# Challenges in soil erosion research and prediction model development

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Quantification of soil erosion has been traditionally considered as a surface hydrologic process with equations for soil detachment and sediment transport derived from the mechanics and hydraulics of the rainfall and surface flow. Under the current erosion modeling framework, the soil has a constant set of erodibility parameters, such as the USLE-K, interrill K (Ki), rill K (Kr) and critical shear stress (Tau-c), which quantify the resistance of the soil against the erosive power of the rain. Recent research findings show both soil erosion (or detachment) and sediment deposition vary significantly as the subsurface hydrologic condition is varied indicating a strong association between the surface and subsurface hydrology in controlling dominant erosion processes. For example, we observed a much greater amount of sediment detachment (also, sediment concentration) under saturation and seepage conditions as compared to when the soil is free drained. On the other hand, a greater amount of sediment was deposited under the drainage condition, contrarily to the current deposition equations would have predicted. These findings bring up challenges in the soil erosion model concept, such as the definition of erodibility parameters (USLE-K, Ki, Kr, and Tau-c), quantification of sediment transport capacity and sediment deposition. In this presentation, we will discuss research directions that will advance soil erosion science and new erosion model concepts.