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Applicability of tempQsim models to relevant processes in temporary streams

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Recent experiences have shown, that the importance of temporary rivers in the Mediterranean is not sufficiently recognised, especially in terms of their impact on the quality of receiving waters. Policy makers, researchers as well as modellers must be aware of the distinctive dynamics which are introduced when severe flood events follow intensive dry periods. In contrast to humid environments, accumulation of nutrients is much more favoured. This leads to strongly inhomogeneous redistribution of pollution loads.

A proper consideration of the distinct hydrological behaviour is critical for adequate catchment management in dry lands and requires specific modelling approaches. In the framework of the EC project tempQsim, a set of perceptual models have been developed for eight study sites in the Mediterranean to determine relevant drivers for water quality processes under different hydrological conditions, land use and pollution.

Building on these outcomes, different hydrological and water quality models (Mercedes, Topmodel, Pesera, Eurosem, HSPF, SWAT, and Answers2000) have been tested. The experience gathered showed a number of constraints, in particular related to the impact of spatial distribution of rainfall, significant transmission losses, accumulation of mass, and the impact of drying and re-wetting on the characteristics of nutrient turnover.

Integrating the experience gathered, a set of tempQsim models have been established (i) PESCAS (Irvine, Chapman, Turner, Cooper, Kirkby), (ii)tempQsim - stream (Braunschweig, Obermann, Cooper, Neves, Froebrich), (iii) tempQsim - reach (Utzo-

raki, Trancoso, Nikolaidis).

PESCAS is devoted to the simulation of sediment and nutrient delivery at coarse scale, with special respect to difficult data availability at catchment scale.

TempQsim-stream is an in-stream water quality model which pays particular attention to a proper consideration of transmission losses and mass accumulation during the dry period. It also takes into consideration relevant nutrient transformation and the production/ decomposition of particulate matter. Special emphasis is also given also to a stable conservation of mass during the routing with the onset of flow.

TempQsim - reach is a detailed approach to simulate water quality dynamics at the reach scale. Here expansion-contraction of the inundated area of rivers as well as detailed interaction of hydrodynamic, sediment transport and biochemical processes is included.

The PESCAS model is designed to simulate long term effects of land use change and erosion on the water quality dynamics and their distribution across a region. The tempQsim-stream model is designed for a simulation of first flush events and the consideration of storm water overflows and other point source pollution from municipal areas. In principal it can be linked to the delivery parts of catchment models, such as SWAT and HSPF. In the context of the tempQsim project, contributions to the improvement of the SWAT model have also been achieved (Lo Porto, De Luca) , which are related to a consideration of a sub-daily time step, assimilating weather radar data to take into account spatial variability of rainfall and the improved representation of Mediterranean land-use types. The TempQsim-reach model can be linked to application of Catchment models in the upstream part and enables the more detailed simulation of nutrient transformations in lower reaches, affecting the final loads to downstream water bodies such as coastal areas and lagoons.

Together with specific model approaches to consider highly spatial distributed rainfall by the integration of radar data (Garcia, Castillo) a set of tools have also been developed to support the applicability of the tempQsim-models under various hydrological conditions.

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