

AgriChannels

Ecohydrology of agricultural open channels for ecoABSYS services assessment

ABSTRACT

Developing agricultural systems both environmentally and economically competitiveness necessitates, to be viable, to consider all cultivated landscape elements, including those on fields borders. Those landscape element, such as open channel networks (drainage and irrigation) at the interface between agricultural fields, are a lever to conciliate this double performance. Open channels of agricultural landscape were primarily settled by farmers to supply water for crops or drain excess of run-off or soil waters in order to increase crop production. But it is recognized now that these elements may also be biodiversity habitats, buffer zones to mitigate sediment/pollutant transfers, etc. These secondary functions of open-channel may be conflicting with the primary ones of these landscape elements and trade-offs, using vegetation maintaining strategies, have to be found. Open channels (drainage and irrigation) networks have a complex functioning at the earth between biotic and abiotic processes, an intermittent flow governed by rainfall events or irrigation periods, and a varying biodiversity level. Furthermore, the tree-structure of their network, their orientation according to flow direction and the great variations of biodiversity levels and abundances, made the study of this typical object not accessible by traditional methods in ecology. Management practices are also specific for this object and could be considered as the lever of the system for optimisation of ecosystem services purposes, provided that a integrated and spatially explicit modeling approach is realized. To this end, we proposed an original project focusing on the risky object "open channel" that constituted the drainage/irrigation network, by answering the following research questions:

- 1) How to quantify effects of management practices on ecohydrological functioning of the channels network ?
- 2) What is the effect of plant diversity on lateral and vertical flows in drainage networks via hydraulic roughness and conductivity, respectively?
- 3) How to model the system functioning, considering an Eulerian approach of the water flows and a lagrangian approach of the plant biodiversity, to optimize the set of ecosystem services ?

The project aims at consolidating a collaboration between three laboratories (LISAH, G-EAU, AMAP) through an exchange of dataset, experimental dispositives and modelling platforms. It will allow filling the gap between abiotic process simulation in channels (hydraulics, soil hydrodynamics,...) and biotic process (plant community ecology) both stressed by human activities. In addition, It will allow to enhance scientific partnership with other agronomic clusters in Mediterranean Europe (Universities of Padova (Agripolis) and Valencia).

Keywords : Ditch, Ecohydrology, Channel, SFM, Hydraulics

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Project leader : Fabrice Vinatier

Project leader's institution : INRA-INRAE

Project leader's RU : LISAH

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