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Coupling remote sensing and GIS interpolation modeling for mapping soil-water erosion processes in diverse karstic terrains of Lebanon

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Soil erosion by water is a major cause of landscape degradation in semi-humid to semi-arid Mediterranean karstic environments. This study proposes a conditional decision-rule interpolation based model to predict the distribution of multiple erosion processes (i.e., sheet, mass and linear) in diverse karstic terrains of Lebanon (i.e. dolines, lapies, covered karst and open karst) from the measured erosion signs in the field (root exposure, earth pillars, soil etching and drift, and linear channels). First, erosion proxies were derived from the structural OASIS classification of Landsat TM imageries combined with the addition of several factorial erosion maps (e.g, slope, drainage) under a GIS environment. Secondly, erosion signs were measured in the field, and interpolated by the statistical *moments* (means and variance) in the defined erosion proxies, thus producing quantitative erosion maps (tons/ha) at a scale of 1:100000. Seven decision rules were then generated and applied on these maps in order to produce the overall decisive erosion map reflecting all existing erosion processes, i.e. equality, dominance, bimodality, masking, aggravating, dependence and independence. The produced erosion maps are ranging between 0 and more than 1.8 tons/ha for sheet erosion, and 0 and more than 10.5 tons/ha for mass and linear erosion. They are fairly matching with coincidences values equal to 43% (sheet/linear), 48% (sheet/mass) and 49% (linear/mass). The overall accuracies of these maps were estimated to be 76% (sheet erosion), 78% (mass erosion) and 78.5% (linear erosion). The overall decisive erosion

map with fifteen classes corresponds well to land management needs. The model used is relatively simple, and may also be applied to other karstic areas worldwide. It is particularly useful when GIS database on factors influencing erosion is limited.