Geophysical Research Abstracts
Vol. 12, EGU2010-11617, 2010
EGU General Assembly 2010

Overland flow modelling with the Shallow Water Equation using a well balanced numerical scheme: Adding efficiency or just more complexity?

Marie Rousseau (1), Olivier Cerdan (1), Olivier Delestre (2), François James (2), Stéphane Cordier (2), and Fabrice Dupros (1)

(1) BRGM, Orléans, France (ma.rousseau@brgm.fr), (2) MAPMO, Laboratory of applied mathematics, Orléans, France

Overland flow is a key process when considering sediment transfers and the redistribution of soils nutrients and chemicals. To develop and improve watershed and agricultural land management, it is essential to understand and correctly predict the flow location and the effects of surface morphology (topography, roughness) or soil properties (friction, infiltration capacity. . .) on this process.
To reflect complexity of the involved phenomena and spatial heterogeneity of soils factors, several modelling approaches, characterized with different resolution methods and different simplifications of the shallow water system (or Saint-Venant equations), have been developed.
This study aims at comparing the predictive abilities of different models and evaluating the advantages of using a numerical scheme more complex. For this comparison, 3 codes have been elaborated: i) a first resolving shallow water equations with a well-balanced finite volume method, ii) a second which resolves shallow water equations with a MacCormack finite difference method and iii) a third which resolves the kinematic waves model with a finite volume method. To underline their main strengths and weak points, those three codes have been compared on different test cases. We have observed that, for cases with relatively simple configurations all the models give similar results, whereas in cases of more heterogeneous spatial configurations we have to make the resolution method more complex to obtain better results. When modelling at coarse resolution, i.e. when the model grid resolution is higher that the resolution at which processes occur, simple numerical methods may be sufficient.