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热点文章

Tectonics, climate, and the rise and demise of continental aquatic species richness hotspots

Thomas A. Neubauer, Mathias Harzhauser, Elisavet Georgopoulou; et al.

Continental aquatic species richness hotspots are unevenly distributed across the planet. In present-day Europe, only two centers of biodiversity exist (Lake Ohrid on the Balkans and the Caspian Sea). During the Neogene, a wide variety of hotspots developed in a series of long-lived lakes. The mechanisms underlying the presence of richness hotspots in different geological periods have not been properly examined thus far. Based on Miocene to Recent gastropod distributions, we show that the existence and evolution of such hotspots in inland-water systems are tightly linked to the geodynamic history of the European continent. Both past and present hotspots are related to the formation and persistence of long-lived lake systems in geological basins or to isolation of existing inland basins and embayments from themarine realm. The faunal evolution within hotspots highly depends on warm climates and surface area. During the Quaternary icehouse climate and extensive glaciations, limnic biodiversity sustained a severe decline across the continent and most former hotspots disappeared. The Recent gastropod distribution is mainly a geologically young pattern formed after the Last Glacial Maximum (19 ky) and subsequent formation of postglacial lakes. The major hotspots today are related to long-lived lakes in preglacially formed, permanently subsiding geological basins.

（来源：PNAS, 2015, 112(37): 11478–11483）

中文点评:

<div align="center">冰川作用影响欧洲的内陆水生物种</div>

Thomas Neubauer 及其同事研究发现，欧洲内陆水系统的有限的生物多样性反映了在上次冰川作用末期启动的一个相对年轻的模式。巴尔干半岛的里海与奥赫里德湖目前是欧洲仅有的内陆水生生物多样性热点地区。然而，化石记录揭示出了古代物种丰富性很高，这与一系列长期存在的湖有关联。他们研究了内陆水系统的物种丰富性是否与改变地貌以及在地质时间和空间尺度上驱动气候变化的板块构造过程有关联。这组作者构建了从中新世到今天的大陆水生腹足动物的一个广泛的历史，并且证明了欧洲大陆的地球动力学史跟随了内陆水生生物多样性的出现和进化的步调。在长期存在的湖泊系统中繁盛的热点地区，温暖的气候遇到了强的动物群进化时期。相比之下，第四纪冰室的寒冷和冰川作用的加深，强烈地削减了内陆水生生物多样性，这预示着这个大陆各地多数之前存在的热区的消亡。这些发现合起来提示了目前欧洲内陆水道的物种丰富性模式是一个相对年轻的构造，它始于最近一次冰期的末期。

（来源：http://www.eurekalert.org）

Saving Iran's great salt lake

Richard Stone.

Lake Urmia, in Iran's northwestern corner, was once the planet's sixth largest salt lake, covering about 5200 square kilometers—a bit larger than the Great Salt Lake in Utah. Flamingos, egrets, and other waterfowl feasted on brine shrimp, and resorts catered to tourists who believed that bathing in the saline waters improves health. But after gradually receding for years, the water body shriveled last year to a mere 10% of its maximum. Like the Aral Sea, a better-known vanishing salt lake in Central Asia, Lake Urmia is exposing a salt desert that generates noxious dust, threatening crops and people. Wildlife is vanishing, all the way down to its endemic shrimp, and recreation is also on the extinction list. Iran plans to spend around $6 billion over the next decade on Urmia's revival—the largest environmental project in the country.

（来源：Science, 2015, 349: 1044-1047）

中文点评:

<div align="center">Science "伊朗科学"特刊报道：拯救乌尔米湖</div>

伊朗垂死的大型咸水体——乌尔米湖。该湖泊的水体正在快速地后退并暴露出一个产生毒尘的盐漠，这对农作物和人都构成了威胁。该湖泊的消亡原因大多可被归因于水的管理，流入乌尔米湖的近 90%的水来自 3 条河，但为了灌溉和水力发电，这 3 条河都被筑坝。该湖泊流域周围估计有 4 万口非法开采的井，它们也让问题变得复杂。为了挽救乌尔米湖，伊朗政府已经启动了其迄今为止最大规模的环保工程。

（来源：http://www.eurekalert.org）

Freshwater discharges drive high levels of methylmercury in Arctic marine biota

Amina T. Schartup;Prentiss H. Balcom; Anne Soerensen; et al.

Elevated levels of neurotoxic methylmercury in Arctic food-webs pose health risks for indigenous populations that consume large quantities of marine mammals and fish. Estuaries provide critical hunting and fishing territory for these populations, and, until recently, benthic sediment was thought to be the main methylmercury source for coastal fish. New hydroelectric developments are being proposed in many northern ecosystems, and the ecological impacts of this industry relative to accelerating climate changes are poorly characterized. Here we evaluate the competing impacts of climate-driven changes in northern ecosystems and reservoir flooding on methylmercury production and bioaccumulation through a case study of a stratified sub-Arctic estuarine fjord in Labrador, Canada. Methylmercury bioaccumulation in zooplankton is higher than in midlatitude ecosystems. Direct measurements and modeling show that currently the largest methylmercury source is production in oxic surface seawater. Water-column methylation is highest in stratified surface waters near the river mouth because of the stimulating effects of terrestrial organic matter on methylating microbes. We attribute enhanced biomagnification in plankton to a thin layer of marine snow widely observed in stratified systems that concentrates microbial methylation and multiple trophic levels of zooplankton in a vertically restricted zone. Large freshwater

inputs and the extensive Arctic Ocean continental shelf mean these processes are likely widespread and will be enhanced by future increases in water-column stratification, exacerbating high biological methylmercury concentrations. Soil flooding experiments indicate that near-term changes expected from reservoir creation will increase methylmercury inputs to the estuary by 25–200%, overwhelming climate-driven changes over the next decade.

（来源：PNAS, 2015, DOI:10.1073/pnas.1505541112）

中文点评：

<div align="center">

洪水泛滥与北极水的神经毒素

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研究表明，在下一个十年时间里，水电产业可能让气候变化对北方生态系统的影响加剧，并让食用来自这些河口的北极海洋哺乳动物和鱼类的土著人口的健康面临风险。沿海的鱼类和海豹从各种来源得到甲基汞（MeHg）这种强效神经毒素，但是北极河流与海冰融化的淡水流的增加以及与水电开发有关的洪水，是否可能增加甲基汞（MeHg）浓度，这仍不清楚。Amina T. Schartup 及其同事研究了加拿大拉布拉多地区梅尔维尔湖的亚北极地区的甲基汞（MeHg）制造和生物积累的环境驱动因素。这组作者测量了沿着从淡水区到外拉布拉多海不断增加的盐度梯度的海水、海底沉积物以及浮游动物样本的汞与甲基汞（MeHg）浓度。这些发现揭示出了生活在分层的海水——表面的盐含量低，在深处的盐含量高——中的浮游动物比在中纬度生态系统中的生物积累了更多的甲基汞（MeHg）。这些发现很可能是由于被称为海洋雪的一个有机物薄层造成的，它浓缩了微生物甲基化，而且还可能是由于在一个相对小的区域中的食草和食肉浮游动物的存在。这组作者说，这些发现提示，水电产业建立的蓄水库可能在未来十年时间里增加河口的甲基汞（MeHg）浓度达 25%到 200%，这超过了气候变化预计造成的影响。

（来源：http://www.eurekalert.org）

摘要精选

Sediment transport dynamics near a river inflow in a large alpine lake

Scheu, K. R.; Fong, D. A.; Monismith, S. G.; et al.

