国际知名研发机构重庆行动

中欧社会论坛

健康河流与可持续水资源管理专题研讨会

International R&D Institution Mission to Chongqing

CHINA-EUROPA Forum

On Healthy Rivers and the Implementation of Sustainable Water Resource Management

主办：重庆市科学技术委员会　中欧社会论坛组委会

承办：重庆大学城市建设与环境工程学院

Sponsored by: Chongqing Science & Technology Commission (CSTC)
China-Europa Forum
Organized by: Faculty of Urban Construction & Environmental Engineering of Chongqing University

2009 中国·重庆
2009 China·Chongqing

序　言

在新中国成立60周年的喜庆日子里，由中华人民共和国科学技术部和重庆市人民政府联合举办的“国际知名研发机构重庆行动”系列活动在重庆隆重召开。活动以“合作、创新、发展”为主题，以重庆产业创新需求为导向，为国外研究机构与重庆企业、高校和科研院所提供具体的市场需求和项目对接机会，促进国外研究机构与重庆企业、高校和科研院所建立长期紧密的跨国“产学研”联盟关系，为境外机构开拓中国西部潜在市场提供良好的商机。以此次“重庆行动”为契机，为重庆市经济建设和科技创新提供良好的发展平台。

重庆地处长江流域经济带、西南区域经济圈和三峡库区腹地，是中国西部唯一具备水、陆、空、铁立体交通运输网络的城市，长江上游的经济中心。改革开放以来，重庆作为中国最年轻的直辖市，紧紧抓住西部大开发、三峡工程建设和城乡统筹发展的机遇，与时俱进，开拓创新，大力推进科技产业发展，取得了明显成绩。特别是直辖12年来，重庆市科技发展步伐显著加快，科研投入在GDP中所占比重逐年加大，切合重庆地方实际、具有鲜明重庆特色的一大批科研成果为重庆市社会经济各项事业的发展起到了至关重要的积极作用。但我们也清醒地认识到，重庆生态环境建设，尤其是三峡水库生态环境保护，同库区社会经济高速发展的矛盾依然突出，适宜于在重庆独特社会、生态背景下开展的环境治理措施仍还有限，面向“五个重庆”的可持续水环境管理体系尚需进一步完善。

健康河流与可持续水资源管理专题研讨会以“促进生态水文学，发展可持续的生态系统和水资源管理模式”为会议主题，邀请中欧相关领域科学家着重就大型水利工程对生态系统的影响、评估与表征及其可持续、环境友好的水资源管理展开深入交流，探讨包含生态目标的大型水利工程实施原理与水生态管理模式。

中欧社会论坛

二零零九年十月二十五日

目录

主办单位：中欧社会论坛组委会；重庆市科学技术委员会

Sponsored by： China-Europa Forum;

Chongqing Science & Technology Commission (CSTC)

承办单位：重庆大学城市建设与环境工程学院

Organized by: Faculty of Urban Construction & Environmental Engineering, Chongqing University

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波兰 Poland	Maciej ZALEWSKI	UNECSO 生态水文学欧洲中心（波兰国家科学院国际研究院）主任；波兰罗兹大学/教授; Director of European Regional Centre for Ecohydrology under the auspices of UNESCO; Professor, Chairman of the Department of Applied Ecology University of Lodz;
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中国 China	郭劲松 Jinsong GUO	中欧社会论坛 T52c 中方组组长; 重庆大学城环学院/副院长/教授; Chair of China counterpart in T52c group; Professor, Deputy Dean of Urban Construction and Environmental Engineering, Chongqing University
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	Tianyu LONG	Professor， Chongqing University

(2) 重庆市科委生产力促进中心邀请参会专家

Guests invited by the Productivity Promotion Center of CSTC.

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德国 Germany	Guenter SUBKLEW	德国尤里希研究中心 博士; Researchers/Doctors at Research Centre Juelich, Germany;
	Arnd KUHN	
	Hans-Dieter NARRES	
	Peter A. WILDERER	德国慕尼黑工业大学 教授; Professor, Technische Universität München (TUM)

重庆大学城市建设与环境工程学院郭劲松教授致辞

尊敬的各位领导、专家、嘉宾：

中欧社会论坛于2005年由香港霍英东基金会和瑞士梅耶人类进步基金会共同倡导成立，它是中国与欧洲社会之间一个具有创意的对话进程，每两年一次在中国和欧洲轮流举行，旨在加深中欧社会各层面、各行各业间的广泛交流、理解与沟通，自由分享双方在社会进步与发展各个方面的成果与经验，非排他性地联合双边社会各领域一起思考人类社会进步与可持续发展的未来方向和应对方案，消除彼此的误解和误会，共建一个多元和谐的世界，其创新性、广泛性和作用都吸引了中欧双边众多官方和民间机构组织的参与。论坛得到了全国政协外事委员会、经济社会理事会和中国驻欧盟使团的高度关注和大力支持，并已发展成中欧双边最重量级的民间层面的对话机制。

生态水文学是在20年内全球水环境研究领域迅速发展的交叉学科，围绕淡水资源的有限性及与人类需求的矛盾，在生态学、水文学各自独立完善的理论基础上，融合了自然地理学、河流地貌学、土壤学、气象学、植物学、水文地质学等多学科理论与方法，研究高强度人类开发活动对水文循环的干扰以及水生态系统的响应，以生态过程和水文过程耦合机制的尺度效应为学科关键点，以水资源可持续利用和维持生态系统永续健康发展为学科目标，揭示生态系统中生态格局和生态过程水文学机制，寻求环境友好、经济可行、社会可接受的多维、有效的淡水资源可持续管理模式。迄今，该学科尚未形成独立的理论框架和方法体系，仍然处于理论探求阶段，但其强大的应用前景受到了国际社会的广泛关注，联合国教科文组织（UNESCO）国际水文计划第五阶段（IHP-V）把生态水文学理论和方法的探索作为重要内容之一，已开展39个探索性的项目并取得初步研究成果。

健康河流与可持续水资源管理专题研讨会是第三届中欧社会论坛的重要组成部分，亦是第六届UNESCO-BRESCE（联合国教科文组织欧洲科学文化办公室）河口、滨海生态水文学研究组专题会议。本届论坛以“促进生态水文学，发展可持续的生态系统和水资源治理模式”为会议主题，邀请中欧相关领域科学家着重就大型水利工程对水生态系统的影响、评估与表征及其可持续的、环境友好的水资源管理展开深入交流，以生态水文学的基本观点，多视角分析大型水利工程对水文格局的重构及其生态响应机制，进一步丰富生态水文学的研究内涵与各研究内容的逻辑关系，并探讨包含生态目标的大型水利工程实施原理与水生态管理模式。

重庆市科学技术委员会副主任张文先生致欢迎辞

各位嘉宾、各位专家：

上午好!

