



## **Agricultural soil erosion and geomorphology: is there common ground? (Ralph Alger Bagnold Medal Lecture)**

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Soil erosion refers both to an agricultural problem and a (set of) geomorphic process(es). Agricultural scientists and geomorphologists study these processes from a different perspective: while geomorphologists are interested in (long-term) landscape development, soil erosion studies were mainly set up on agricultural or grazing land to assess (short-term) soil erosion risk and the efficiency of soil conservation measures.

Due to the agricultural interest in soil erosion, there are now more data available on soil erosion rates than on any other geomorphological process. Furthermore, a wide range of soil erosion models exist and soil erosion processes have been studied in detail both in the laboratory and in the field. In geomorphological research on long-term landscape evolution, relatively little use is made of these data and models, perhaps as they are being considered as irrelevant to landscape evolution given the relatively short time span and small spatial scale that they usually cover. At first sight, recent estimates of human impact on sediment fluxes in large fluvial systems seem to confirm this view as it is estimated that the latter have risen only by ca. 10% due to human impact.

In this presentation we investigate if and how soil erosion data and process understanding may be useful in developing insights in long-term evolution of soil-covered geomorphological systems. A key issue in this respect is how soil erosion data can be adequately scaled over space and time. The latter requires appropriate models to describe sediment production and transfer. Efforts to develop and apply such models are underway: we investigate some possible approaches and discuss a number of issues that warrant attention, both in terms of model development and testing as well as in terms of data collection and interpretation. Particular attention will be given to scaling issues and to the importance of using adequate process descriptions in long-term soil erosion models, as well as to the importance of incorporating feedbacks between erosion processes and the soil system.

The development of adequate long-term soil erosion models will not only benefit geomorphology as a science. Such models will also be of great help to assess soil erosion and its consequences for the sustainability of human societies, in particular with respect to agricultural productivity and other ecosystem services derived from agricultural land. Addressing these issues indeed requires an integrated, long-term approach: geomorphologists can play a critical role in developing such an approach.