Geography

Query paper:
Title: The European Soil Erosion Model (EUROSEM): a dynamic approach for predicting sediment transport from fields and small catchments
Abstract: The European Soil Erosion Model (EUROSEM) is a dynamic distributed model, able to simulate sediment transport, erosion and deposition over the land surface by rill and interill processes in single storms for both individual fields and small catchments. Model output includes total runoff, total soil loss, the storm hydrograph and storm sediment graph. Compared with other erosion models, EUROSEM has explicit simulation of interill and rill flow; plant cover effects on interception and rainfall energy; rock fragment (stoniness) effects on infiltration, flow velocity and splash erosion; and changes in the shape and size of rill channels as a result of erosion and deposition. The transport capacity of runoff is modelled using relationships based on over 500 experimental observations of shallow surface flows. EUROSEM can be applied to smooth slope planes without rills, rilled surfaces and surfaces with furrows. Examples are given of model output and of the unique capabilities of dynamic erosion modelling in general.

Candidate papers:

1. **Title:** The size distribution of throughfall drops under vegetation canopies
   Abstract: Many soil erosion models require the evaluation of the energy or the momentum of impacting rain drops. While there are already models to simulate rain drop size-distributions from the rainfall intensity, there are no adequate models to simulate the size-distributions of throughfall under vegetation canopies. This paper suggests that throughfall may be divided into clear throughfall which has the same drop size distribution as the rain (and which may be simulated with existing models) and intercepted throughfall which has a quite different distribution and which is dependent neither on the rainfall intensity nor canopy characteristics like leaf size and texture.
2. **Title:** Splash detachment: Runoff depth and soil cohesion
   Abstract: A set of laboratory experiments has been carried out in order to investigate the importance of soil cohesion and the interference due to the depth of the surface runoff on the detachment rate of soil particles and aggregates. Experimental data show that the soil detachment rate decreases as the runoff depth increases. This indicates that the detachment power of the raindrops is partially dispersed by the water layer. An inverse relationship between soil detachment and soil cohesion has been confirmed.
3. **Title:** Soil classification for England and Wales [higher categories]
   Abstract: This monograph records the system of soil classification currently in use by the Soil Survey of England and Wales. It includes a table setting out the classification to subgroup level; specifications of horizons and other differentiating characteristics used to define classes; and definitions of major soil groups, groups and subgroups.
4. **Title:** Fog drip from artificial leaves in a fog wind tunnel
   Abstract: The effect of fog intensity and leaf shape On water storage on leaves was studied by using a simple fog wind tunnel and leaves of aluminum and plastic. Test equipment was designed to allow quantification of the chosen variables rather than to duplicate natural conditions. Two

intensities of fog were produced, and drip was measured from leaves of five different shapes. Fog intensity effects tended to obscure weaker leaf shape effects in the tests. Drip measurements were reasonably close to values predicted by calculation using an exponential equation based on fog flow and leaf storage capacity. Results indicate that the method of estimating fog drip could be useful when appropriate climatic and vegetative characteristics are known.

5. **Title:** The soils of Woburn Experimental Farm. I. Great Hill, Road Piece and Butt Close.
   Abstract: The topography, bedrock geology and superficial deposits of the Farm are described. The soils are classified as well-drained soils on the Lower Greensand, imperfectly drained soils in colluvium, poorly drained soils in Head and colluvial deposits over clay, and poorly and imperfectly drained calcareous soils on clay. The distribution and profile morphology, the particle-size distribution, and the mineralogy of the soils are described.
6. **Title:** Threshold conditions for rill initiation on a vertisol, Gunnedah, N.S.W., Australia
   Abstract: The effect of soil shear strength on rill development and erosion of a strongly aggregated vertisol was studied in a flume and in a paddock sown with wheat. Soil strength measurements using a hand held torsional shear vane were related to threshold conditions for rill initiation in the laboratory. Field measurements on the same soil demonstrated the effect of increasing shear strength on rill development. This simple method can be easily used in the field to assess relative susceptibility to rill erosion.