在建国60周年的喜庆日子里，我们在重庆举办了“国际知名研发机构重庆行动”系列活动。此次活动以“合作、创新、发展”为主题，围绕节能环保技术、新能源汽车、生物技术、先进制造业技术举办专题研讨会，组织科技项目对接、科技合作项目洽谈、专题考察等活动，为世界各地研发机构交流经验、促进合作、实现创新发展提供良好平台。在此，我谨代表重庆市政府向各位嘉宾的到来表示最热烈的欢迎，对论坛的召开表示最诚挚的祝贺。

重庆地处长江流域经济带、西南区域经济圈和三峡库区腹地，是中国西部唯一具备水、陆、空、铁、管立体交通运输网络的城市，长江上游的经济中心。直辖12年来，重庆市科技发展步伐显著加快，科研投入在GDP中所占比重逐年加大，切合重庆地方实际、具有鲜明重庆特色的一大批科研成果为重庆市社会经济各项事业的发展起到了至关重要的积极作用。但我们也清醒地认识到，重庆生态环境建设，尤其是三峡水库生态环境保护，同库区社会经济高速发展的矛盾依然凸显，适宜于在重庆独特社会、生态背景下开展的环境治理措施仍还有限，面向“五个重庆”的可持续水环境管理体系尚需进一步完善。

生态水文学，关注于人类开发活动对水文循环的干扰以及水生态系统的响应。作为近年来迅速发展的交叉学科，生态水文学以生态过程和水文过程耦合机制的尺度效应为研究节点，注重基础理论和研究方法的深化与完善，也强调了对水资源管理与可持续利用的生态要求，其实际运用前景备受关注。国际水文计划将其纳入了关键研究部分，而以生态水文过程主要科研成果为指导的可持续水资源管理模式和健康河流体系更是当前迫切需要解决的关键课题。对于重庆这一两江环抱、山水相依的城市而言，生态水文学研究的重要性与现实意义不言而喻。中欧健康河流与可持续水资源管理专题研讨会在渝举办，为重庆水环境基础研究提供了极佳的学习、深化的机会。相信中欧双方专家对生态水文学和健康河流的深入，将成为本次“国际知名研发机构重庆行动”系列活动的重要成果，为重庆可持续水资源管理模式的探索提供宝贵的借鉴和参考。

预祝中欧河流健康与可持续水资源管理专题论坛取得圆满成功！谢谢！

Maciej ZALEWSKI

UNECSO 生态水文学欧洲中心（波兰国家科学院国际研究院）主任；波兰罗兹大学教授；国际水文计划-生态水文学专家组成员。

致力于将水文过程引入人、社会发展、生物圈和全球变化的研究中，阐释流域水文过程中物质、迁移转化规律以及对富营养化、有害藻化暴发的影响，建立面向生物多样性保护、人类社会可持续发展的生态系统环境管理政策与手段。

Director of the International Institute of Polish Academy of Sciences - European Regional Centre for Ecohydrology under the auspices of UNESCO
Chairman of the Department of Applied Ecology University of Lodz
Chairman of the Center for Ecohydrological Studies University of Lodz

MAIN AREA of EXPERSTISE

ECOHYDROLOGY – a sub-discipline of hydrology that focuses on ecological processes occurring within the hydrological cycle and strives to utilize such processes for enhancing environmental sustainability

1) Use of Ecosystem Processes as Management Tool for Sustainable Development, Economic Growth
   and Conservation of Biodiversity
2) Use of Ecosystem Processes in River and Lake Basins for Reduction of Eutrophication, Elimination of Toxic Algal Blooms, Reduction of Sedimentation Rate and Bioenergy Production
3) Restoration of Water and Ecosystem Resources in Urbanized Spaces for Economic Development, Human Health and Quality of Life Improvement

Selected Publications：

Zalewski M., Harper D., Demars B., et al., 2008. Linking Biological and Physical

Processes at the River Basin Scale: the origins, scientific background and scope of Ecohydrology. In: Harper D., Zalewski M., Pacini N., Ecohydrology: Sustainable Management of Water Resources, CAB International, London, 391pp.

Zalewski M., 2007. Ecohydrology as a Concept and Management Tool, (in:) King C., Ramkinssoon J Clüsener- Godt M. Adeel Z. (eds.) Ecohydrology as a concept and management tool. , UNU-INWEH UNESCO MAB, p. 39-53. Canada.

Zalewski M. 2006. The Potential of Conversion of Environmental Threats into Socioeconomic Opportunities by Applying an Ecohydrology Paradigm, [In:] Burdyuzha, V. (ed.) 2006. The Future of Life and the Future of our Civilization

Zalewski M., R. Robarts. 2003. Ecohydrology – a new Paradigm for Integrated Water Resources Management. SIL News 40, Sep. 2003:1-5

Zalewski M. 2002. Ecohydrology—the use of ecological and hydrological processes for sustainable management of water resources. Hydrological Sciences Journal 47(5):825-834

Implementation of Ecohydrology from International Hydrological Programme (IHP) perspective

Maciej ZALEWSKI

Abstract:

Ecohydrology (EH) is a sub-discipline of hydrology that seeks to understand the ecological processes controlled by the hydrological cycle. It strives to utilize this understanding in management of both to enhance sustainability in river basins.

The general assumption of EH is to reverse degradation and achieve sustainable water and ecosystems in anthropogenially-modified basins. In addition to the reduction of erosion, nutrients and pollutant emissions there is a necessity to regulate ecological processes based on understanding "water - biota interactions", from molecular (e.g., microbial loop) to ecosystem (biomanipulation) and to landscape scales (reforestation, creation land/water ecotone zones).

Two halves of ecohydrology can be distinguished: (1) Atmospheric/terrestrial, where the major question is how plant cover changes the dynamic water balance and nutrient/pollutant transfer in to aquatic ecosystems and, (2) Aquatic, where biotic interactions may change nutrient/pollutant allocation from dynamic to non-available pools, such as changing the intensity of eutrophication (by an order of magnitude).

The following concepts of EH provide a framework for its implementation

1. Hydrological : The quantification of the hydrological cycle of a basin, should be the template for functional integration of hydrological and biological processes.

2. Ecological : integrated processes at a river basin scale can be steered in such a way as to enhance the basin's carrying capacity (resilience, biodiversity and ecosystem services).

3. Ecological engineering: The "key element of EH as a new tool for Integrated Water Resources Management (IWRM) is "dual regulation" – use of the understanding of terrestrial and aquatic organisms' adaptation to water quality and dynamics. It can be expressed by testable hypotheses, as follows 1) Hydrological processes generally

regulate biota; 2) Biota can be shaped as a tool to regulate hydrological processes; 3) these two types of regulations can be harmonized with hydrotechnical infrastructure to achieve sustainable water and ecosystem services.

Methodology of science - EH is integrative – a transdisciplinary, problem-solving science based upon the deductive concept, formulated from the general theory of physics, hydrology and ecology. As a transdisciplinary science, the implicit goal of which is to achieve sustainability, EH integrates not only hydrology and ecology but also considers geophysics, geology, molecular biology, genetics, mathematical modeling with socio-economical (e.g. foresight) and legal aspects.

EH goals as a problem-solving science:

(1) slowing down the transfer of water from the atmosphere to the sea (considering flood and drought control as priorities),

(2) reduce input and regulate the allocation of excess nutrients and pollutants in aquatic ecosystems to improve water quality, biodiversity and human health, and

(3) enhancement of ecosystem carrying capacity (resilience, biodiversity, ecosystem services for society) in harmonization with the societal needs within the framework of Integrated Water Resources Management (IWRM).

吴丰昌

中国环境科学研究院国家环境保护湖泊污染控制重点实验室主任、博士生导师、研究员、《湖泊水环境质量基准研究》973 项目首席科学家。1995 年中国科学院地球化学环境地球化学专业博士毕业，后在加拿大 McMaster 大学和日本名古屋大学大气水圈科学研究所工作 8 年。

2001 年入选中国科学院“海外引进杰出人才计划”，2004 年获中科院优秀“百人计划”称号和中国矿物岩石地球化学学会候德封青年科学家奖，2005 年获国家杰出青年基金项目资助，2006 年获中国青年科技奖。目前为《Environmental Pollution》和《湖泊科学》刊物编委，中国环境科学学会水环境分会副理事长。

主要从事湖泊污染机理与过程、水质基准和标准、风险评估，及污染控制技术和管理等方面的研究。自 2000 年以来，共发表论文 50 余篇，其中 SCI 论文 45 篇，参编英文专著 2 部。

Feng-Chang Wu

Professor, Director of the State Environmental Protection Key Laboratory for Lake Pollution Control/Research Center for Lake Ecology & Environments. Chief scientist of 973 project “Lake Water Quality Criteria”. Achieved Ph.D. degree on environment geochemistry in Institute of Geochemistry Chinese Academy of Sciences; Stay and doing research in Canada McMaster University and Nagoya University Japan for over 8 years.