Sediment dynamics were investigated in Lake Maggiore, Italy, with field observations from October to mid-December 2012. Three moorings were deployed in Pallanza Bay, a small embayment on the western side of the lake near the Toce River inflow, to measure temperature and currents throughout the water column and suspended sediment concentration (SSC) was estimated with acoustic instrumentation. River intrusions are shown to dominate observed SSC, although a small amount of sediment resuspension was observed at the site of the shallowest mooring during a large wind event that produced strong upwelling of the thermocline followed by downwelling. Although vertical turbulent sediment flux is typically assumed to indicate resuspension and the upward transport of sediment ($\overline{(w'c')} > 0$), downward turbulent sediment flux was observed ($\overline{(w'c')} < 0$) near the bed during

the largest observed intrusion event. The downward turbulent sediment flux significantly contributes to net deposition rates, which are one order of magnitude larger than rates of erosion measured during the two major events observed. Horizontal transport of sediment occurs in vertically confined layers due to buoyancy-driven intrusions. Beneath the intrusions, sediment settles out of the water column at settling rates that appear to be constant with depth based on acoustic Doppler current profiler backscatter measurements. The effective settling velocities needed to produce the observed vertical transport of SSC during an inflow intrusion are one order of magnitude larger than those due to the Stokes settling velocity (w(s)) alone. Particle flocculation and possible convective instabilities may play a role in generating the large observed effective settling rates.

（来源：LIMNOLOGY AND OCEANOGRAPHY, 2015, 60(4): 1195-1211）

Evaporation from Lake Kinneret, Israel, during hot summer days

Shilo, Elad; Ziv, Baruch; Shamir, Eylon; et al.

The relationships between the evaporation from a medium size (168.7 km(2)) Lake Kinneret (Northern Israel), and its governing synoptic factors are well demonstrated during the summer of 2010. During July-August the daily temperature of the air and water surface were similar to 2-4 degrees C higher, the daily wind over the lake was similar to 80% weaker, and the evaporation from the lake was similar to 5% lower than the long-term July-August mean. In this study, we explore the impact of the regional and local synoptic-scale atmospheric conditions on the evaporation from the lake during exceptionally hot days in the mid-summer months (July-August). The factors that were found to be correlated with the lake evaporation are the temperatures at 850 hPa (negative) and 500 hPa (positive), the sea level pressure difference between Northern Egypt and Armenia (positive), and the height of the marine inversion (positive). Synoptic analysis indicates that two conditions are responsible for the reduction of the Mediterranean Sea Breeze (MSB) during exceptionally hot days, and consequently to the reduction of evaporation from the lake. First, the weakening of the permanent synoptic Etesian winds, which otherwise supports the inland penetration of the MSB; and second, the descent of the marine inversion to a height below the topographic ridge of the Galilee Mountains upwind of the study area, which blocks the Marine Sea Breeze from reaching Lake Kinneret.

（来源：JOURNAL OF HYDROLOGY, 2015, 528: 264-275）

Hysteretic relationships in inundation dynamics for a large lake-floodplain system

Zhang, Qi; Werner, Adrian D.

Large lake floodplains have important roles in mitigating floods and providing vital habitats for wetland biota. This paper explores the hydrology of the extensive floodplains of Poyang Lake (China) to highlight complex, hysteretic relationships in the inundation dynamics, which are controlled by the heterogeneity of the land surface and time-varying exchanges between the Lake, its catchment and the Yangtze River. A physics-based hydrodynamic model of the system was used to evaluate the development and degree of hysteresis in the relationships between the flooded area, the water storage volume and the water level elevation. The modeling results indicate that the degree of hysteresis varies spatially with point of reference within the Lake. It is noted that a clockwise hysteresis is present for the majority of the Lake,

but a counter-clockwise hysteresis is present at the upstream boundary, similar to a river-floodplain behavior. Both the floodplain and the permanently inundated region contribute to Poyang Lake's volume-stage hysteretic effects. The time-varying inflow from rivers in the catchment is the major factor affecting hysteresis, rather than Yangtze River controls on Lake discharge. As expected, an increase in land surface roughness (representing denser vegetation cover) produced greater hysteresis, most notably in the storage curve and derived mainly from the floodplain region. Hysteresis is an important characteristic of the floodplain hydrology that needs to be incorporated in simpler models of the inundation dynamics to avoid errors of up to 50% in the floodplain water storage. The current study shows for the first time the hysteretic nature, and its major causal factors, of the hydrology of a large lake-floodplain system. An improved understanding of Poyang Lake floodplain behavior is offered to guide the future development of water management models.

（来源：JOURNAL OF HYDROLOGY, 2015, 527: 160-171）

Change in event-scale hydrologic response in two urbanizing watersheds of the Great Lakes St Lawrence Basin 1969-2010

Trudeau, M. P.; Richardson, Murray

The cumulative impacts of urban land use change on natural stream flow regimes and lotic ecosystems are poorly understood, and generally under-studied within the hydrologic sciences literature. Moreover, flow assessments using daily or monthly flows cannot adequately characterize long-term trends in event-scale flow dynamics in urbanizing watersheds. Accordingly, we analyzed high temporal resolution (15-min flows) growing season discharge records for two urbanizing watersheds in Canada's Great Lakes Basin, the Don and Humber, over a 42-year period. Results show that total discharge between May 26th and November 15th in the mainstem rivers has increased by about 45%, independent of total rainfall depth, over four decades. Peak rain event flow rates have increased by almost 0.1 m(3) s(-1) yr(-1) in both watersheds and event flow variability has increased two-fold in the Don and almost five-fold in the Humber. In the Don, the ratio of rising limb event flows to median flow (for the period May 26 to November 15) increased from 1.5 in the 1970's to 2.3 in the 2000's. A similar comparison of ratios in the Humber showed similar results, with higher variation in flow response Rising limb event flow acceleration increased 2-fold over 4 decades in the Don and slightly more in the Humber. This study provides a new understanding of the changes in event-scale flow regime dynamics associated with over four decades of intensive urbanization, including increased magnitude of rising limb flows and flow acceleration, and systematic increases in the variability of peak discharges. Overall, our analysis demonstrates marked alteration in total and event flow regimes resulting in chronic perturbation of stream flows. The results demonstrate an important application of long-term, high temporal resolution hydrological records. Furthermore, we quantify the degree to which hydrologic stationarity within the Don and Humber watersheds has been compromised over four decades, during a period prior to detectable climate-induced changes in rainfall patterns.

（来源：JOURNAL OF HYDROLOGY, 2015, 527: 1174-1188）

Variation of water level in Dongting Lake over a 50-year period: Implications for the impacts of anthropogenic and climatic factors

Yuan, Yujie; Zeng, Guangming; Liang, Jie; et al.

Understanding the variation regularity of water level and the potential drivers can provide insights into lake conservation and management. In this study, inter- and inner-annual variations of water level in Dongting Lake during the period of 1961-2010 were analyzed to determine whether anthropogenic or climatic factor should be responsible for the variations. The results showed that water level decreased significantly during the period of 1961-1980, while increased significantly during the period of 1981-2002 at the 5% significance level. However, the variation trend of water level after 2002 did not reach a significant level. The variation in the dry season was more obviously than that in the wet season. The date when water level was firstly below 24 m during the period of 2003-2010 appeared about 27 days earlier than usual, and the date was even advanced to mid-September in 2006. As for the duration, water level was below 24 m for about 185 days in the period of 2003-2010 and 20-30 days longer than the other two periods. In conclusion, water level might be influenced by a combination of anthropogenic and climatic factors, with rainfall probably as the main driver responsible for hydrological alteration during the period of 1961-1980 and 1981-2002 while dam construction as the main driver during the period of 2003-2010. Under the circumstance of uncontrollable climate change, effective measures for reservoir operation should be put forward to maintain the ecological integrity and ensure water release and storage capacity of aquatic ecosystems.

