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Peshmelba : a spatialized model of water circulation and pesticide fate at the catchment scale coupling the landscape elements with the openpalm coupler

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Pesticide transfers are highly influenced by the presence of discontinuities that can accelerate or slow down and dissipate water and contaminant flows, such as grass strips, slopes, hedgerows or roads. Those landscape features must thus, be integrated into watershed management plans which implies to take them into account when modeling water and contaminant at the small catchment scale. However, if influence of landscape elements has already been widely explored at field scale, models generally don't reach the catchment scale.

The project PESHMELBA aims at developing a modeling tool of water and contaminants circulation and fate at the scale of small catchments in order to optimize landscape organisation. The model explicitly takes into account spatial organization of landscapes by representing the existing features, their space location and shape. Dominating processes ruling water and contaminants circulation for each element type are mainly represented by existing and validated models. Those models present different levels of conceptualization and are used as modeling units ensuring a modular structure. In order to implement the spatial and temporal couplings, the different units are gathered and connected in the OpenPALM coupler (Fouilloux and Piacentini, 1999). This innovative approach allows to obtain a spatialized model of the whole catchment. A special attention is paid to design a mesh representative of the landscape configuration. Soil types and land uses are overlayed to deduce surface homogeneous units. Linear elements (ditches, slopes, hedgerow,...) are also included in the mesh. In addition to shaping the area of application of each modeling unit, this method also aims to define connectivity between landscape elements. Preliminary results were achieved by considering a hillslope with several plots and ditches. They showed this method is promising to represent water and pesticides fate in complex landscapes and to test different development scenarios in order to assess the influence of agricultural/landscape management practices on water quality.

References

A. Fouilloux and A. Piacentini. The PALM Project: MPMD Paradigm for an Oceanic Data Assimilation Software. Lecture Notes In Computer Science, Vol. 1685, 1999, pp. 1423 - 1430