In 2001, selected as “Oversea Talents Program” in Chinese Academy of Science, got the title of “100 Talents Program” in The Chinese Academy of Science, awarded Hou DeFeng Young Scientist Prize by the Chinese Society of Mineralogy, Petrology and Geochemistry in 2004. Supported by National Natural Science Foundation for Distinguished Young Scholar in 2005. Achieved the Young Scientists Award of China in 2006. Editor of *Environmental Pollution* and *Journal of Lake Science,* deputy director of Water Environmental Branch in Chinese Society of Environmental Science.

Mainly engaged in the lake pollution mechanism and process, water quality criteria and standard, risk assessment, pollute control technique and management etc. Since 2000, published more than 50 thesis, and 45 SCI theses, as well as 2 English monographs.

天然有机质及其在地表环境中的重要性

吴丰昌

中国环境科学研究院国家环境保护湖泊污染控制重点实验室，北京，100012

摘要

天然有机质是地表各种环境介质中的重要化学组分, 分布广泛.越来越多的研究已经表明:它在地表生态系统的物理、化学和生物过程中都起着十分重要的作用; 它与生态系统的各个重要环节密切相关, 是生态系统中能量与物质循环的重要途径.因此, 天然有机质不仅是生物地球化学、生态学和环境科学等研究领域的重要内容之一, 而且也是环境污染的评价、预测和治理研究中的基础理论问题, 是目前环境质量、毒理学、环境立法和管理研究共同关注的科学问题。

本报告系统以我国湖泊与河流水环境为例, 较为系统地报道了天然有机质的来源、化学结构、循环特征, 与养分循环的耦合关系, 对有毒金属元素和有机污染物迁移转化和毒性影响机理等几个方面的研究进展。

重点介绍了①质分离富集、分析和综合表征技术，②地表环境中天然有机质的来源、化学结构和循环特征，③有机质与富营养化（养分循环）的关系，特别是有机氮磷与水体富营养化的关系，④天然有机质与污染物的相互作用及氯化机理，特别是溶解有机质与有毒重金属离子相互作用研究的新方法－紫外吸收滴定法，等4方面的成果。这些研究对环境生物地球化学理论和研究方法的发展，及湖泊污染控制与管理有十分重要科学意义。

最后，报告针对我国水体富营养化和环境污染等重要环境问题, 阐述当前应该采取的研究思路和存在的主要科学内容, 并对现代有机环境与生物地球化学学科的研究趋势进行了展望。

Natural Organic Matter and its Significance in the Surface Environment

Feng-Chang Wu

Abstract

Natural organic matter (NOM) is the important chemicals widely distributed in surface environments, e. g. water, soil, sediment and precipitation. Recent studies have showed that NOM played important roles in the physical, chemical and biological processes, as well as energy and material cycling in the surface ecosystem. Therefore, NOM is not only important research objects for biogeochemical, ecological and environmental sciences, but also serves as foundational issues of assessment, prediction and treatment for environment pollution. Furthermore, NOM is the common concerned objects for environmental quality, toxicology, environmental legislation and management.

This presentation will present some systematic results on the source, chemical structure and fate of NOM, effects on transport, transformation and toxicity of toxic metals such as Hg and Cu, POPs and PPCPs, and the connection with nutrient cycling in lakes and rivers in across China. It mainly includes: (1) Separation, enrichment, analysis and characterization of NOM; (2) Source, chemical structure and cycling behaviors of NOM; (3) Its relation with nutrient cycling, especially the relationship between organic nitrogen/phosphorous and eutrophication; (4) The interaction between NOM and pollutants, the chlorination mechanism of NOM, and a novel method, ultraviolet absorption titration, for investigating the interaction between NOM and toxic metals.

Those results would have significant application to the theoretic and methodological development in environmental biogeochemistry, as well as lake pollution control and management.

Finally, this presentation will point out main scientific issues and research approach for water eutrophication, environment pollution and other environment problems, and will propose a research trend in the modern environmental science and technology.

Giorgios SYLAIOS

中欧社会论坛 T52c 组欧方组长，希腊色雷斯德谟克里特大学教授；

致力于滨海生态系统（海湾、礁湖等）、河流生态系统环境问题的相关研究，运用生态水文学/水力学基本原理，致力于通过生态系统数值建模与模拟分析，阐明不同时空尺度下环境变迁对上述生态系统的影响机制，解释人类活动（筑坝蓄水等）和全球气候变化背景下滨海生态系统的响应特点及其潜在对人类生存、发展的影响。

Assisstant Professor, Democritus University of Thrace

Research Interests

Environmental studies of coastal aquatic ecosystems, such as lagoons (series of Nestos river lagoons and Rodhopi lagoons), river deltas (delta areas of rivers Strymon, Nestos and Evros), semi-enclosed gulfs (Strymonikos, Pagasitikos) and other coastal areas (Kavala gulf).

Development and application of hydrodynamic and dispesion numerical models at the above mentioned areas, aiming to analyze the mechanisms responsible for the temporal and spatial environmental change.

Monitoring and modeling of wave climate in coastal areas, in association to meteorological conditions, determination of longshore and cross-shore sediment transport, dynamic beach processes, studies on coastal erosion and shore protection.

River hydrological and water quality monitoring and modeling, environmental impacts of river damming, ecohydrology methods to improve the riparian environment and ecosystem.

Environmental data assimilation, non-linear time-series description and forecasting methods, fuzzy methods for data analysis from environmental monitoring stations.

Selected Publications：

Sylaios, G.K. & V.A. Tsihrintzis (2009). A budget model to scale the biogeochemical cycles in two semi-enclosed coastal water bodies. Environmental Modelling & Assessment, Vol. 14(1), 59-72.

Sylaios, G.K., Gitsakis, N., Koutroumanidis, T. & V.A. Tsihrintzis (2008). CHLfuzzy: A Spreadsheet Tool for the Fuzzy Modeling of Chlorophyll-a Concentrations in Coastal Lagoons, Hydrobiologia, Vol. 610(1), 99-112.

Sylaios, G.K., Tsihrintzis, V.A., Akratos, C. & K. Haralambidou (2006). Quantification of Water, Salt and Nutrient Exchange Processes at the Mouth of a Mediterranean Coastal Lagoon. Environmental Monitoring & Assessment, Vol. 119(1-3), 275-301.

Sylaios G., Stamatis, N., Kallianiotis, A. & P. Vidoris (2005). Monitoring and assessment of land-based nutrient loadings, distributions and cycling within Kavala Gulf. Water Resources Management, Vol. 19(6), 713-735.

Environmental Implications of Nestos River Damming and Entrenchment – Ecohydrology Solutions for Riparian and Coastal Resoration

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Like most river systems, Nestos River, Northern Greece, has undergone significant environmental changes, mainly due to human activities, which adversely affect the river ecosystem that alter habitats and differentiate qualitative and quantitative characteristics of the fish populations. These are: a) changes in the water quality of the river due to point and non-point pollution sources (urban, industrial and agricultural pollution), b) changes in the hydrological status of the system, with the construction of an irrigation (Toxotes, 1966) and two hydroelectric dams (Thisavros and Platanovrisi, 1996) in Greece and an irrigation dam (Despatis, 1967) in Bulgaria that continually regulate the river flow. The combination of all these human impacts leads to the deterioration of the habitat's quality and the gradual reduction and / or extinction of fish species populations. In parallel, increased erosion rates have been observed along Nestos Delta coastline, ranging from a few centimeters up to 25 m per year. Such phenomenon has been attributed to the entrenchment of Nestos River course along its delta and to the construction of an extensive irrigation system during the early 1950s.