（来源：JOURNAL OF HYDROLOGY, 2015, 525: 450-456）

基于 ICESat/CrysSat-2 卫星测高及站点观测的纳木错湖水位趋势变化监测

宋春桥, 叶庆华, 程晓

青藏高原的内陆湖是区域气候变化的重要指示器。近年来，卫星测高技术成为高原湖泊动态的有力观测手段。目前，冰卫星(ICESat)测高数据(2003～2009 年)已成功运用于高原内部湖泊水位变化监测，而高原湖泊水位的持续监测则依赖于高精度的新型卫星如 CryoSat-2 卫星(2010 年发射)。本文选择纳木错作为研究对象，基于实测水位数据，评价 CryoSat-2 卫星(适中的地面脚点)测高数据的精度。研究表明该卫星获取的湖泊水位与实测结果的相关系数达到 0.71 (P < 0.01)，平均误差和均方根误差分别为−0.12 m 和 0.18 m。综合 ICESat 和 CryoSat-2 两颗卫星测高数据和实测水位，进一步分析了纳木错水位在 2003～2013 年内的变化规律。结果显示，纳木错水位在 2003～2008 年处于快速上涨阶段，增速为每年 0.24 ±0.04 m；在 2009～2013 时段，水位表现为微弱下降，年变化−0.09 ±0.04 m。基于气象站点的气候观测数据，纳木错湿季水位增量表现出与降雨量显著正相关，后期的湖泊水位增速减缓甚至下降可能与当地气候干湿变化密切相关。

（来源：科学通报, 2015, 60(21): 1287-1297）

Modeling circulation and seasonal fluctuations in perennially ice-covered and ice-walled LakeUntersee, Antarctica

Steel, H. C. B.; McKay, C. P.; Andersen, D. T.

Lake Untersee, Antarctica, is a freshwater perennially ice covered lake bounded along its north by the Anuchin glacier. The Massachusetts Institute of Technology general circulation model, used on a representative wedge-shaped lake and actual bathymetry for Lake Untersee, produces estimates for circulation and long-term temperature and mixing trends. Modeled circulation is dominated by an anticyclonic gyre in front of the glacier, with slower similar to 3mms-1 flow exhibited around the lake's perimeter, allowing effective mixing throughout most of the lake with time scales of one month. Estimated velocities bound maximal glacial flour particle size at similar to 10m for effective transport throughout the lake, consistent with the sediment's mostly fine composition observed in field studies, and mixing time scales mean nonuniformities in measured O-2 concentration likely require recent or ongoing sources. Areas in which large temperature gradients prevent exchange of fluid demonstrate minimal mixing, such as the lake's upper water layers and the anoxic basin in the south, and circulation is consistently slowed in the northern sheltered bay area. Mean flow velocities fluctuate by about one fifth of their magnitude between summer and winter, and the lake's almost homothermal body temperature varies by about one tenth of a degree over the same period. While calculated temperature profiles qualitatively agree with field data, the model's long-term equilibrium temperature differs substantially, likely due to poor description of heat transfer with the glacier. Model robustness tests show results differ by approximate to 10% when either grid scale or water temperature are halved.

（来源：LIMNOLOGY AND OCEANOGRAPHY, 2015, 60(4): 1139-1155）

Quantile regression improves models of lake eutrophication with implications for ecosystem-specific management

Xu, Yaoyang; Schroth, Andrew W.; Isles, Peter D. F.; et al.

Although commonly used by those tasked with lake management, the statistical approach of data averaging (DA) followed by ordinary least-squares regression (OLSR) to generate nutrient limitation models is outdated and may impede the understanding and successful management of lake eutrophication. Using a 21-year data set from Lake Champlain as a case study, the traditional DA-OLSR-coupled approach was re-evaluated and improved to quantify the cause-effect relationships between chlorophyll (Chl) and total nitrogen (TN) or total phosphorus (TP). We confirmed that the commonly used DA-OLSR approach results in misleading cause-effect nutrient limitation inferences by illustrating how the process of DA reduces the range of data distribution considered and masks meaningful temporal variation observed within a given period. Our model comparisons demonstrate that using quantile regression (QR) to fit the upper boundary of the response distribution (99th quantile model) is more robust than the OLSR analysis for generating eutrophication models and developing nutrient management targets, as this method reduces the effects of unmeasured factors that plague the OLSR-derived model. Because our approach is statistically in line with the ecological law of the minimum', it is particularly powerful for inferring resource limitation with broad potential utility to the ecological research community. By integrating percentile selection (PS) with QR-derived model output, we developed a PS-QR-coupled approach to quantify the relative importance of TN and TP reductions in a eutrophic system. Utilising this approach, we determined that the reduction in TP to meet a specific Chl target should be the first priority to mitigate eutrophication in Lake Champlain. The structure of this statistically robust and straightforward approach for developing nutrient reduction targets can be easily adopted as an individual lake-specific tool for the research and management of other lakes and reservoirs with similar water quality data sets. Moreover, the PS-QR-coupled approach developed here is

also of theoretical importance to understanding and modelling the interacting effects of multiple limiting factors on ecological processes (e.g. eutrophication) with broad application to aquatic research.

A hydrodynamics-based approach to evaluating the risk of waterborne pathogens entering drinking water intakes in a large, stratified lake

Hoyer, Andrea B.; Schladow, S. Geoffrey; Rueda, Francisco J.

Pathogen contamination of drinking water lakes and reservoirs is a severe threat to human health worldwide. A major source of pathogens in surface sources of drinking waters is from body-contact recreation in the water body. However, dispersion pathways of human waterborne pathogens from recreational beaches, where body-contact recreation is known to occur to drinking water intakes, and the associated risk of pathogens entering the drinking water supply remain largely undocumented. A high spatial resolution, three-dimensional hydrodynamic and particle tracking modeling approach has been developed to analyze the risk and mechanisms presented by pathogen dispersion. The pathogen model represents the processes of particle release, transport and survival. Here survival is a function of both water temperature and cumulative exposure to ultraviolet (UV) radiation. Pathogen transport is simulated using a novel and computationally efficient technique of tracking particle trajectories backwards, from a drinking water intake toward their source areas. The model has been applied to a large, alpine lake - Lake Tahoe, CA-NV (USA), The dispersion model results reveal that for this particular lake (1) the risk of human waterborne pathogens to enter drinking water intakes is low, but significant; (2) this risk is strongly related to the depth of the thermocline in relation to the depth of the intake; (3) the risk increases with the seasonal deepening of the surface mixed layer; and (4) the risk increases at night when the surface mixed layer deepens through convective mixing and inactivation by UV radiation is eliminated. While these risk factors will quantitatively vary in different lakes, these same mechanisms will govern the process of transport of pathogens.

Isomeric specific partitioning behaviors of perfluoroalkyl substances in water dissolved phase, suspended particulate matters and sediments in Liao River Basin and Taihu Lake, China

Chen, Xinwei; Zhu, Lingyan; Pan, Xiaoyu; et al.

The occurrence and distribution of eleven perfluoroalkyl substances (PFASs) and the isomers of perfluorooctanoate (PFOA), perfluorooctanesulfonate (PFOS) and perfluorooctane sulfonamide (PFOSA) were investigated in water dissolved phase, sediment and suspended particulate matter (SPM) in two typical watersheds in China: Liao River Basin and Taihu Lake. The total concentrations of the PFASs in the dissolved phase were 44.4-781 ng/L in Liao River with high contribution of perfluorobutane sulfonate (PFBS) (75.7%) and PFOA (9.86%). The PFASs in the dissolved phase in Taihu Lake was 17.2-94.4 ng/L with PFOA (39.8%), perfluorohexanoate (PFHxA) (30.1%) and PFOS (16.8%) as the dominant PFASs. The log Koc values of the PFASs in both SPM and sediment increased with increasing the perfluorinated carbon chain length. In Liao River Basin, the long chain perfluorocarboxylates (C10-12)

bound with SPM contributed >30% to the total amount in water, suggesting that SPM could not be ignored when the environmental load of long chain PFASs in water was assessed. For the isomers of PFOA, PFOS and PFOSA, the linear isomers always displayed higher partition coefficients on particulate phases than the branched ones. An established isomer-profiling technique was applied to assess the relative contributions of various industrial origins for PFOA. In Liao River, when SPM was included in the water samples, there were contributions of PFOA from electrochemical fluorination (ECF) (similar to 55%), linear telomer (similar to 41%) and isopropyl telomer (similar to 4%) sources. While, the results based on the dissolved phase alone indicated more contribution of ECF (similar to 70%) source and lower contribution from linear telomer (similar to 26%) source. The discrepancy suggests that omitting SPM from water samples might lead to misunderstanding on the industrial origins of PFOA. In Taihu Lake, the isomer profile of PFOA was influenced mainly by ECF (similar to 88%) and partially by linear-telomer (similar to 12%) sources.

