

Contents

Preface by G. Nützmann, P. Viotti, P. Aagaard	V A Istulay
1 Processes	
The unsaturated zone – a neglected component of nature D. Ronen, S. Sorek	3
Use of stable isotope analysis to assess biodegradation of petroleum hydrocarbons in the unsaturated zone. Laboratory studies, field studies, and mathematical simualtions D. Bouchard, D. Hunkeler, P. Höhener, R. Aravena, M. Broholm, P.	Politighase Multiphase Encount
Kjeldsen A model assessing bioavailability of persistent organic	17
pollutants in soil	Solute ox
G. Fragoulis, M. Trevisan, E. Puglisi, E. Capri	39
Geochemical changes under variably saturated conditions during artificial recharge via ponded infiltration – A field study J. Greskowiak, G. Massmann, H. Prommer, G. Nützmann, A.	
Pekdeger	51
Transport of Cr(VI), Ni(II) and Mn(II) through metallurgical wastes. Batch and column experiments R. Rodríguez, L. Candela	65
Modeling adsorption-desorption processes of Cu on montmorillonite and the effect of competitive adsorption with a cationic pesticide	
T. Undabeytia, S. Nir, G. Rytwo, C. Serban, E. Morillo, C. Maqueda	79
NMR spectroscopy: a tool to study interactions between organic pollutants and soil components?	
A.M. Delort, B. Combourieu, N. Haroune, P. Besse, M. Sancelme	93
2 Modelling	
Incorporating geomicrobial processes in reactive transport models of subsurface environments	
P. Regnier, A.W. Dale, C. Pallud, Y. van Lith, S. Bonneville, C. Hyacinthe, M. Thullner, A.M. Laverman, P. Van Cappellen	107

Consequences of Different Kinetic Approaches for Simulation of Microbial Degradation on Contaminant Plume Development	
D. Schäfer, A. Manconi, S. Grandel, A. Dahmke	127
Natural Attenuation in the unsaturated zone and shallow groundwater: coupled modeling of vapor phase diffusion, biogeochemical processes and transport across the capillary fringe	141
U. Maier, P. Grathwohl	D. Ron
Enhancement of solute spreading in soils due to particle-facilitated transport and preferential flow S. Bold, R. Liedl, P. Grathwohl	157
Multiphase and Multi-component Interactions through the Unsaturated Saturated Zone Field and Model Study S. Sorek, M. Kuznetsov, A. Yakirevich, D. Ronen	171
Solute contaminant transport in variably saturated dual- porosity/dual permeability chalk: field tracer experiments and modelling	
S. Brouyère	187
Integration of pedotransfer functions and topographical data to obtain soil hydraulic properties at catchment scale M. Palladino, N. Romano, A. Santini	197
Analytical Model for Gravity-Driven Drainage G. Severino, A. Comegna, A. Sommella	209
3 Integration	
Hydrogeophysical characterization of subsurface solute trans- port at the Krauthausen test site: experiments and numerical modelling	
H. Vereecken, A. Kemna, A. Tillmann, J. Vanderborght, A. Verweerd	219
Tracer Experiments on Field Scale for Parameter Estimation to calibrate Numerical Transport Models J. Fank, G. Rock	239
Biogeochemical modeling of reactive transport applied to laboratory and field studies on jet-fuel contamination	
P. Aagaard, J.B.S. Knudsen, M.R. Klonowski, G. Breedveld, Z. Zheng	251

Assessing the potential for natural or enhanced in-situ bioremediation at a TCE-contaminated site by coupling process analysis and modeling	
F. Aulenta, A. Di Fazio, M. Leccese, M. Majone, M. Petrangeli Papini, S. Rossetti, N. Stracqualursi, V. Tandoi, P. Viotti	265
Partial source treatment by in-situ technologies – a review of limits, advantages and challenges S. Grandel, A. Dahmke	279

penanty of Earth Sciences, Geochemistry, P.O. Box 80021, 3508 TA



GUNNAR NÜTZMANN is Professor of Hydrology at the Humboldt University of Berlin and Head of the Department of Eco-Hydrology at the Leibniz-Institute of Freshwater Ecology and Inland Fisheries (IGB). His research topics mainly address flow and transport in porous media and the numerical simulation of hydrological systems.



PAOLO VIOTTI is Associate Professor of Environmental Engineering at the University of Rome "La Sapienza". His research topics mainly address pollutants transport in soil, subsoil and the atmosphere as well as the numerical simulation of ecological systems.



PER AAGAARD is Professor of Geosciences at the University of Oslo. His main fields of research are low temperature geochemical interactions involving pore fluids, minerals and organic matter with special reference to petroleum geology, environmental geology and hydrogeology.

Nützmann · Viotti · Aagaard (Eds.) Reactive Transport in Soil and Groundwater

Technologies for soil remediation require real knowledge and understanding of the processes involved and a correct and complete numerical approach in order to reach the best results at the lowest possible cost. The authors focus on the improvement of the scientific base for the development of integrated indicators of the environmental risks created by the presence of pollutants in water and porous media. They deliver insights into the understanding of integrated process, and also modeling capabilities. The establishment of a set of integrated indicators to evaluate the pollution status and risk of water resources will considerably aid environmental agencies, administrators and regulators and profit the society as a whole.