Several EU-funded programs have been implemented along Nestos River, aiming to monitor the above environmental changes and propose the appropriate actions for

riparian and coastal restoration. A LIFE-Nature project intended to restore the deltaic configuration at Nestos River mouth, by re-flooding and reconnecting with the main course four old Nestos branches, which were drained after river entrenchment. Interreg IIIA Greece-Bulgaria Project intended to monitor the environmental conditions and the fish fauna populations along Nestos River and its tributaries, aiming to restore the adverse effects produced from river damming and dams operation. These actions included: a) increase of natural fish fauna species stocks that have suffered population decline, b) transfer of broodstocks from upstream to downstream of the dams and vice versa for the species indicated that is necessary to restore the communication between the isolated populations, and c) improvement of the fish fauna natural environment, with actions such as the creation of small, artificial acclimatization basins for juveniles along the river bank.

禹雪中

中国水利水电科学研究院教授；

致力于水利水电工程作用下河流生态系统响应过程的研究工作，以河流生态系统结构和功能分析为基础，建立绿色水电评估的指标体系和评价标准，以修复自然的河流生态水文过程为目标，研究水利水电工程生态调度的准则和方法，综合考虑经济-环境-社会三方面的因素，进行水电可持续发展机制的研究。

Xue-Zhong Yu

Professor, China Institute of Water Resources and Hydropower Research

The research of Prof. Yu is focused on the impacts of the hydropower project on river ecosystem. Based on the analysis of the structure and functions of the river ecosystem, indicators and standards of the green hydropower assessment are developed. Aiming at the restoration of the natural eco-hydrological alternation, the ecological operation principles and methods are studied. The research on the hydropower sustainability is conducted with the comprehensive consideration of economic, environmental and social issues.

Selected Publications：

Yu Xuezhong, Yang Zhifeng, Peng Qidong. (2008). Preliminary Study on Index System of Ecological and Environmental Protection of Hydropower Project[J]. *Journal of Hydroelectric Engineering*, 27(2), 35-39. (In Chinese)

Yu Xuezhong, Liao Wengen, Luo Huihuang. (2007). Discussion on Establishing Green Hydropower Certification in China[J]. *Water Power*, 33(7), 1-4. (In Chinese)

Yu Xuezhong, Li Chong, Tang Wanlin(Translated), Swiss Federal Institute for Aquatic Science and Technology, Low Impact Hydropower Institute of US. Green Hydropower and Low Impact Hydropower Certification Criteria[M]. Beijing: Science Press, 2006.

Study on indicators and standards of green hydropower assessment*

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Abstract: Green hydropower assessment refers to a process of assessing the impact of hydropower projects under operation phase on the river eco-system. It reflects the real situation of the river eco-system and functions under the influence of hydropower projects. Based on the analysis of the implication of green hydropower, this paper set up a green hydropower index system composed of hydrological character, water environment, river morphology, connectivity of the river systems, biotopes, biological communities and river landscape. The assessment standard on a quantitative approach supplemented by qualitative approach is proposed. Then a comprehensive approach based on AHP fuzzy assessment method is employed for the assessment. The paper takes Manwan hydropower station in Lancang River as the case study and obtains the overall assessment results and major limiting factors which serve as the basis for taking protection measures for the project.

Key words: Green Hydropower, Indicators, Assessment Standards, Assessment Method, Manwan Hydropower Station

□

Ioan JELEV

罗马尼亚国家环境保护发展研究院主任；奥拉德大学教授;

致力于通过水文、水动力模拟，研究人工改变下河流生态系统和滨海生态系统的生态响应机制，从生态水文学的角度，分析人工干扰下水环境的管理模式和治理对策以及立法、经济学手段等。

Engineer, Doctor of Technical Science,

Senior Scientific Researcher - Degree I at the

National Research and Development Institute for Environmental Protection (ICIM)

and the National Institute for Hydrology and Water Management,

Environmental Management Professor at the University of Oradea

Field of activity and abilities:

- water management;
- environmental protection;
- environmental and water legislation;
- environmental and economy;
- fluid mechanics;
- hydraulic machines;
- physical and mathematical modeling of steady and unsteady flows with open surface from rivers and canals, of pressurized flows (hydroelectric plants, pumping stations, pumping storage plants) and of transient mixed flows in hydraulic galleries and conduits;
- automation & control Devices for pressurized pipes;
- scientific peer review, as member of assessing group of Ministry of Education and Science for ”RELANSIN” Program, scientific assessments for selection of projects for National Researche Program ”NUCLEU” (both in the field of environment, particularly in the field of Water Resources) as well as for the Hong Kong University in Fluid Mechanics fields;
- evaluation of scientific works, national programs and projects in the field of water management and environment;
- attestation for issuing specific documentations like Environmental Impact Assessment and Environmental Balance Assessment obtained from the National Commission on Accreditation of Environmental Evaluators;

- attestation for issuing specific documentations like Hydraulic Engineering Studies and Fezability Studies, obtained from the Ministry of Environment and Water Management;
- elaboration of National Reports concerning research activities as President of the Commission for Ecology, Environmental Protection, Water and Forest Management within the Romanian Consultative Board for Scientific Research;
- professional skills and experience in a large fields of environment;
- representant of Romania in many international environmental activities like International Conventions, bilateral, regional and international conferences, meetings, negociations etc;
- computer programming in FORTRAN and use of MICROSOFT WORD and MICROSOFT OFFICE POWERPOINT.

Publication:

Books and synthesis works:

- 11 Books and synthesis works.

*Scientific Articles***:**

- Over 90 papers published in scientific reviews of speciality in Romania and abroad (Journal of Applied Mechanics, Water Power & Dam Construction, Journal of the International Association for Hydraulic Research etc.) as well as scientific papers at conferences in Romania and abroad (Annex I present a selection of papers).

The impact of human activities on the Danube River and Danube Delta. Solutions for the Danube River rearrangement

IOAN JELEV & VIORICA JELEV

In the current state of sustainable development policies, the Danube River, particularly the Danube Delta, located at the interface between Danube and the Black Sea, as a relevant habitat for a large number of species of wild flora and fauna, is subject to a growing international interest, especially after 1990, when due to the decision issued by the Romanian Government, the unsustainable economic activities in that area have been stopped. From that moment on, the area received the status of biosphere reservation, as a natural world heritage. At the same time, the Danube Delta is located not only administratively, but also geographically, at the cross point of the concerns of the two regional environmental conventions of great importance: The Convention for Sustainable Management of the Danube River and The Convention for the Black Sea Protection. An interface Task Force has been established – DABLAS – to harmonize and to correlate the objectives and the targets assumed by the two important conventions.

The Danube Delta, as a complex result of the interaction between the Danube and the sea, is currently, to the greatest extent, under the influence of the Danube River's activity.

The Danube River is, after the Volga River, the second largest river in Europe and, at the same time, one of the most important in the world, due to its length of 2860 km, to the surface of watershed of over 817.000 km^2, and also due to its multi-annual average discharge of approximate 6300 m^3/s.

Human activities have caused many changes in physical and chemical parameters of the Danube River and Danube Delta, such like: high waters regime – floods regime; low waters regime – drought – pond depletion; the morphologic evolution of branches and of sediments at the exit point to the sea; density flows –

lack of salt water; pollution phenomena; satisfying the necessities – drinking water supply, maritime navigation, agriculture, pisciculture, ecology, tourism; modifying the hydrologic and hydraulic parameters, as an effect of some hydrotechnical works in the Delta – calibrations of the water bed, embankment, damming , opening new branches, restorations(ecological reconstructions).