（来源：WATER RESEARCH, 2015, 80: 235-244）

Processes that control water chemistry and stable isotopic composition during the refilling of LakeNgami in semiarid northwest Botswana

Meier, Scott D.; Atekwana, Eliot A.; Molwalefhe, Loago; et al.

Lake Ngami in semiarid Botswana was dry until 2009 when it began filling with water because of regional increases in precipitation and from redirection of water to the lake from distributaries of the Okavango River. We measured the physical, chemical and stable isotopic composition of lake water collected at 25 cm below the surface along a 18 km axial transect from the inflow river to the distal end of the lake. Our objective was to determine the processes that control water properties and to establish baseline values for future temporal and spatial comparisons. The major ionic concentrations (e.g., Cl^-, Na^+, Ca^{2+}) and the stable oxygen (delta O^{-18}) and hydrogen (SD) isotope ratios show three distinct regions of increasing concentrations and isotopic enrichment, respectively along the transect. The delta O^{-18} vs. SD data plot along the Okavango Delta evaporation line and suggest modification of lake water by evaporation. The proportions of the major ions in the inlet water and in the lake were similar and logCl(-) vs. logNa(+) suggests an evaporative enrichment of solutes. The segmentation of the major solutes and the delta O^{-18} and SD into three regions along the axial transect results from differential evaporation of lake recharge from 2010, 2011 and 2012, and are thus controlled by the residence time of recharge in the lake. Unlike the major ions, the dissolved inorganic carbon (DIC) concentrations and the stable carbon isotopic ratios (PC) of DIC increase along the axial transect to about midway in the lake, and then reach steady state. The delta C^{-13} of dissolved organic matter in the inlet river and lake averaged similar to-25.7 +/- 0.3 parts per thousand while that for particulate organic carbon decreased from similar to-24 parts per thousand in the inlet river to similar to-28 parts per thousand in the lake from water column productivity. Carbon cycling in Lake Ngami is controlled by evaporation which increase DIC concentrations and equilibration between carbon in DIC and atmospheric $CO_2(g)$. The results show the importance of evaporation and residence time in controlling the solute chemistry and the dominance of atmospheric $CO^2(g)$ in controlling carbon cycling during the filling stages of lakes in arid environments.

（来源：JOURNAL OF HYDROLOGY, 2015, 527: 420-432）

Metagenomic insights into strategies of aerobic and anaerobic carbon and nitrogen transformation in boreal lakes

Sari Peura, Lucas Sinclair, Stefan Bertilsson; et al.

Thousands of net-heterotrophic and strongly stratifying lakes dominate the boreal landscape. Besides their central role as emitters of greenhouse gases, we have only recently begun to understand the microbial systems driving the metabolic processes and elemental cycles in these lakes. Using shotgun metagenomics, we show that the functional potential differs among lake types, with humic lakes being particularly enriched in carbon degradation genes. Most of the metabolic pathways exhibit oxygen- and temperature-dependent stratification over depth, coinciding with shifts in bacterial community composition, implying that stratification is a major factor controlling lake metabolism. In the bottom waters, rare and poorly characterized taxa, such as ε-Proteobacteria, but also autotrophs, such as photolithotrophic Chlorobia were abundant. These oxygen-depleted layers exhibited high genetic potential for mineralization, but also for fixation of carbon and nitrogen, and genetic markers for both methane production and oxidation were present. Our study provides a first glimpse of the genetic versatility of freshwater anoxic zones, and demonstrates the potential for complete turnover of carbon compounds within the water column.

Greenhouse gas emission and storage in a small shallow lake

Bartosiewicz, M.; Laurion, I.; MacIntyre, S.

Small lakes are likely to show considerable temporal variability in greenhouse gas emissions given their transient stratification and short residence time. To determine the extent that CO_2 and CH_4 emission and storage depends on surface meteorology, we studied a shallow lake during 2 years with contrasting rainfall and thermal stratification. Gas fluxes were estimated with wind-based and surface renewal models and compared to direct measurements obtained with floating chambers. The assessment of greenhouse gases storage revealed that the lake gained CO_2 in association with rainfall in both the rainier (2011) and drier summer (2012). In 2011, stratification was less extensive and disrupted frequently. The lake was a source of CO_2 and CH_4, and ebullition exceeded diffusive fluxes of CH_4. In 2012, stratification was more persistent, the lake was a sink for CO_2 during dry periods, CO_2 and CH_4 accumulated in the hypolimnion later in the summer when rainfall increased, diffusive fluxes of CH_4 were similar to those in 2011 mid-summer and over four times higher during overturn. Ebullition was lower in the drier summer. Fluxes measured with chambers were closer to estimations from the surface renewal model and about two times values estimated with wind-based models.

Large difference in carbon emission – burial balances between boreal and arctic lakes

E. J. Lundin, J. Klaminder, D. Bastviken; et al.

Lakes play an important role in the global carbon (C) cycle by burying C in sediments and emitting CO_2 and CH_4 to the atmosphere. The strengths and control of these fundamentally different pathways are

therefore of interest when assessing the continental C balance and its response to environmental change. In this study, based on new high-resolution estimates in combination with literature data, we show that annual emission:burial ratios are generally ten times higher in boreal compared to subarctic – arctic lakes. These results suggest major differences in lake C cycling between biomes, as lakes in warmer boreal regions emit more and store relatively less C than lakes in colder arctic regions. Such effects are of major importance for understanding climatic feedbacks on the continental C sink – source function at high latitudes. If predictions of global warming and northward expansion of the boreal biome are correct, it is likely that increasing C emissions from high latitude lakes will partly counteract the presumed increasing terrestrial C sink capacity at high latitudes.

（来源：Scientific Reports, 2015, 5, DOI:10.1038/srep14248）

缅甸 Twintaung 玛珥湖碳酸盐年纹层及 100 年来微区原位元素分析

孙青，单雅冰, SEIN Kyaing, 等

报道了缅甸蒙育瓦地区发现的 5 个玛珥湖，通过对这些玛珥湖的纹层研究，发现深度最大的 Twintaung 玛珥湖发育了碳酸盐年纹层，纹层层偶由厚度约为 50~400 m 的碳酸盐微层以及厚度 100~600m 的碎屑-有机质层组成，其中碳酸盐微层是鉴定年纹层的重要标志。Twintaung 玛珥湖年纹层的形成与缅甸蒙育瓦地区特殊的气候环境密切相关，每年 12~4 月为"干-热季"，降水少、蒸发高、湖水过饱和，导致方解石微晶生成；同时，每年干旱季节也是蓝藻 Spirulina 的繁盛时期，藻类繁盛需要消耗大量的 CO_2，也促使碳酸盐生成.5~11 月为"湿-热季"，降水较多，形成碎屑、有机质混合层。独立的核素测年(137Cs, 210Pb)数据与纹层计数基本一致，证明了纹层的年季特征。为了理解元素指标的气候意义，我们运用同步辐射原位分析方法获得高分辨率元素数据，并与气象观测记录对比。通过主成分分析及与气象记录的对比，认为第一主成分主要包括岩石成因的元素(K, Ti, Fe, Cu, Zn,Rb 和 Zr 等)，可能主要与物理化学风化作用、降水以及粉尘输入有关，影响因素复杂；第二主成分主要包括元素 Ca 和 Sr，主要赋存于碳酸盐颗粒中，可能主要与蒸发-降水关联。气候干旱时期，湖水中 Ca 离子呈过饱和，促使碳酸盐沉淀。缅甸 Twintaung 玛珥湖碳酸盐年纹层沉积中 Ca 元素可能是高分辨率古气候变化研究的重要替代指标。

（来源：科学通报, 2015, 60(11): 1038-1047）

The influence of dissolved organic carbon on primary production in northern lakes

Seekell, David A.; Lapierre, Jean-Francois; Ask, Jenny; et al.

