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Assessment of suspended matter transport in a large agricultural catchment using the MOHID water modelling system

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Suspended sediment transport from agricultural catchments to stream networks is responsible for impaired water quality, reservoir sedimentation and the transport of sediment-bound pollutants (pesticides, particulate nutrients, metals and other adsorbed toxic substances). The dynamic of pollutants adsorbed on sediment and associated with particulate organic carbon, from land areas into stream network arises mainly from erosion and sedimentation processes. It is known that up to 90% of suspended sediment is transported during flood event and therefore quick flood events have a major impact on pollutant transport. This study – part of the EU AguaFlash (http://www.aguaflash-sudoe.eu/) project – examined and quantified suspended sediment dynamics from catchment to river (erosion, transport, deposition on hillside and in the river).
Semi-distributed, physics-based watershed or reservoir models are generally used to simulate sediment dynamics. One of the limitations of this kind of modelling is that transport along agricultural field and the possibility of deposition of suspended sediments in hillslopes are not considered. Consequently, all sediments eroded are assumed to be accumulated in the river and the sediment and associated pollutant dynamics are over- or under-estimated.
In our approach, the mechanistic physics-based water modelling system MOHID (http://www.mohid.com) was used to quantify soil erosion and sediment transport processes at the local and macroscopic scale. This paper present the erosion and transport mathematical model and modelling strategy used and compares our initial results with filed data obtained on an 1100 km^2 intensive agricultural catchment (Save catchment, South-west France) during 2007-2009 and with simulation data produced using SWAT (Soil and Water Assessment Tool, 2005 version). The contribution of the MOHID model compared with that of the semi-distributed SWAT model is discussed.

Keywords: Erosion, suspended sediment, transport, mechanistic approach, MOHID model, water quality, agricultural catchment, SWAT model