Some of the changes and solutions to reduce the associated impact, are emphasised in the present paper

何大明

Daming He, Professor, Directors of the Asian International Rivers Center and the School of Physical Sciences Research, at Yunnan University, and the Key Laboratory of International Rivers and Transboundary Eco-security in Yunnan Province.

RESEARCH INTERESTS

Transboundary Water Resources and Eco-security in International Rivers, Ecoydrological Process and cascade development, Decision Support system for river basin Management.

Selected Publications:

He Daming, Liu Jiang, Hu Jingming, the Transboundary Eco-security Maintaining and Multiple-level Controlling in Longitudinal Range-Gorge Region of Southwest China, under pressing, Sciences Press, Beijing, 2009

He Daming, Feng Yan, Fu Jingming, the Utilization of Transboundary water resources and Emvironmental Conservation of International Rivers in China, Sciences Press, Beijing, 2007.

He Daming, Feng Yan, the Reasonable Utilization and management of Transboundary Water Resources, Sciences Press, Beijing, 2006

Li Shaojuan, **He Daming***, Water level Response to Hydropower Development in the Upper Mekong River, J. of the Human Environment 2008, 37(3):170-177.

Li Yungang., **He Daming** *, Ye Changqing, Spatial and temporal variation of runoff of Red River Basin in Yunnan, J. Geogr. Sci, 2008, 18 (3): 308-318

Kaidao Fu, **Daming He**, Xixi Lu Sedimentation in the Manwan Reservoir in the Upper Mekong and its downstream impacts Quaternary International 2008, 186:91-99

生态水文学发展与河流健康维持

何大明

河流是地表生态系统的命脉，维持着地表生命系统必需的生境；河流过程维持了地球的水分、养分、盐分、泥沙、热量等物质和能量交换的动态平衡，为人类的可持续发展提供巨大的经济、文化和生态服务功能，成为人类文明的摇篮。

全球变化背景下，河流生态系统结构和功能的快速变化，引发一系列经济、社会和生态问题，河流生态系统的健康维持和功能持续利用，日益受到关注和重视，并迅速成为各国河流管理的目标与方向。

在漫长的历史时期，人类社会主要集中关注、开发和利用河流的经济功能，忽视了其极为重要的生态功能。在中国，大规模的水电梯级开发是影响河流健康最主要驱动力。在西南山区，集中了全国水电资源可开发装机容量的约 60%，已成为国家水电能源基地建设的主体区。近年来，该区水电开发从干流到支流“遍地开花”，显著改变了河流的水文过程、生态过程和水环境状况，水资源合理利用与河流健康维持的矛盾日益尖锐。

流域是一个相对独立的生态单元，流域水系构成其关键的生态系统。从河流到流域，生态完整性是维护河流健康及流域生态安全的物质基础。但是，关于河流健康及生态完整性的综合研究还很少。生态水文学（Ecohydrology）这一门新兴边缘学科发展，将为河流健康和流域生态安全的维护，提供强有力的科学基础。

在全球变化背景下，需要从三个方面发展生态水文学，使其成为服务于河流健康和流域生态安全维持的基础学科：

（1）将传统的水文循环概念拓展到生态水文循环，重新认识水文循环的生命维持机制，特别是对生物多样性的维持机制；以生态水文循环为载体，重新认识河流、流域生态系统的完整性，重新认识河流的生态功能，为流域整体协调开发、河流健康维护和以流域为基本单元的生态治理提供科学依据。

（2）现有水文学、生态学等学科的知识体系，大都从以自然环境为主体的下垫面变化研究过程中发展而来，难于解决当前高强度人类胁迫环境中的生态水文循环及其效应问题。需要发展新的理论和方法，揭示高强度人类胁迫环境中，如城市河流、大规模水电体积开发区、大规模调水区、自然环境严重退化区（如石山区）、环境污染严重区（如大河三角洲）等，新的生态水文循环机制、变化规律及其与河流健康维持的关联。

（3）将生态水文学界定为“研究高强度人类开发活动对水文循环的干扰以及水生态系统的响应，以生态过程和水文过程耦合机制的尺度效应为学科关键点，以水资源可持续利用和维持生态系统永续健康发展为学科目标，揭示生态系统中生态格局和生态过程水文学机制，寻求环境友好、经济可行、社会可接受的多维、有效的淡水资源可持续管理模式。” 是科学、合理的。按此发展，从河流到流域，都需要大量与生态水文循环密切相关的系统观测数据，如对关键生态要素（生物）的变化以及变化对环境因子的响应等观测数据。现有的基本水文台站，不仅缺乏水生生物的观测，也缺乏河流生态系功能变化的监测，难于支持生态水文学的发展。因此，需要重新检视水文、生态监测体系，按生态水文学的发展需求，构建新的观测基准（包括观测指标体系建设和台网建设）。

Advancement of Eco-Hydrology for River Health Maintenance

Da-Ming He

As the lifelines of the earth surface ecosystem, rivers maintain the necessary habitat of earth surface life system. The river system dynamic courses maintain the balance of material and energy exchange such as moisture, nutrients, salt, sand and heat on earth surface, and offer the enormous economic, cultural and ecological service functions for people, becoming the cradle of human civilization.

Under the influences of global change trengthening, a series of critical economic, social and ecological issues have been resulted by the rapid changes of river ecosystem structure and function. The river ecosystem healthy maintenance and its functions' sustainable utilization have been focused and are becoming the governance targets in many countries.

In the long history, the human society mainly focused on the development and utilization of the economic function of river systems, however, the most important ecological functions of rivers were ignored. In china, the rapid hydropower development is the main driving force affecting river health. 60% available installed capacity of national hydropower resources is concentrated in southwest of China, and this area has become the major base of the national hydropower energy development. In recent years, as the large scale cascade hydropower dams building, the hydrological processes, ecological processes, and water environment of the rivers in this region have been changed dramatically, which is resulting in more and more conflicts between utilization of water resources and the maintenance of rivers health.

Basin is a relatively independent ecological unit, and the river system consists in the key ecosystem for the basin's eco-security. From river to basin, ecological integrity is the material basis for the maintenance of river health and ecological security of basin. However, only a few comprehensive studies on river health and their ecological integrity have been put forward. The development of the new interdisciplinary ecohydrology will offer powerful scientific basis for maintaining river health and watershed ecological security.

In China, under the influences of global change strengthening,, three aspects of ecohydrology need to be developed for the maintenance of river health and river basin ecological security:

(1) Expanding the tradition hydrological cycling concept to ecohydrological cycling, Re- recognizing the life support mechanism of the ecohydrological cycling, especially the maintenance mechanism of biodiversity; According to the ecohydrological cycling, re-consider the integrity and its ecological function of river and river basin ecosystems, so as to provide the scientific basis for the comprehensive development and coordinative management of river basin, and the maintenance of river health.

(2) The current knowledge frameworks on hydrology and ecology were built based on the researches about the natural environment and its change on the earth. It is difficult to solve the problems on ecohydrological cycle and its impacts in environments where are strongly influenced by large scale human activities. So, the new theories, methods, and approaches are needed to be developed to discover the ecohydrological cycle mechanism in the changed environments by intensive human activities, such as city rivers, large scale hydropower development area and inter-basin water division region, the serious environment deterioration area, and the heavy polluted area. And to discover the linkage between the ecohydrological cycle mechanisms and river health maintenance.