Exemplary analysis:

1. **Relevance:** Since EUROSEM explicitly simulates plant cover effects on interception and rainfall energy, understanding the size distribution of throughfall drops is crucial for accurately modeling how vegetation affects soil erosion processes.
   Reason for Citation: This paper is likely cited because it addresses the impact of raindrop size distribution under vegetation canopies on soil erosion.
2. **Relevance:** The findings that soil detachment rate decreases with increasing runoff depth and that there's an inverse relationship between soil detachment and soil cohesion are directly relevant to EUROSEM's simulation of erosion processes, particularly in modeling splash erosion and the transport capacity of runoff.
   Reason for Citation: This study provides insights into how soil cohesion and runoff depth affect the detachment rate of soil particles, which is a key component of soil erosion.
3. **Relevance:** EUROSEM's ability to be applied across different landscapes and soil types necessitates a comprehensive understanding of soil classification.
   Reason for Citation: This paper likely offers a framework for categorizing soil types within the model, ensuring that EUROSEM's simulations account for the wide variety of soil characteristics found in fields and small catchments.
4. **Relevance:** Understanding these dynamics might be useful for refining the model's simulation of how vegetation influences soil moisture levels and, consequently, erosion processes.
   Reason for Citation: Although not directly related to soil erosion, this paper's exploration of water storage on leaves and the effect of fog intensity on water drip could inform aspects of EUROSEM related to plant cover effects on moisture interception.
5. **Relevance:** By comparing model outputs with real-world data on soil types, topography, and erosion patterns described in this study, the developers of EUROSEM can assess and improve the

model's accuracy and reliability.
Reason for Citation: This paper provides detailed information on the soils of a specific location, which could have been used to validate or calibrate EUROSEM.

6. **Relevance:** The findings regarding soil shear strength and its impact on rill erosion provide empirical data that could be used to refine the model's algorithms related to rill channel formation and evolution.
Reason for Citation: This study's focus on the conditions necessary for rill initiation in a specific soil type (vertisol) is directly relevant to EUROSEM's capabilities in simulating rill development and erosion.

Exemplary ranking: Ranked order: paper 5, paper 2, paper 1, paper 3, paper 6, paper 4

1. **Explanation:** This study is important for understanding the impact of vegetation on soil erosion, particularly through the modification of rainfall characteristics. Since EUROSEM explicitly models plant cover effects, this paper's findings can enhance the simulation of how vegetation influences erosion processes.
2. **Explanation:** This paper is crucial for understanding the fundamental processes of soil erosion, specifically how soil cohesion and runoff depth influence soil particle detachment. It provides empirical data that are directly applicable to refining the erosion processes within EUROSEM, making it highly relevant for follow-up research aiming to enhance the model's accuracy in simulating erosion.
3. **Explanation:** Soil classification is fundamental for any erosion model, as it affects the simulation of various processes like infiltration and runoff. This paper provides a framework that could be essential for ensuring EUROSEM's applicability across different soil types, making it relevant for research aimed at broadening the model's utility.
4. **Explanation:** Although the study of fog drip and its impact on water storage on leaves might inform aspects of EUROSEM related to vegetation's effect on moisture interception, it is somewhat tangential to the core focus of soil erosion modeling. Therefore, it ranks last in terms of direct relevance to follow-up research on EUROSEM.
5. **Explanation:** While this paper offers specific data that could be used for model validation or calibration, its relevance might be somewhat limited by its focus on a particular location. However, it still provides valuable real-world data that can help in assessing the model's performance.
6. **Explanation:** Given EUROSEM's emphasis on simulating rill and interill processes, this paper's insights into the conditions necessary for rill initiation are invaluable. It offers specific empirical data that can help in calibrating the model's algorithms for rill formation, which is a critical aspect of erosion modeling.