Seminar Series of the Centre for Water Resource Systems 2010

Date: 22/12/2010 at 14.00
Venue: Seminarraum 222, 3rd Floor
at the Institute of Hydraulic Engineering and Water Resources Management, Karlsplatz 13, Vienna
Speaker: **Dr. Gerrit H. de Rooij**, Helmholtz Centre for Environmental Research (UFZ), Department for Soil Physics, Germany.
Title: **Catchment hydrology in lowlands: what to do if the phreatic surface is hillier than the landscape**
Abstract: Lowland catchments are often intensively used for agriculture and can have an elaborate network of drain tubes and ditches. Their high nutrient input from fertilizer and manure and the efficiency of the drainage network in removing excess water from the land combine to create severe nutrient loading of the surface water within the catchment and downstream from the catchment exit.
We instrumented a catchment with the specific target to unravel the various flow routes a rain drop can follow from the soil surface to the stream. It proved particularly challenging to capture the fastest flow routes (overland flow) because they generated short, sharp spikes that can easily escape detection. Because it is not realistic to place sensors everywhere in the catchment we resorted to a nested-scale approach, with the emphasis at the field scale on measuring fluxes towards the ditch, and on frequent measurements of surface water flux and quality at the subcatchment and catchment scales. The presentation will highlight the most important features of the measurement network and the observation strategy.
In order to make use of the data, we needed to make the field-scale data applicable to the catchment. Furthermore, the dynamics of the drainage network owing to groundwater level variations that made drain tubes and ditches dry up caused massive changes in the flow routes towards the surface water: as soon as a ditch dried up, the subsurface travel distance towards the stream water of nearby subsurface water increased by tens if not hundreds of meters. We developed an elegant albeit elaborate procedure to model the discharge generation process at the catchment scale taking into account these dynamics, which will be discussed in some detail.

Date: 09/09/2010 at 16.00
Venue: Seminarraum 222, 3rd Floor
at the Institute of Hydraulic Engineering and Water Resources Management, Karlsplatz 13, Vienna
Speaker: **Prof. Andrew Western**, Department of Civil and Environmental Engineering, University of Melbourne, Australia
Title: **Surface water – groundwater interaction in two parts: losses in the desert and feedbacks**
Abstract: Groundwater in Australia is both an important resource and implicated in land and stream Salinisation. Understanding the relationships between surface and groundwater is an important hydrological problem with implications for management of the resource and Salinisation. This seminar will describe results from the following two projects. 1) Estimating diffuse groundwater discharge from the Great Artesian Basin. This work involves using hydrochemical, hydrometric and remote sensing techniques to estimate losses of groundwater in diffuse discharge areas associated with mound springs in the arid zone of South Australia. The challenges of working in data poor settings and the trials and

tribulations of utilizing new data sources such as remote sensing will be covered. 2) Multiple Hydrological Steady States and Resilience. This work from Dr Tim Peterson's PhD and subsequent projects explores the role feedbacks in surface water – groundwater interaction in landscapes with saline soils or groundwater. Resilience concepts and potential impacts of positive feedbacks in the hydrologic system will be explored through numerical modelling, which shows that multiple stable states are possible in surface water - groundwater systems under reasonable hydrologic process assumptions. The impacts of stochastic forcing of such systems will also be examined.

Date: 24/6/2010 at 16.00
Venue: Seminarraum 2063, Karlsplatz 13, 2nd Floor, Steige 3
Speaker: **Prof. Dan M. Frangopol**, Lehigh University, ATLSS Research Center, USA
Title: **Integrated Reliability-Based Life-Cycle Optimization Framework for Maintenance and Monitoring of Aging Structures: Applications to Bridges and Naval Ships**
Abstract: Our knowledge to model, analyze, design, maintain, monitor, manage, predict and optimize the life-cycle performance of structures and infrastructures under uncertainty is continually growing. However, in many countries, including the United States, the civil infrastructure is no longer within desired levels of performance and safety. Decisions regarding infrastructure systems should be supported by an integrated reliability-based life-cycle multi-objective optimization framework by considering, among other factors, the likelihood of successful performance and the total expected cost accrued over the entire life-cycle. The primary objective of this lecture is to highlight recent accomplishments in the life-cycle performance assessment, maintenance, monitoring, management and optimization of aging structural systems under uncertainty. Applications of the proposed integrated framework to life-cycle management of existing bridges and naval ships are presented and discussed.