(3) In the conference, the ecohydrology is identified to research the influence of the high intensive human activities on hydrology cycling and the response from the river aquatic ecosystems. Its key scientific topic is the scaling effect of combinations of hydrological processes and ecological processes. Its scientific target is to facilitate the sustainable utilization of water resource and the maintenance of river ecosystem health; and its major purpose is to seek for effective freshwater sustainable governance models in environmental friendly, economic reasonably and social acceptable ways. Thus, abundant systematic data related to ecohydrological cycle are necessary from rivers to watersheds, such as the observation data of pivotal ecosystem essentials change and response to environmental factors. But in China, based on the available basic hydrological gauges, no enough data of aquatic organisms and river ecological function change could be used to facilitate the ecohydrology development. It is necessary to re-examine the monitoring index of both hydrology and ecology, and develop new ecohydrological monitoring network.

Luis CHICHARO

葡萄牙埃尔加夫大学教授；UNECSO 国际滨海生态水文学研究中心主任;

致力于从生态水文循环的角度阐释水生生态系统对高强度人类活动的响应特点与机制，阐释海岸水体酸化、温度改变对生物区系（鱼类、藻类等）的影响，研究城市排污对水生生态系统（鱼类）的影响，围绕欧盟水环境管理框架，研究葡萄牙、西班牙滨海地区生态响应指标体系、水环境管理方法和对策。

Associate Professor - Faculty of Marine and Environmental Sciences, University of Algarve; Director of the “International Centre for Coastal Ecohydrology” (under approval for UNESCO Centre)

Selected Publications：

Chícharo L. and M. A. Chícharo. (2006) Applying the Ecohydrology approach to the Guadiana estuary and coastal areas: lessons learned from dam impacted ecosystems. Estuarine Coastal and Shelf Science Volume 70, Issues 1-2:1-2

Chícharo, L. Chícharo, M. A, Ben-Hamadou, R. (2006). Use of a hydrotechnical infrastructure (Alqueva Dam) to regulate planktonic assemblages in the Guadiana estuary: basis for sustainable water and ecosystem services management. Estuarine Coastal and Shelf Science Volume 70, Issues 1-2:3-18

Chícharo, L.; Regala, J.; Gaspar, M.; Alves, F. & Chícharo M.A. (2002) Reburial time and indirect mortality of Spisula solida clams caused by dredging Fisheries Research. 59 (1-2), 247-258.

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Ecohydrology tools to manage coastal ecosystems impacted by dams

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Abstract:

Estuaries are threatened by a long series of anthropogenic activities. As a consequence, the carrying capacity of coastal ecosystems is exceeded and this has commonly led to a serious environmental degradation of estuaries and coastal waters worldwide. Modification in the freshwater discharge caused by dams and reservoirs, is one of the most influent factors affecting the dynamic functioning of estuaries and coastal ecosystems. In fact, today the more than 45,000 large dams (more than 15 meters high) are responsible for retaining more than 25 % of the world rivers discharge before reaching the ocean, with obvious consequences to estuarine and coastal ecosystems functioning.

At the Guadiana estuary, in south Portugal, significant changes were observed in the productivity, biodiversity and nursery functions of the estuarine ecosystem after the construction of the large Alqueva dam. These changes also affected the coastal zone ecosystem, as reflected by changes in fishes and bivalves assemblages and related coastal fisheries landings.

In this work we present a series of ecohydrology based tools for the integrated management of dams, considering the downstream ecological requirements of estuaries and coastal waters, that allows to control eutrophication symptoms, toxic algae blooms development, alien species spreading and simultaneously sustain estuarine nursery functions and coastal fisheries.

朱江

世界自然基金会（瑞士）北京代表处－武汉项目办公室高级项目官员，环境工程博士。

2003 年至今，负责世界自然基金会“汇丰银行长江项目”及“汇丰与气候伙伴同行”项目中与长江水生态环境及湖泊湿地保护相关的环境流恢复、江湖连通、湖泊生态渔业和珍稀水生生物保护的项目管理工作。

Jiang Zhu

Senior progarmme officer of World Wildlife Fund Beijing Office - Wuhan Programme 0ffice, Environmental Engineering Ph.D.

Since 2003, Dr. Zhu Jiang managed a series of projects related to the Yangtze River and lake wetland attribute to “Restoring the Web of Life in the Central Yangtze ” and “HSBC Climate Partnership” found by WWF including restoration of environmental flows, re-connection of rivers and lakes, lake ecological fisheries and protection of aquatic life in the rivers and lakes.

Selected Publications：

1、 重建江（河）湖动态联系，修复水网生态环境，人民长江，2004 年 9 月。

2、 重建江湖联系，保护涨渡湖湿地，人民长江，2005 年 11 月。

3、 天鹅洲长江故道湿地生物多样性保护的现状和对策，生物多样性保护，2005 年 10 月。

长江中下游环境流恢复探索与实践

朱江

摘要：本报告对长江流域生态水文所涉及的环境流概念、问题及影响进行了阐述，并介绍世界自然基金在长江中下游就恢复环境流项目。

“环境流”是指维持河流－湖泊－河口地区生态环境健康和生态服务价值，符合一定水质、水量和时空分布规律要求的河流水流体制。长江流域河流、湖泊和河口，孕育了丰富的生物多样性，为人类提供了丰富的水资源、鱼产品等自然资源以及净化水质、调蓄洪水、休闲游乐等服务功能。而长江周期性洪水－枯水过程，是形成自然资源、促进社会经济和文化发展的强大趋动力。

然而，由于人类活动和自然因素，长江流域的水流体制已发生了巨大改变。其中，人类的干扰活动主要包括长江干流的水利水电工程建设和长江中下游的江湖阻隔。所面临的典型问题有：

1、三峡工程已使长江水流发生较大变化，从而严重影响长江中下游水生态系统。主要包括：1)夏季长江水位降低，将阻碍河流与泛滥平原间水体交流和物质交换，导致洞庭湖、鄱阳湖湿地面积减小、生物多样性下降；2)长江中下游河水泥沙减少，水体透明度将显著上升，导致库区及长江干流藻类激增；库区清水下泄冲刷河道也将加速长江干流河道变化，并显著改变长江与湖泊的水位关系；3)三峡库区底层低温水下泄，使春季坝下干流水温偏低，加之洪峰低平，长江鱼类繁殖将受严重影响；4）库区蓄水期间，长江干流水量下降致使海水入侵河口地区的风险加大，河口淡水资源及河口生态环境将发生变化。

2、近 50 年来，特别是上世纪 50, 70 年代，长江中下游沿江湖泊大规模围垦，导致大多数湖泊与河流之间修建堤坝从而江湖阻隔，目前仅剩鄱阳湖、洞庭湖等少数湖泊自然通江。江湖阻隔的主要生态影响有：1)阻碍自然水文过程，降低湖泊生境异质性；2)阻碍鱼类的洄游和繁殖；3)减少水位波动幅度，阻碍湿生植被发育；4)水流静止，蓝绿藻等占优势。这些效应致使阻隔湖泊生物多样性大幅度下降，生态系统的结构和功能发生根本改变。

近年来， 在汇丰银行的资助下，WWF（世界自然基金会）实施“恢复长江生命网络”和“汇丰与气候伙伴同行”项目，推动绿色水电认证、三峡工程生态调度、长江中下游江湖连通等工作。在全球气候变化背景下，长江流域降雨模式将发生重大变化，环境流的研究、示范与推广、宣传与政策，已经成为 WWF 全球气候变化框架中适应性保护工作的重要部分。

Study and Implementation on the Recovery of Environmental Flows at Middle & Lower Reaches of the Yangtze River

Zhu Jiang

Abstract: In this report, the concept, problem and potential impact related to the Yangtze Watershed and its eco-hydrology have been discussed, and the project implemented by World Wildlife Fund to recovery the environmental flow at middle & lower reaches of the Yangtze River have been introduced.

