Geophysical Research Abstracts
Vol. 14, EGU2012-5124-1, 2012
EGU General Assembly 2012

Scale effect on overland flow connectivity, at the interill scale

A. Penuela Fernandez, C. Bielders, and M. Javaux

Departement of Environmental Sciences and Land Use Planning, Université Catholique de Louvain (UCL), Croix du Sud, 2, bte 2, B-1348 Louvain-la-Neuve, Belgium (andres.penuela@uclouvain.be)

The relative surface connection function (RSC) was proposed by Antoine et al. (2009) as a functional indicator of runoff flow connectivity. For a given area, it expresses the percentage of the surface connected to the outlet (C) as a function of the degree of filling of the depression storage. This function explicitly integrates the flow network at the soil surface and hence provides essential information regarding the flow paths' connectivity. It has been shown that this function could help improve the modeling of the hydrogram at the square meter scale, yet it is unknown how the scale affects the RSC function, and whether and how it can be extrapolated to other scales. The main objective of this research is to study the scale effect on overland flow connectivity (RSC function). For this purpose, digital elevation data of a real field (9 x 3 m) and three synthetic fields (6 x 6 m) with contrasting hydrological responses was used, and the RSC function was calculated at different scales by changing the length (L) or width (l) of the field. Border effects were observed for the smaller scales. In most of cases, for L or l smaller than 750mm, increasing L or l, resulted in a strong increase or decrease of the maximum depression storage, respectively. There was no scale effect on the RSC function when changing l. On the contrary, a remarkable scale effect was observed in the RSC function when changing L. In general, for a given degree of filling of the depression storage, C decreased as L increased. This change in C was inversely proportional to the change in L. This observation applied only up to approx. 50-70% (depending on the hydrological response of the field) of filling of depression storage, after which no correlation was found between C and L. The results of this study help identify the critical scale to study overland flow connectivity. At scales larger than the critical scale, the RSC function showed a great potential to be extrapolated to other scales.