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Influence of Terraced area DEM Resolution on RUSLE LS Factor

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Topography has a large impact on the erosion of soil by water. Slope steepness and slope length are combined (the LS factor) in the universal soil-loss equation (USLE) and its revised version (RUSLE) for predicting soil erosion. The LS factor is usually extracted from a digital elevation model (DEM). The grid size of the DEM will thus influence the LS factor and the subsequent calculation of soil loss. Terracing is considered as a support practice factor (P) in the USLE/RUSLE equations, which is multiplied with the other USLE/RUSLE factors. However, as terraces change the slope length and steepness, they also affect the LS factor. The effect of DEM grid size on the LS factor has not been investigated for a terraced area. We obtained a high-resolution DEM by unmanned aerial vehicles (UAVs) photogrammetry, from which the slope steepness, slope length, and LS factor were extracted. The changes in these parameters at various DEM resolutions were then analysed. The DEM produced detailed LS-factor maps, particularly for low LS factors. High (small valleys, gullies, and terrace ridges) and low (flats and terrace fields) spatial frequencies were both sensitive to changes in resolution, so the areas of higher and lower slope steepness both decreased with increasing grid size. Average slope steepness decreased and average slope length increased with grid size. Slope length, however, had a larger effect than slope steepness on the LS factor as the grid size varied. The LS factor increased when the grid size increased from 0.5 to 30-m and increased significantly at grid sizes >5-m. The LS factor was increasingly overestimated as grid size decreased. The LS factor decreased from grid sizes of 30 to 100-m, because the details of the terraced terrain were gradually lost, but the factor was still overestimated.