"Environmental flow" refers to river flow regimes which can maintain Rivers-Lakers-Estuary ecological environmental health & ecological service, meeting the requirements of a certain water quality, quantity and spatial-temporal distribution. The Yangtze River basin, lakes and estuaries serve a wealth of biological diversity, and provide a wealth of water resources, fish products and other natural resources for people. Furthermore, they also offered water purification, flood storage, recreational and other service functions. And the periodic floods – dry process was the powerful driving force for formation of natural resources, promotion of socio-economic and cultural development.

Nevertheless, the Yangtze River water system has suffered huge changes by human activities and natural factors. The main interference with human activities includes the Yangtze River water conservancy and hydropower project construction and the barrier of the middle & lower reaches of Yangtze River. The typical eco-environmental problems are list as follows:

(1) The Three Gorges Project has brought significant change in river flow of the Yangtze River. The water ecosystems of the middle & lower reaches of Yangtze River have been seriously affected. Including: 1) Reduction of the Yangtze River water level would impede the water exchange and material exchange between the river and floodplain in summer. They also would decrease wetland area and biodiversity in Dongting Lake and Poyang Lake. 2) Sediment reduction in middle & lower Yangtze

River would increase water transparency remarkably, and that may result the blooms of algae in the Yangtze River and reservoir area. 3) The discharging of low temperature water at the bottom of Three Gorges Reservoir may result lower temperature water in dam downstream. Combined with smoothing flood peak, the fish breeding will be subject to a serious influence. 4) During reservoir water storage, the water flow of Yangtze River will get down, and increase the risk of estuarine seawater intrusion. Estuaries freshwater resources and their ecological environment will be changed significantly.

(2) In the past fifty years, especially the 1950s and 1970s, due to tremendous land reclamation along the lakes and the Yangtze River, a lot of dams between lakes and rivers have been constructed and resulting blocking rivers and lakes. Only a few lakes such as Poyang Lake and Dongting Lake connect Yangtze River naturally now. The main ecological impact of blocking rivers and lakes are including: 1) impeding the natural hydrological process, reducing lake habitat heterogeneity; 2) impeding fish migration and reproduction; 3) reducing water level fluctuations, impeding wetland vegetation development; 4) water flow static, and the dominance of cyanobacteria, etc. These influences would significantly decline the biological diversity of the blocking lakes, and the ecosystem structure and function were changed fundamentally.

In recent years, funded by HSBC, the project “Restoring the Web of Life in the Yangtze River” and “HSBC Climate Partnership” were implemented by World Wildlife Fund. WWF also tried to do other meaningful important work including promoting green hydropower certification, eco-operation of Three Gorges Dam and rivers-lakes connection in middle and lower Yangtze River. In the context of global climate change, the rainfall patterns of Yangtze River basin will undergo significant changes. The research, demonstration, promotion, advocacy and policy on environmental flows have become one of the most important parts of adaptive protection work for WWF global climate change framework.

Andrew PLATTER

英国利物浦大学教授

致力于通过放射性物质标示与示踪，从大尺度地学研究角度研究人类活动下的沉积相改变，分析全球环境变迁（海平面升高、生态系统演变等）同人类活动的相互影响，着重探讨湖泊、滨海等高强度人类活动区域的生态水文过程，探索可持续的环境管理对策和管理手段。

Professor in Physical Geography , Department of Geography, University of Liverpool

Research Interests:

Dr. Plater is an established researcher in the area of Holocene environmental change, particularly sea-level trends, coastal evolution, sediment flux and provenance in the UK, Europe and the USA. Radionuclide dating and tracing applications are another area of specialisation, primarily the use of U-series approaches to dating lake and alluvial sediments and in sediment yield and provenance determination. Recent areas of research activity include studies on metal and radionuclide pollution in tidal flat sediment in the UK and China, and the impact of human activity and climate on sedimentation in lakes and lagoons in Europe, USA, South Africa and Zambia. His current activity as Deputy Director of the Institute for SWIMMER has led to research developments in the areas of Estuarine Ecohydrology and Marine Management, being currently involved in scoping perimarine wetlands and saltmarshes as sustainable coastal and catchment management tools and on transdisciplinary co-operation amongst the social and natural sciences in Marine Spatial Planning

Selected Publications：

Plater, A.J., Stupples, P., and Roberts, H.M. (2009) Evidence of episodic coastal change during the late Holocene: The Dungeness barrier complex, SE England. Geomorphology, 104 (1-2), 47-58.

Plater, A.J. and Lang, A. (2008) (eds.) Fluvial Systems: Dynamics, Morphology and the Sedimentary Record. Special Issue in honour of Adrian Harvey.

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Plater, A.J. and Kirby, J.R. (2006) The potential for perimarine wetlands as an ecohydrological and phytotechnological management tool in the Guadiana estuary, Portugal. Estuarine, Coastal and Shelf Science, 70, 98-108.

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Plater, A.J. and Appleby, P.G. (2004) Tidal sedimentation in the Tees estuary during the 20th Century: radionuclide and magnetic evidence of pollution and sedimentary response. Estuarine Coastal and Shelf Science, 60, 179-192.

Estuary response to climate change and human impact: Managing the future with reference to the past

Andrew J. Plater

Present and future coastal populations rely on healthy estuarine, deltaic and lagoonal ecosystems for the delivery of goods and services that support human well-being. Sustainable provision of these ecosystem goods and services is highly dependent on effective management at the land-ocean interface under increasing pressure from climate change, population growth and human impact on catchment land-use and river hydrology. Examples are drawn from coastal wetlands over a range of timescales (Holocene to the present) to illustrate their sedimentary and geomorphic evolution in response to changing sea-level, climate, fluvial sediment flux and coastal morphology. Particular attention is given to coastal wetlands under conditions of high relative sea-level rise and reduced terrestrial sediment delivery during the mid-Holocene as a model for future estuary hinterlands where climate change is leading to accelerated sea-level rise and where river flow is becoming increasing impounded and recycled.

程根伟

中科院成都山地所研究员，副所长，四川省地理学会理事长。主要从事水文学与水资源研究，特别在森林水文学的原理及其效应评价，水文预报理论与技术，梯级水库群动力学模拟及优化调度等方面进行了系统的工作，研发出分布式水文模型、森林演替模型、河流水动力学模型以及梯级水库群调度模型等，发表论文 60 余篇，出版专著 5 部。

Gen-Wei Cheng

Research Professor, Deputy director of the Institute of Mountain Hazards and Environment, CAS. Chairman of Sichuan Society on Geography. Achieved Ph.D. degree on hydrology at Hohai University in 1988. Major in hydrology and water resources, especially in principles and assessment on forest hydrology, the hydrology forecast theories and technique, dynamic simulation and optimum operation of the cascades reservoirs etc. Recent works focus on distribution hydrology model, forest succession model, river hydrodynamic model and the cascading reservoirs operation model etc. Over 60 research papers and 5 monographs have been published.