Dissolved organic carbon (DOC) concentrations in lakes are changing globally, but little is known about potential ecosystem impacts.We evaluated the relationship between DOC and whole-lake primary production in arctic and boreal lakes. Both light extinction (inhibits primary production) and nutrient availability (stimulates primary production) are positively and nonlinearly related to DOC concentration.

These nonlinearities create a threshold DOC concentration (4.8mg L-1), below which the DOC-primary production relationship is positive, and above which the relationship is negative. DOC concentration varies maximally between regions, creating a unimodal relationship between primary production and DOC that emerges at broader scales because arctic lakes largely fall below the threshold DOC concentration, but boreal lakes fall above it. Our analysis suggests that the impact of DOC trends on lake primary production will vary across lakes and regions as a result of contrasting baseline conditions relative to the DOC threshold.

（来源：LIMNOLOGY AND OCEANOGRAPHY, 2015, 60(4): 1276-1285）

Effects of increased concentrations of inorganic nitrogen and dissolved organic matter on phytoplankton in boreal lakes with differing nutrient limitation patterns

Daggett, Carmen T.; Saros, Jasmine E.; Lafrancois, Brenda Moraska; et al.

Global changes are currently contributing to increasing concentrations of nitrogen (N) and dissolved organic matter (DOM) in boreal lakes. While these changes can affect phytoplankton, the relative importance of each of these subsidies and how their effects vary with nutrient limitation patterns remain unclear. We investigated the effects of increasing N and DOM on phytoplankton in two relatively remote boreal regions of the northern US with lakes that differ in N and DOM concentrations: Acadia National Park (ACAD) in the northeastern US, and Isle Royale National Park (ISRO) in the north-central US. Nutrient enrichment assays were conducted in two lakes from each area first to assess nutrient limitation patterns. To determine the effects of increasing N and DOM, changes in phytoplankton biomass and community structure were examined in bioassay experiments using a N gradient combined with either DOM enrichment or DOM shading treatments. Algal biomass response indicated N limitation in ISRO and N&P co-limitation in ACAD. In the N gradient experiments, algal biomass in the N-limited lake increased along the N gradient, while it was unaffected in the N&P co-limited lake. Regardless of nutrient limitation pattern, algal biomass increased with DOM enrichment, with DOM additions primarily stimulating chlorophytes, diatoms, and chrysophytes. In contrast, shading with DOM had no effect on any phytoplankton response metrics. In boreal lakes, the effects of N enrichment were dependent on nutrient limitation status of the lake, whereas the effects of DOM enrichment were observed across lakes regardless of nutrient limitation status, suggesting that increasing DOM may have widespread effects on aquatic systems.

（来源：AQUATIC SCIENCES, 2015, 77(3): 511-521）

Water quality changes following nutrient loading reduction and biomanipulation in a large shallow subtropical lake, Lake Griffin, Florida, USA

Fulton, Rolland S., III; Godwin, Walter F.; Schaus, Maynard H.

Lake Griffin received discharges for decades from muck farms developed on former floodplain wetlands, leading to hypereutrophic conditions. Management actions included wetland restoration of farmland to reduce nutrient discharges, and harvesting of gizzard shad to remove nutrients in fish biomass and

reduce nutrient recycling from sediments. Despite a reported susceptibility to wind-driven sediment resuspension, there have been substantial improvements in water quality in Lake Griffin, including decreases in nutrient concentrations, chlorophyll-a, and cyanobacterial biovolume, and increases in water transparency. Water quality improvements in Lake Griffin were substantially greater than occurred in ten comparison lakes. External nutrient load reduction was the primary factor contributing to water quality improvement, although there was evidence of an effect of shad harvesting, including correlations between shad catch per unit effort and nutrient concentrations, and an estimated effect of biomass removal and recycling reduction accounting for about 40% of the external load during the harvest period. Net production of total nitrogen in the lake was strongly related to external total phosphorus loading, indicating phosphorus limitation of nitrogen fixation. The response of Lake Griffin indicates that the combination of external nutrient load reduction and biomanipulation can result in sustained improvements in water quality in shallow subtropical lakes.

（来源：HYDROBIOLOGIA, 2015,753(1): 243-263）

Deriving nutrient targets to prevent excessive cyanobacterial densities in US lakes and reservoirs

Yuan, Lester L.; Pollard, Amina I.

High densities of cyanobacteria can interfere with the use of lakes and reservoirs for recreation and as sources for drinking water, and one approach for reducing the amount of cyanobacteria is to reduce nutrient concentrations in the waterbody. An approach is described for deriving numeric targets for concentrations of total phosphorus (TP) and total nitrogen (TN) that are associated with a pre-specified probability of cyanobacterial biovolume that exceeds the recommended World Health Organization thresholds for recreation in the water. The analysis consisted of two phases. First, a divisive tree algorithm was used to identify groups of lakes in which the relationship between nutrients and cyanobacterial biovolume was similar. Second, hierarchical Bayesian models were used to estimate relationships between cyanobacterial biovolume, TP and TN, while partitioning the observed variance in biovolume into components associated with sampling variability, temporal variability, and among-lake differences. The final model accounted for 91% of the variance in cyanobacterial biovolume among different lakes and was used to identify nutrient concentrations that maintain a low probability of excessively high cyanobacterial biovolumes. When no classes of lakes were specified and the relationship between cyanobacterial biovolume and nutrient concentrations was modelled using a national data set, mean targets of 87 and 1100gL(-1) were derived for TP and TN, respectively, to maintain cyanobacterial biovolume below moderate risk levels as defined by the World Health Organization. After classification, mean nutrient targets in lakes that were found to be most susceptible to high biovolumes of cyanobacteria (i.e. deep lakes) were 61 and 800gL(-1) for TP and TN, while higher nutrient thresholds were observed for other classes of lakes.

（来源：FRESHWATER BIOLOGY, 2015, 60(9): 1901-1916）

Invasive trout increase the climatic sensitivity of zooplankton communities in naturally fishless lakes

MacLennan, Megan M.; Dings-Avery, Chantal; Vinebrooke, Rolf D.

1. Widespread stocking of fish into naturally fishless montane lakes has restructured their food webs by excluding invertebrate top predators and releasing smaller zooplankton from predation and competition. The persistence of non-native trout in these lakes may also compound the effects of global warming, such that current efforts to manage these two stressors independently may be ineffective.

2. We conducted a survey of 22 naturally fishless and stocked lakes positioned along an altitudinal (and thus climatic) gradient and a two-factor experiment using outdoor mesocosms. We hypothesised that stocked rainbow trout (Oncorhynchus mykiss) increase the effects of higher temperature on zooplankton production in naturally fishless lakes by suppressing large invertebrates (e.g. Chaoborus), which then releases from predation smaller species that are more sensitive to warming. We also expected that introduced trout would stimulate primary production by suppressing larger grazers and increasing nutrient availability.

