



Doctoral position “Modelling water quality in rivers”

in the Research Training Group (RTG) **Integrated Hydrosystem Modelling** and at the interface to the Collaborative Research Centre **CAMPOS** at the **University of Tübingen, Department of Geosciences, Environmental Systems Analysis/Environmental Toxicology** in strong cooperation with the **University of Waterloo, Canada, Earth and Environmental Sciences**. The position can be filled **as early as possible**, but not later than October 1, 2018 (**duration: 3 years**). The salary is based on the public-service regulations of the state of Baden-Württemberg (**TV-L E13, 75%**).

Motivation. Surface waters receive a diversity of micropollutants (e.g. pesticides, pharmaceuticals, personal care products) from diffuse sources like agriculture and point sources like wastewater treatment plants. These pollutants may change the water quality and impact aquatic organisms and ecosystems. Thus, it is of fundamental importance to understand processes and parameters that determine pollutant fate on a catchment scale in order to identify potential contaminant long-term sources and develop effective measures for river management. In addition to chemical analysis, toxicity may also serve as an indicator to monitor water quality from wastewater to drinking water. Applying cell-based bioassays allows investigating the cumulative effects of chemicals that exhibit the same mode of toxic action as addressed by the selected bioassays. The resulting effect-scaled concentrations, so-called bioanalytical equivalent concentrations (BEQs), can be used to understand the fate and effects of micropollutants in a river system by developing an effect-balance model that is based on the mass balance concept.

Approach. Data for substance concentrations are measured with chemical and bioanalytical tools in the catchment of the River Ammer, a tributary of the Neckar River in southwestern Germany, by colleagues within the Collaborative Research Center “CAMPOS – Catchments as Reactors” of the Center for Applied Geosciences (<http://www.geo.uni-tuebingen.de/forschung/campos.html>). In addition, environmental parameters like discharge, main ions, DOC, and electrical conductivity are determined. The substances include pharmaceuticals (e.g. carbamazepine, diclofenac), pesticides (e.g. mecoprop, DEET), flame-retardants (e.g. TCPP, TDCPP), and fragrances (e.g. OTNE, HHCB). A chemical fate model is currently under development and includes one-dimensional stream flow, particle transport and reactive solute transport simulated by the advection-dispersion-reaction equation. This will be the basis to develop a new model concept that describes the fate of bioanalytical equivalent concentrations (BEQ) to simulate (eco)toxicological effects of chemical mixtures based on a mass balance approach. The main objective of this project is to expand the mechanistic numerical fate model for the Ammer River as outlined above by a module for toxicity equivalents. These models will be used to interpret both, the measured concentrations of dissolved and particle-associated micropollutants as well as the toxicity equivalents in the river. This will help to explain differences in pollutant fate and attenuation processes and allow the transfer of the new modelling concept to other rivers.

The potential candidate should have a Diploma or Master Degree in Hydrology, Environmental Engineering, Physics, Applied Mathematics, Systems Science, Geoecology, or Environmental Sciences and shall provide an excellent understanding of transport and transformation processes of chemical compounds within the



environment. Knowledge of mathematical modelling and experience with software for numerical computing (e.g. Matlab, R) are required.

The main work place is in Tübingen; a six months research stay at the University of Waterloo, Canada, is integral part of the training. The RTG, CAMPOS and the participating Universities offer structured PhD programs with joint international training and supervision that support PhD candidates in their career phase as well as programs to support women in research and teaching and thus encourage applications from qualified female scientists. In the case of equivalent qualified and experienced candidates, physically challenged applicants are given preference.

Further information on the RTG (including the application form) can be viewed at www.hydromod.uni-tuebingen.de or will be provided by: **Prof. Dr. Christiane Zarfl** (christiane.zarfl@uni-tuebingen.de; phone: +49 (0) 7071/29-76076) or **Prof. Dr. Beate Escher** (beate.escher@uni-tuebingen.de).

Please submit **applications** to hydromod@ifg.uni-tuebingen.de (ONE pdf-file, max. 5MB). Applications should include a letter of motivation, a CV, transcripts or degree certificates including grades, proof of special qualifications, prints of publications if applicable, the filled out application form and a list of at least three referees.