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Erosion in Arid Environments Derived From Pre-Columbian Agricultural Terraces in Southern Peru

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Undisturbed constructed earthworks of known age and initial morphology in arid environments provide an ideal basis for developing and testing models for long-term erosion. Using constructed earthworks reduces the uncertainties inherent in previous studies in which natural features of unknown or uncertain initial morphology and age were used. Inca agricultural terraces located in the arid lands of southern Peru and abandoned in 1532 A.D. offer an ideal site for testing erosion modeling.

The pattern and amount of erosion over the last 470 years may be determined from comparison of digital elevation models of the observed morphology with the reconstructed original morphology of the Inca terraces. Soil is eroded on the terrace treads and at the edges of the rises by wash processes forming rills that are subsequently enlarged as erosion continues through time. Portions of the material leave the system and other material is accumulated at the base of the rise as wash deposits and fans.

Calculation of total soil removed from the terrace system, measured by volume comparison of observed and original morphology, indicated that material has been removed from the slope at a rate of 0.011 cm/yr. The known initial morphology of the terraces and the material characterization serve as bases for model calibration. The volume of material removed on the slope and the observed pattern on erosion on these terraces constitute points of reference for evaluating the results of modeling the slope using currently available erosion models.