Geophysical Research Abstracts,
Vol. 10, EGU2008-A-05585, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-05585
EGU General Assembly 2008

Solute transport in rivers with surface and hyporheic storage: the STIR model

M. Zaramella, **A. Marion** and A. Bottacin-Busolin

Dept. of Hydraulic, Maritime, Environmental and Geotechnical Engineering, University of Padova, Italy (andrea.bottacin@unipd.it / Fax: +39 0498275424 / Phone: +39 0498275756)

Solute transport in rivers is controlled by surface hydrodynamics and by mass exchange between the surface stream and distinct retention zones. The net mass transfer along a river is usually significantly affected by temporary storage within the sediments, where biogeochemical processes contribute to determining the fate of the transported substances. This paper presents a conceptual model (STIR, Solute Transport In Rivers) that accounts for the effect of the stream-subsurface interactions on river mixing. A probabilistic approach is used to model the exchange between the stream and the surrounding storage zones. An integral form for the residence time distribution (RTD) in a river reach is thus derived where the detainment of solutes in the dead zones and in the hyporheic zone is represented by appropriate residence time distributions. The STIR model is advantageous for at least two reasons. The first advantage is that exchange parameters can be expressed as functions of measurable physical quantities, therefore it has predictive capabilities, and the results can be generalized to conditions different from those directly observed in field experiments. The second reason is that individual exchange processes are represented separately by a given RTD, making the model flexible and modular, capable to incorporate the effects of a variety of exchange processes and chemical reactions in a detailed way. The reliability of the model has been confirmed by applications to field cases of heavily polluted natural streams in a few countries of the Mediterranean area.