3. The survey confirmed that non-native trout and temperature are significant explanatory variables of zooplankton species turnover. Both lines of evidence agreed that the positive influence of higher temperature on total zooplankton biomass occurred only in the presence of non-native trout, probably because warming stimulated reproduction of smaller, herbivorous species that are favoured in lakes with stocked fish. Otherwise, the direct effects of higher temperatures on fishless communities were negligible. The positive effect of fish on primary production also probably provided the extra food to support greater reproduction by these small herbivorous species under warmed conditions.

4. Stocking trout into naturally fishless montane lakes increases the sensitivity of their zooplankton to the otherwise subtle direct effects of higher temperature. The likely effect of global warming on food webs in montane lakes may depend on their trophic structure, and the destabilizing influence of introduced fish.

（来源：FRESHWATER BIOLOGY, 2015, 60(8): 1502-1513）

Strong impact of nitrogen loading on submerged macrophytes and algae: a long-term mesocosm experiment in a shallow Chinese lake

Olsen, Saara; Chan, Fengyi; Li, Wei; et al.

1. Excess loading of phosphorus (P) and nitrogen (N) triggers a shift in the trophic structure of shallow lakes from a clear-water, macrophyte-dominated state to an algal-dominated turbid state. However, the role of N in the shift is debated, and experimental evidence is, with a few exceptions, based on short-term studies (days to a few months).

2. We studied the effect of N loading on macrophytes (dominated by Potamogeton lucens and Ca-bomba caroliniana), periphyton, filamentous algae and phytoplankton in mesocosms over 10 months (starting in October) in subtropical China (Wuhan). There were three N treatments: controls (CN) without nitrogen addition (mean TN = 1.9 mg L-1), low nitrogen (LN) addition (mean TN = 3.5 mg L-1) and high nitrogen (HN) addition (mean TN = 5.5 mg L-1). Total phosphorus (TP) concentration in the water column remained moderate (0.05-0.07 mg L-1) during the experiment in all treatments.

3. Macrophyte abundance declined in the LN and HN treatments in the first 6 months, but not in controls, followed by a partial recovery in the LN treatments. They disappeared completely in the HN treatments the following summer. Periphyton (biofilm on plastic) and phytoplankton biomass remained unaffected during the first 6 months but increased over the summer by two or three times, compared with controls, in

low and high nitrogen treatments, respectively. By contrast, the abundance of filamentous algae increased over winter but declined during the summer with no obvious relationship to the N treatments. There was no difference in the TN or nitrate concentrations or soluble protein, soluble sugar and Chl-a content of P. lucens leaves and stems with increasing N load.

4. Macrophyte populations are partially resilient to abrupt increases in N loading at moderate TP concentrations, but, after prolonged exposure, a complete collapse occurs. Our results further indicate that macrophyte loss is exacerbated by shading by filamentous algae during the winter, and by phytoplankton and periphyton in the summer, while there was no indication of direct N toxicity.

（来源：FRESHWATER BIOLOGY, 2015, 60(8): 1525-1536）

Cyanobacterial dynamics in shallow Lake Apopka (Florida, USA) before and after the shift from a macrophyte-dominated to a phytoplankton-dominated state

Waters, Matthew N.; Schelske, Claire L.; Brenner, Mark.

Paleolimnological data were used to reconstruct the primary producer history of shallow, hyper-eutrophic Lake Apopka, Florida, U.S.A. Lake Apopka changed from a macrophyte-dominated state to a phytoplankton-dominated state in 1947. It has remained phytoplankton-dominated despite efforts to re-establish clear-water conditions and submersed aquatic plants.

Photosynthetic pigments, organic matter and nutrients (C, N, P) were analysed in a 4.28-m sediment core that spans the past c.8000years. Our objectives were to: (i) reconstruct the primary producer history of Lake Apopka throughout its c.8000-year existence, (ii) determine whether the cyanobacterial dominance established in 1947 in Lake Apopka is the only period of cyanobacterial dominance in the lake's history and (iii) relate changes in the cyanobacterial community to known human impacts and recent management efforts.

Lake Apopka possessed a macrophyte-dominated primary producer community throughout most of its Holocene history, with diatoms, green algae and some cyanobacteria characterising the non-macrophyte, primary producer component of the community.

Since 1947, however, higher plants have been virtually absent in the lake and cyanobacteria have dominated the primary producer community, marking the first time that cyanobacteria have played such an important role in the lake. The cyanobacterial community itself has undergone multiple changes since 1947, confounding management efforts that have focused on a single driver of the primary producer community that is phosphorus.

（来源：FRESHWATER BIOLOGY, 2015, 60(8): 1571-1580）

The introduced signal crayfish and native noble crayfish have different effects on sublittoral macroinvertebrate assemblages in boreal lakes

Ercoli, Fabio; Ruokonen, Timo J.; Koistinen, Sofia; et al.

We investigated differences in the abundance, community composition and taxon richness of sublittoral macroinvertebrates in boreal lakes containing introduced invasive signal crayfish (Pacifastacus

leniusculus) or native noble crayfish (Astacus astacus). We hypothesised that sublittoral macroinvertebrate assemblages in lakes containing noble crayfish, which reportedly prefer the shallow littoral, would differ little from those in lakes without crayfish, in contrast to assemblages in lakes containing signal crayfish, which reportedly forage at greater depths.

In a set of 24 small and medium-sized Finnish lakes, eight lakes contained signal crayfish, eight had noble crayfish and eight control lakes had no crayfish. At three sites per lake, we sampled macroinvertebrates quantitatively from soft sediment in the sublittoral.

The sublittoral macroinvertebrate assemblage in lakes with noble crayfish and control lakes was similar. In contrast, lakes with signal crayfish had a lower density of Trichoptera and Ephemeroptera, as well as a lower density and species richness of Chironomidae, and a lower overall benthic density and taxon richness.

In contrast to some previous reports from other habitats, we infer that introduced signal crayfish have stronger negative effects than native noble crayfish on sublittoral macroinvertebrates. Hence, the ecological equivalence or differences of crayfish species cannot be generalised across habitats.

（来源：FRESHWATER BIOLOGY, 2015, 60(8): 1688-1698）

Macrozooplankton and the persistence of the deep chlorophyll maximum in a stratified lake

Pannard, Alexandrine; Planas, Dolors; Beisner, Beatrix E.

Deep chlorophyll maxima (DCM) are common in deep, oligotrophic stratified lakes. The DCM refer to the maximal chlorophyll a concentration found at depth, and not at the lake surface. While control of the DCM is thought to be via physicochemical factors in many lakes, a role for zooplankton grazing in epilimnetic waters remains a possibility. The occurrence and dynamics of DCM are poorly documented in smaller lakes, where zooplankton grazing is likely to have a stronger structuring effect. In small, shallow stratified lakes, biological control by grazing may be magnified by the short vertical gradient and overall higher water temperature. The respective contributions of several physical, chemical and biological parameters to the vertical distribution of phytoplankton biomass in a small stratified lake were examined. Associations between phytoplankton depth distribution and vertical gradients in temperature, light and nutrients and the density of herbivorous zooplankton were established through regressions and generalised linear models. Colimitation of the DCM by light from above and nutrients from below was detected. A threshold was detected at 3% incident light (100mol photon m(-2) s(-1)), below which the DCM disappeared. Epilimnetic biomass was related to nutrient availability, with a threshold concentration at 4gPL(-1), below which the DCM dominated. Greater stability of the water mass and more zooplankton were associated with higher phytoplankton biomass in the DCM. Stability is likely to have controlled vertical nutrient fluxes, which were intercepted by the metalimnetic phytoplankton. Zooplankton grazing of epilimnetic biomass could have increased incident light reaching the top of the metalimnion, thereby favouring proliferation of photosynthetic biomass in the DCM. Wind mixing events, as detected by a reduction in Lake number (L-N, a measure of the influence of wind forcing on vertical structure), induced vertical intrusions of metalimnetic water, rich in nutrients and phytoplankton, into the epilimnion. We can infer that dominance of phytoplankton in the epilimnion would have occurred earlier during the summer if grazing by zooplankton had not removed epilimnetic phytoplankton. Our results suggest that, while

stable stratification is necessary for initial DCM formation, zooplankton grazing may promote the persistence of a DCM.

