Modified hillshade assists in the identification of geomorphologic units of the Moon

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Hillshade can greatly enhance the visualization of a surface for spatial analysis, graphical display or terrain extraction. However, its utilization is limited because the results depend on a particular sun azimuth and elevation. The image identification of geomorphologic units in shaded regions of the Moon, similarly, is affected by the azimuth and altitude of the sun. Therefore, utilize the advances while overcome the bias of hillshade, and then apply the modified hillshade to detect the geomorphologic units in shaded regions of the Moon will provide important methodological support for lunar topographic database construction. In this work, we optimize the traditional hillshade by enhancing the visibility of features in terms of scale, relief, orientation, and shape. The enhancement of the above topographic features is achieved by blending hillshaded terrain, curvature, slope, positive openness and sky-view factor into a remote sensing image. We select different study areas to test the modified hillshade, and find that the method proposed in this work can extract the basic geomorphologic units of the Moon in diverse terrain environments. Comparing to using the classic hillshaded digital elevation models, the boundary of various geomorphologic units is augmented and the extraction accuracy is improved using the modified hillshade.