantly extracted with including their widths and shapes. L is concerned with the spetial structure of the extracted. Larger values of L provides maps of larger spatial features and smaller L provides smaller structures.

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These concepts were applied to 50m-mesh digital elevation model of Japan and openness maps of L=5km and L=0.5km were synthesized. In those maps, ridge-lines and valley-lines were relevantly extracted with including their widths and shapes. L is concerned with the spetial structure of the extracted. Larger values of L provides maps of larger spatial features and smaller L provides smaller structures. In the paper, after describing the principle of the opennesses, we will show openness maps of various regions all over Japan. Traditionally, algorithms of image processing, e.g., edge detection, relief map, etc., have been applied to DEM. Since those algorithm are based upon neighborhood operation of pixel, the extracted features are restricted to be micro spatial scales, and often disturbed by data noises. On the other hand, remote sensing imagery have been used for topological interpretation, but topographical features sometimes confused by variations of land covers and land uses, or detection itself are disturbed by cloud. Openness maps are, however, are free from those
disadvantages and provide relevant topographical features.