Editorial Virtual Special Issue for Ecological Engineering journal

Development and applications of the SWAT model to quantify ecological functions at watershed scale under global changes (climate and anthropogenic changes)

Guest editors: Lei Chen (China), K. Venkata Reddy (India), Kyung Hwa Cho (Korea), Sabine Simeoni-Sauvage (France), Jose-Miguel Sánchez-Pérez (France).

Natural and anthropogenic pressures control water, sediment and pollutant transfer in different parts of a watershed, through various pathways including surface and groundwater. In addition to these control factors, many physical, chemical and biological processes are also involved. These functions can be considered environmental or ecosystem services in regards to the degradation of pollutants. Natural benefits rely on ecological functions such as organic matter decomposition in soils, contaminant retention in sediment or biotic/abiotic interaction in water regulation (Couvet, 2010 ; Teyssèdre & Couvet, 2010). These functions are based on biological and physical processes as well as on ecosystem structures, especially hydrosystems like river system and wet areas that ensure ecological functions for flood and drought regulation, wastewater purification and biodiversity protection. These functions depend on major processes as nutrient transport and transformation in biogeochemical cycles (Sánchez-Pérez et al. 2003, 2009; Sauvage et al. in press). Sediment dynamics in stream bed play a part in ecosystem service operations through biogeomorphological processes (Schoenn et al., 2012). Finally, microbial activity and bioturbation play a key role in the storage and the treatment of pollutants (Dojlido & Best, 1993 ; Banerjee et al., 2013). Water quality regulation is part of a major ecological function that ensures safety, well-being and public health (Braat & de Groot, 2012). Above all, it is advised to take advantage of natural benefits to improve water quality. The role of these ecological functions can be difficult to evaluate and in many cases are included in a global process. However, it is important to note their effect on the transportation of matter and pollutants in a watershed. To evaluate these functions, these processes must be characterized and quantified. The catchment scale is an integrative scale used to evaluate environmental services. Integrated modeling is a way to evaluate the transfer of water, matter, pollutants and the role of environmental services involved. Hence, quantifying regulation functions in time and space as well as characterizing hot spots and hot moments relating to water quality natural depuration at watershed scale are challenges to overcome in evaluating regulating functions (Billen et al.,2011). Various approaches exist as global methods, in situ sampling, isotope monitoring, or models and applied at local scale. However, none of them consider these functions at watershed scale or, if it is the

case, they consider them only in a static or empiric ways (review of Francesconi et al. 2016; Momblanch 2016 ; Romero et al., 2013; Grizzetti et al., 2015).

The aim of this special issue is to group all papers evaluating the ecological functions related to water quality regulation which have not been evaluated so far at large scale. The identification control factors based on environmental aspects (ecological diversity, soil and climate conditions) as well as on anthropogenic aspects (land use, human activities) have to be put in evidence. The evolution of the ecological functions in a context of global change will be appreciated. We wait for papers relating investigations in developing new method to model ecological functions at a watershed scale, improving SWAT model with expected results, in order to improve the simulation of water quality regulation, modeling ecological functions under climate and anthropic changes scenarios.

The special issue selection category is: VSI: SWAT modelling

Submission deadline: 15 May 2018

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