Effects of water temperature on summer periphyton biomass in shallow lakes: a pan-European mesocosm experiment

Mahdy, Aldoushy; Hilt, Sabine; Filiz, Nur; et al.

Periphyton communities play an important role in shallow lakes and are controlled by direct forces such as temperature, light, nutrients, and invertebrate grazing, but also indirectly by planktivorous fish predation. We performed a pan-European lake mesocosm experiment on periphyton colonization covering five countries along a north/south geographical/temperature gradient (Estonia, Germany, Czech Republic, Turkey, and Greece). Periphyton biomass on artificial polypropylene strips exposed at 50 cm water depth at low and high nutrient regimes (with mean total phosphorus concentration of 20 and 65 mu g L-1, respectively) was compared during mid-summer. No significant effect of nutrient loading on periphyton biomass was observed as nutrient concentrations in the mesocosms were generally above limiting values. Water temperature significantly enhanced summer periphyton biomass development. Additionally, direct and indirect top-down control of snails and fish emerged as a significant factor in periphyton biomass control.

Hidden biodiversity in an ancient lake: phylogenetic congruence between Lake Tanganyika tropheine cichlids and their monogenean flatworm parasites

Maarten P. M. Vanhove, Antoine Pariselle5, Maarten Van Steenberge; et al.

The stunning diversity of cichlid fishes has greatly enhanced our understanding of speciation and radiation. Little is known about the evolution of cichlid parasites. Parasites are abundant components of biodiversity, whose diversity typically exceeds that of their hosts. In the first comprehensive phylogenetic parasitological analysis of a vertebrate radiation, we study monogenean parasites infecting tropheine cichlids from Lake Tanganyika. Monogeneans are flatworms usually infecting the body surface and gills of fishes. In contrast to many other parasites, they depend only on a single host species to complete their lifecycle. Our spatially comprehensive combined nuclear-mitochondrial DNA dataset of the parasites covering almost all tropheine host species (N = 18), reveals species-rich parasite assemblages and shows consistent host-specificity. Statistical comparisons of host and parasite phylogenies based on distance and topology-based tests demonstrate significant congruence and suggest that host-switching is rare. Molecular rate evaluation indicates that species of Cichlidogyrus probably diverged synchronically with the initial radiation of the tropheines. They further diversified through within-host speciation into an overlooked species radiation. The unique life history and specialisation of certain parasite groups has profound evolutionary consequences. Hence, evolutionary parasitology adds a new dimension to the study of biodiversity hotspots like Lake Tanganyika.

Seed bank characteristics of the Nymphoides peltata population in Lake Taihu

Wei Huang, Qiuwen Chen.Kaining Chen.

The Nymphoides peltata (N. peltata) population has shown rapid expansion in Lake Taihu, China, in recent years. The core question is whether N. peltata seeds have contributed to the expansion. To address this, we randomly selected three N. peltata stands to investigate the seed bank characteristics of N. peltata in Lake Taihu. Results showed that N. peltata had high seed production, with a maximum seed yield of 1763 seeds per m2. Density of intact and fragmented seeds decreased rapidly with sediment depth. Few intact or fragmented seeds were distributed at depths greater than 4 cm in the sediment. Spatial distribution of the seed bank indicated that most seeds sank to the sediment within the N. peltata stands, and few seeds took advantage of their floating ability. Seeds recovered from the sediment during April to June had a low germination rate, and no seeds germinated during October to April. Cold exposure treatment increased the germination rate remarkably. No seedlings were found in the field from January 2012 to December 2012, indicating that few seeds were successfully established in the surveyed area. The results suggested that sexual reproduction had little direct contribution to the N. peltata expansion in this large shallow lake.

Food-web stability signals critical transitions in temperate shallow lakes

Jan J. Kuiper, Cassandra van Altena, Peter C. de Ruiter; et al.

A principal aim of ecologists is to identify critical levels of environmental change beyond which ecosystems undergo radical shifts in their functioning. Both food-web theory and alternative stable states theory provide fundamental clues to mechanisms conferring stability to natural systems. Yet, it is unclear how the concept of food-web stability is associated with the resilience of ecosystems susceptible to regime change. Here, we use a combination of food web and ecosystem modelling to show that impending catastrophic shifts in shallow lakes are preceded by a destabilizing reorganization of interaction strengths in the aquatic food web. Analysis of the intricate web of trophic interactions reveals that only few key interactions, involving zooplankton, diatoms and detritus, dictate the deterioration of foodweb stability. Our study exposes a tight link between food-web dynamics and the dynamics of the whole ecosystem, implying that trophic organization may serve as an empirical indicator of ecosystem resilience.

Differences in the regeneration traits of Potamogeton crispus turions from macrophyte- and phytoplankton-dominated lakes

Dong Xie, Hengjie Zhou, Hong Zhu.

Potamogeton crispus is widely used in submerged macrophyte restoration in China. Turions are an important means of reproduction in this species. To compare the regeneration abilities of P. crispus turions in macrophyte- and phytoplankton-dominated lakes, we collected P. crispus turions from a

macrophyte-dominated lake (Liangzi Lake) and a phytoplankton-dominated lake (Taihu Lake). Both lakes are important lakes in the middle and lower reaches of the Yangtze River in China. Our field survey revealed that the turions from the phytoplankton-dominated lake had smaller sizes and higher concentrations of total nitrogen (TN) and total phosphorus (TP) than did those from the macrophyte-dominated lake. Rapid sprouting of the turions from the phytoplankton-dominated lake in 32 days was observed under experimental conditions, although the sprout sizes (heights and biomass) were smaller than those from the macrophyte-dominated lake. Compared with sprouted turions from macrophyte-dominated lake, the sprouted turions from the phytoplanktondominated lake accumulated higher soluble sugar (SS) but lower starch and free amino acid (FAA) concentrations. A 12-day interval sprout removal treatment significantly stimulated the resprouting of turions from both lakes, but scale-leaf-removal treatments had no effect. This study provides evidence that the regeneration strategies of P. crispus turions differ in macrophyte- and phytoplankton-dominated lakes.

（来源：Scientific Reports, 2015,5, DOI: 10.1038/srep12907）

The phytoplankton community of tropical high-mountain crater lake Wonchi, Ethiopia

Degefu, Fasil; Schagerl, Michael.

Atelomixis influences phytoplankton composition in regions where day-night temperature variations are high. Although this physical process is shown as the most important driver in a number of tropical-subtropical lake systems, information on tropical high-mountain lakes is largely lacking. We therefore studied the phytoplankton community composition and the underlying limnological variables of the atelomictic tropical high-mountain Lake Wonchi (Ethiopia) for 13 months. Nutrient levels indicated oligotrophic conditions with ammonium being the primary nitrogen form. The phytoplankton community comprised 53 taxa distributed in five taxonomic divisions, which could be assigned to 15 codas based on phytoplankton functional group classification. Partial atelomixis and low nutrient concentrations seemed to be key variables in structuring phytoplankton community composition, which was quite stable and characterized by high diversity of heavy, immobile and fast-sinking planktonic desmids of the N (A) codon during mixing followed by diatoms (MP codon). A near-monospecific bloom of Peridinium cinctum (Lo codon) prevailed before the onset of lake turnover in December 2011 with conditions of nutrient depletion, which was later followed by the functional groups F-J during the episode of complete mixing and then replaced by the N (A) codon. Non-metric multidimensional scaling resulted in a 2-dimensional solution, which revealed clear segregation of phytoplankton community to five groups. Mixing regime of the water column, conductivity, total phosphorus, ammonium and zooplankton had significant influence on the observed seasonal pattern.