Selected Publications：

1. Hydrology cycling and numerical modeling in the forest ecosystem in mountainous region. Beijing: Science Press, 2004.
2. Theory and Mathematical model in the Hydrological Forecasting. Beijing: China Waterpower Press, 2008.
3. Theory and Methodology in the Risk Analysis of Hydrology. Beijing: Science Press, 2009
4. Forest change: the hydrological effects of the upper Yangtze River valley, AMBIO, Royal Swedish Academy,25（4）,1998.10,
5. The Carbon accumulation and dissipation features of sub-alpine woodland in Mt. Gongga. Journal of Geographical Sciences, 13(1),2003
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三峡水库含生态目标的综合优化调度方法

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摘要：由三峡和葛洲坝构成的梯级水库具有库容大、调度灵活、具有反调节能力

的特点，充分发挥这一工程优势，实现径流泥沙优化调度，改善长江河流生态，是值得深入研究的重大工程学问题。作者研究了长江上游梯级水库开发对河流水文特性的影响，介绍了具有库区水沙动力学模拟功能的三峡梯级水库调度系统。针对三峡水库在初步设计阶段所确定的调度原则，提出可以采用汛前降低库水位消落速度，汛期加大库水位波动范围，汛后利用电站日调节产生人工潮汐等调度方法，在保证实现原有的防洪、发电和排沙等目标的条件下，避免不适当的人造洪水对鱼类繁殖的不利影响，增加河流水位和流量波动幅度，加大库区支流水量交换能力。所提出的综合调度方式将使水库上下河段的径流变化更接近天然河流特征，有利于改善河流水体生态和水环境质量。

Optimum Comprehensive Operating Scheme in the Three-Gorge Reservoir: Ecological Object Oriented

Abstract: The Three Gorges reservoir is of the characteristics of huge storage capacity and easily-be-controlled. They are the key scientific problems in making use of this engineering advantage, optimal controlling of flow-sediment and improving river ecological condition. The author discusses the comprehensive impacts of cascade reservoir construction to river flow in the upper Yangtze River. The Three Gorges Reservoir (TGR) simulation and operating system with function of flow-sediment dynamic simulation has been developed. Based on the operating designed mode of the TGR, some new methods have been proposed: Gently decreasing the water level before flood season; increasing the water level variation during the flood season; by means of daily regulation of hydropower station to generation artificial tides. These operating approaches can avoid the inadequacy man-made flood's disturbance to fish's propagate, enhance fluctuation of water-stage and discharge in river, and increase the stream exchange of main reach and branches of the river. These operating methods will make the change feature of stream similar to that of nature river, may improve the river ecological condition and water environment quality.

郭劲松

工学博士、教授、重庆大学城市建设与环境工程学院副院长、重庆大学三峡库区水质安全与生态重建研究院副院长。国际水协专家组成员、中国环保产业协会水污染控制专业委员会常务理事、重庆市水利学会副理事长、重庆市环境科学学会环境化学委员会副主任。主要研究方向：污染控制工程、水生态与水环境研究、城市给水排水工程。

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Deputy Dean of Research Institute of Three Gorges Reservoir Region's Ecological Reconstruction and Water Quality Security, Chongqing University.
IWA Expert Member

MAIN RESEARCH INTERESTS

Methodology and Technology Research on Water and Wastewater Treatment
Limnological study on surface water in the Three Gorges Reservoir and Environmental Management

Selected Published Papers in the Past 3 Years

1. 李哲, 郭劲松, 方芳等.三峡小江回水区氮素赋存形态与季节变化特点. 环境科学. 2009, 30(6): 28-34;
2. 李哲, 郭劲松, 方芳等. 三峡小江回水区蓝藻季节变化及其与主要环境因素的相互关系. 环境科学. 2010. 已录用.
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9. Long, T., Woo, M. 2008. Monthly Streamflow Simulation for Upper Changjiang Basin above the Three Gorges, China. Hydrological Sciences for Managing Water Resources in the Asian Developing World. IAHS Publ. 319-12
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三峡小江富营养化和水华研究进展与防控对策

重庆大学　郭劲松

三峡水库成库后，库区大多数支流回水区水华的频繁暴发已成为当前最为严重的生态环境问题之一。同湖泊相比，物理边界的不稳定使得支流回水区水华成因具有典型的特殊性和复杂性。本研究以库区典型支流—小江流域为研究对象，对其回水区段展开近 3 年的野外跟踪观测，从大时空尺度氮、磷生物地化循环、中尺度浮游植物群落演替及其生态响应特征、微观尺度生源要素界面传输机制和常见水华优势藻的生理生态特性等 3 个层面，揭示三峡水库调蓄下小江流域水文、水环境变化和水生态响应特点。对小江回水区富营养化和水华现象的主要认识包括以下几个方面：

1. 三峡水库小江回水区总体呈中-富营养状态，但水华现象发生频繁，敏感时段为 2~3 月冬末初春（硅藻）、4~5 月春末夏初（甲藻、蓝藻）和 8~10 月的夏末秋初（硅藻）。
2. 藻类各生境要素（水温、光照、营养物等）季节变化特点明显。颗粒态磷 PP 在 TP 中所占比重在洪水低水位运行期达到最高；冬季高水位运行下，溶解性活性磷酸盐 SRP 则逐渐成为 TP 的最主要赋存形态。氮素源汇关系因出现季节性的固氮型蓝藻水华而变得异常复杂，其季节性的波动较磷显著。虽然磷可能是小江回水区的限制性营养物，但其限制性程度并不高。
3. 固氮型蓝藻水华发生的主要诱因一方面同 4-5 月期间水温升高有关，另一方面在水土流失严重的流域背景下，春末夏初的短时强降雨过程使泥沙含量增加并在一定程度上改变了氮、磷的比例关系，为固氮型蓝藻生长创造了较优的生存环境，促其生长并诱发水华。
4. 三峡库区支流消落带是关键的氮、磷交换库；消落带土壤氮、磷含量并不低于长江中下游富营养浅水湖泊底泥的相应值，而在水库动态调蓄下，其将在很大程度上影响氮、磷的生物地球化学循环过程。
5. 对小江回水区富营养化和水华的防控除了开发应急防控技术外，可通过小江回水区的调节坝，改变水文、水动力过程加以实现。

Reviews of research advances and controlling strategies on eutrophication and algal blooms in the tributaries of the Yangtze in the Three Gorges Reservoir

Chongqing University, Jinsong Guo

The increase in the frequency of the algal blooms in the backwater areas of tributaries of the Yangtze River in the Three Gorges Reservoir (TGR) has become one of the most serious environmental issues after the initiate impoundment of the TGR. However, compared to lake systems that have a relative static physo-chemical boundary, the drastic seasonal water level fluctuation by the operation of the Three Gorges Dam contributed to a characteristic of complexity in the specific reservoir systems. The Xiaojiang, located in the mid-part of the TGR, was selected, and nearly 3 years limnological and ecohydological research campaign has put forward in 3 aspects, i.e. the large scale study on biogeochemical cycling of nitrogen & phosphorus, study on the succession patterns of phytoplankton community, soil-water interface transport of nitrogen and phosphorus and the response of phytoplankton assemblages. Current research progress was as follows:

1. General trophic status in the backwater area of Xiaojiang river (XBA) was meso-eutrophic. Algal blooms were frequently detected in Feb.~Mar.(Diatoms), April~May (Cyanobacteria, Dinoflagellata) and Aug.~Oct. (Diatoms).
2. Seasonal variations of major environmental parameters in the XBA were significant. Particulate phosphorus dominated in the forms of phosphorus in the flood season with low water level operation stage while soluble reactive phosphorus was the major forms of phosphorus. The sink & source of nitrogen was even complex due to the occurrence of N-fixing cyanobacteria blooms. General limiting nutrients was phosphorus, although N-limiting condition was also detected.
3. The occurrence of N-fixing cyanobacteria bloom in the end of spring and early summer was due to the following 2 reasons: the increase of water temperature, the sharp decrease of light transparency and change of N/P ratio by the suspended sediments due to the thunder storms and instable hydrodynamic condition during the time.
4. The water fluctuation zone (WFZ) in the tributaries was regarded as the significant exchange pool of nitrogen and phosphorus in TGR. The general level of nitrogen and phosphors in the soil of WFZ was no less than that in the sediments in the eutrophic shallow lake at the mid and lower reaches of the Yangtze River. Under the circumstances of the seasonal operation by TGD, the potential impact on patterns of biogeochemical cycling of nitrogen and phosphorus by WFZ was evident.
5. Besides the controlling techniques on algal bloom, modification of river flow regime by the regulation dam at the upper of XBA was regarded as an effective approach.