Spatial scale dependency issues in the application of the Modified Universal Soil Loss Equation (MUSLE)

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Spatial Scale Dependency Issues in the Application of the Modified Universal Soil Loss Equation (MUSLE)

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Abstract: The Modified Universal Soil Loss Equation (MUSLE) is used within a range of hydrological models to estimate daily and long-term sediments yields from catchments of various sizes. As part of a project designed to link a sediment model to other existing water resources models (rainfall-runoff, water resources yield and water quality models), the question of spatial scale dependencies within the MUSLE was raised. This study attempted to identify the spatial scale dependency issues from previous studies that used the MUSLE but found little information. Some hypothetical examples are therefore presented to try and isolate the key issues and the results suggest that both the erosivity and topographic factors in the MUSLE are potentially spatially scale dependent, particularly if a lumped or semi distributed modelling approach is used. The lack of output consistency noted when MUSLE is applied across spatial scales in the current analysis, points to broader complications as scale variations increase. The conclusion is that such scale dependencies will add to the uncertainties inherent in all hydrological models, if they are not carefully understood and appropriately addressed.

Keywords: MUSLE; Scale dependency; Erosion; Sediment yield; Uncertainty