Date: 22/6/2010 at 15.00
Venue: Seminarraum 222, 3rd Floor
at the Institute of Hydraulic Engineering and Water Resources Management, Karlsplatz 13, Vienna
Speaker: **Dr. Markus Venohr**, Leibniz Institute of Freshwater Ecology and Inland Fisheries, Berlin, Germany
Title: **Nutrient balance in river systems using MONERIS**
Abstract: For further information please see: http://moneris.igb-berlin.de/

Date: Tuesday, April 27, 2010 at 14:00
Venue: Seminarraum 222, at the Institute of Hydraulic Engineering and Water Resources Management
Speaker: **Prof. Ross Woods**, National Institute of Water & Atmospheric Research (NIWA), New Zealand
Title: **Similarity variables for hydrology: A seasonal snow model**
Abstract: The seasonal development and depletion of snow cover is a visible and widespread feature of large areas of the earth's surface. Snow plays a major role in the terrestrial water and energy balance especially in the northern hemisphere, with major climatic, economic, ecological and cultural significance. To improve understanding of the key drivers of the seasonal snowpack, we formulate and solve an analytical model of seasonal snowpack dynamics, by assuming a simple temperature index model for the snowpack, driven by purely seasonal climate forcing. Three dimensionless variables control the modeled system: one to indicate the temperature regime, one for the seasonality of both temperature and precipitation, and one for the mean precipitation rate relative to a characteristic melt rate. The purpose of the model is to provide insight into the relative roles of the mean and seasonality of temperature, the mean and seasonality of precipitation, and the melt factor, in

controlling snow climatology. The model can be used to make broad-scale predictions of the climatology of seasonal snow water storage, and its sensitivity to climate. Particular variables of interest include the maximum seasonal snow storage, the start and end of the snow accumulation period, and the time of year at which the snowpack is completely melted. The model makes useful uncalibrated predictions at six widely separated sites in the western USA which have a continuous seasonal snowpack. When applied to several hundred sites in Austria, the model makes poor uncalibrated predictions. We explore the reasons for this, generalise the model to account for within-season variability of temperature, re-evaluate the model, and discuss unresolved challenges.

Date: Friday, April 9, 2010 at 13:00
Venue: Seminarraum 222, at the Institute of Hydraulic Engineering and Water Resources Management
Speaker: **Dr. Murray Peel**, University of Melbourne, Australia
Title: **Recent research: Vegetation impact on mean annual catchment evapotranspiration & a contribution toward doing hydrology backwards**
Abstract: Historically, relationships between catchment vegetation type, evapotranspiration and runoff have been assessed primarily through paired catchment studies. The literature contains results from over 200 of these studies from around the world but two factors limit the applicability of the results to the wider domain. Firstly, catchment areas are generally small (<10 km2). Secondly, the range of climate types is narrow, with temperate (Köppen C) and cold (Köppen D) climate types in the majority. Here we present results from a global assessment of the impact of vegetation type on mean annual catchment evapotranspiration for a large, spatially and climatically diverse dataset of 699 catchments. Overall, the results presented are consistent with those from reviews of paired catchment studies. However, the value of a diverse hydroclimatic dataset for assessing the vegetation impact on evapotranspiration is clearly demonstrated. Based on the methodology of Kirchner (2009, WRR W02429), we examined catchment dynamic storage and recession time scales and estimated catchment average precipitation and evapotranspiration using hourly discharge data. The analysis was applied to a small moist temperate forested catchment (Myrtle Creek) located east of Melbourne, Australia. In contrast to the Plynlimon experimental catchments, where Kirchner tested his methodology, the storage-discharge relationship for Myrtle Creek varied both within and between years and the hourly streamflow recessions exhibited strong diurnal patterns. These hydrologic features confounded our application of Kirchner's method in this catchment. Following modification, we were able to successfully apply a modified Kirchner methodology to the Myrtle Creek catchment, which allowed us to estimate recharge to and evapotranspiration from the saturated zone based only on the hourly hydrograph. We conclude that a modified version of Kirchner's approach can be applied successfully to a small moist temperate forested catchment.

Date Tuesday March 23, 2010 at 16:00
Venue Seminarraum 222, at the Institute of Hydraulic Engineering and Water Resources Management
Speaker **Prof. Regina Sommer**, Medical University Vienna, Institute of Hygiene and Applied Immunology, Water Hygiene
Title: **Water disinfection: Principles and Goals**

Date: Wednesday Feb 17, 2010 at 10:00
Venue: Seminarraum 122 at IPF
Speaker: **Prof. Luca Brocca**, L'Istituto di Ricerca per la Protezione Idrogeologica, Italy

Title: **Some aspects of the hydrology research at IRPI**

Abstract: The presentation will address, firstly, the main research activity developed by the Hydrology Group of the Research Institute for Geo-Hydrological Protection, CNR (IRPI-CNR) of Perugia in terms of hydro-meteorological monitoring (rainfall, discharge and soil moisture), hydrological processes (infiltration, antecedent wetness conditions, overland flow, flood routing), hydrologic and hydraulic modelling, hydraulic risk and real time flood forecasting. Then, the activity on the use of remote sensing data for hydrological applications will be shown more in detail. Specifically, the use of soil moisture estimates obtained from satellite sensors both for rainfall-runoff model improvement and calibration but also for real time flood forecasting will be analysed. Moreover, the use of satellite sensors for rainfall and water level monitoring and inundated area detection will be also handled. Finally, future actions and open questions that have to be still addressed will be pointed out.