（来源：HYDROBIOLOGIA, 2015, 755(1): 197-208）

Size-based diel migration of zooplankton in Mediterranean shallow lakes assessed from in situ experiments with artificial plants

Tavsanoglu, Ulku Nihan; Brucet, Sandra; Levi, Eti Ester; et al.

In warm lakes, fish aggregate within macrophytes, thereby weakening the role of these as a daytime refuge for zooplankton and altering the zooplankton size structure, predation pressure, and water clarity.

To elucidate the role of macrophytes as a refuge for zooplankton and their effect on zooplankton size distribution, we established three sets of strandardized artificial plant beds in 11 lakes in Turkey with contrasting fish predation risk and turbidity. Zooplankton were sampled within and outside of each plant beds during day and night. Fish, collected overnight in multimesh-sized gillnets, were abundant both inside and outside the artificial plant beds, impoverishing the usefulness of plants as a daytime refuge for particularly large-bodied zooplankton. Zooplankton size diversity was negatively related to fish abundance. Diel vertical migration was the frequent anti-predator avoidance behavior, but reverse migration was also observed when Chaoborus was present. In contrast to the small-bodied taxa, large- and medium-sized taxa showed intraspecific size-based migration (i.e., individuals of different sizes had different migration patterns). Predators influenced the size structure and diel movement of zooplankton, but the response changed with the size of zooplankton and water clarity.

Effects of humic stress on the zooplankton from clear and DOC-rich lakes

Robidoux, Marilyne; del Giorgio, Paul; Derry, Alison.

Humic stress is associated with the widespread and ongoing browning of lakes. Natural landscape gradients in dissolved organic carbon (DOC) potentially result in aquatic communities with different tolerances to humic substances and thus expected contrasting responses to further lake browning. If zooplanktonic species are adapted to different background concentrations of DOC, then we expected that the zooplankton from naturally DOC-rich lakes would maintain higher diversity, biomass and overall density in the face of experimental browning than the zooplankton from DOC-poor lakes. We tested this hypothesis in a common-garden experiment by exposing, in enclosures, zooplankton from replicate DOC-rich and DOC-poor source lakes to simulated browning and to clear water. We conducted a 2x2x3 factorial-design field transplant experiment with zooplankton from replicate DOC-rich (>8.5mgL(-1)) and DOC-poor (<3.5mgL(-1)) lakes (Quebec, Canada) over eight weeks. There were two fixed effects: water treatment (brown or clear water) and zooplankton source (from DOC-rich or DOC-poor lakes). Lake source was included as a random variable in the model for the response of copepod body size in the enclosures. A substance derived from peat, SuperHume', was used as a source of DOC. The diversity, biomass and total density of zooplankton from DOC-rich and DOC-poor lakes did not differ upon experimental addition of further DOC. This was despite the presence of different copepod body size phenotypes between source lakes that could have potentially caused different community responses: several dominant species of copepods (Cyclops scutifer, Leptodiaptomus minutus and Tropocyclops prasinus mexicanus) had a larger mean population body size in DOC-rich source lakes than in DOC-poor source lakes. Our findings suggest that the zooplankton from DOC-rich lakes does neither better nor worse than zooplankton from DOC-poor lakes when faced with browning from a humic stressor.

Potential for DNA-based identification of Great Lakes fauna: match and mismatch between taxa inventories and DNA barcode libraries

Anett S. Trebitz, Joel C. Hoffman, George W. Grant; et al.

DNA-based identification of mixed-organism samples offers the potential to greatly reduce the need for resource-intensive morphological identification, which would be of value both to bioassessment and non-native species monitoring. The ability to assign species identities to DNA sequences found depends on the availability of comprehensive DNA reference libraries. Here, we compile inventories for aquatic metazoans extant in or threatening to invade the Laurentian Great Lakes and examine the availability of reference mitochondrial COI DNA sequences (barcodes) in the Barcode of Life Data System for them. We found barcode libraries largely complete for extant and threatening-to-invade vertebrates (100% of reptile, 99% of fish, and 92% of amphibian species had barcodes). In contrast, barcode libraries remain poorly developed for precisely those organisms where morphological identification is most challenging; 46% of extant invertebrates lacked reference barcodes with rates especially high among rotifers, oligochaetes, and mites. Lack of species-level identification for many aquatic invertebrates also is a barrier to matching DNA sequences with physical specimens. Attaining the potential for DNA-based identification of mixed-organism samples covering the breadth of aquatic fauna requires a concerted effort to build supporting barcode libraries and voucher collections.

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Metagenomic study of red biofilms from Diamante Lake reveals ancient arsenic bioenergetics in haloarchaea

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Arsenic metabolism is proposed to be an ancient mechanism in microbial life. Different bacteria and archaea use detoxification processes to grow under high arsenic concentration. Some of them are also able to use arsenic as a bioenergetic substrate in either anaerobic arsenate respiration or chemolithotrophic growth on arsenite. However, among the archaea, bioenergetic arsenic metabolism has only been found in the Crenarchaeota phylum. Here we report the discovery of haloarchaea (Euryarchaeota phylum) biofilms forming under the extreme environmental conditions such as high salinity, pH and arsenic concentration at 4589 m above sea level inside a volcano crater in Diamante Lake, Argentina. Metagenomic analyses revealed a surprisingly high abundance of genes used for arsenite oxidation (aioBA) and respiratory arsenate reduction (arrCBA) suggesting that these haloarchaea use arsenic compounds as bioenergetics substrates. We showed that several haloarchaea species, not only from this study, have all genes required for these bioenergetic processes. The phylogenetic analysis of aioA showed that haloarchaea sequences cluster in a novel and monophyletic group, suggesting that the origin of arsenic metabolism in haloarchaea is ancient. Our results also suggest that arsenite chemolithotrophy likely emerged within the archaeal lineage. Our results give a broad new perspective on the haloarchaea metabolism and shed light on the evolutionary history of arsenic bioenergetics.

（来源：ISME J. 2015,DOI: 10.1038/ismej.2015.109）

Harnessing the potential of the multi-indicator palaeoecological approach: an assessment of the nature and causes of ecological change in a eutrophic shallow lake

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Multi-indicator palaeoecological studies have become increasingly popular over the last decade as the need for a more complete understanding of lake ecological histories has increased. However, the true potential of the full biological record for assessing the potential drivers of observed ecological shifts in lake sediment records has rarely been demonstrated. Here, we examine the remains of a range of food-web components including algae (diatoms), macrophytes (plant macrofossils), zooplankton (chitinous and ephippial Cladocera remains), invertebrates (including chironomids, bryozoans, Mollusca) and fish (fish scales and fish leech egg cocoons) in multiple sediment cores from Groby Pool, an enriched English shallow lake, to assess whole-ecosystem response to eutrophication over the last two centuries. We focus on three striking changes in the palaeorecord, namely the post-1900 increase in Daphnia spp., the post-1840 decline in Cristatella mucedo and the post-1940 increase in Cocconeis placentula, and utilise the multi-indicator palaeoecological data to evaluate possible explanations for these patterns. Principal curves analysis revealed marked and broadly simultaneous changes in the plant macrofossils, cladocerans, diatoms and chironomids (as well as in other animal remains such as bryozoans and Mollusca), indicating an early period of enrichment most likely associated with land-use change in the late 18th century, followed by a more recent eutrophication phase coincident with the discharge of sewage effluent to the lake from 1935. Ecological change, resulting from eutrophication, was shown to have progressed slowly and steadily and to have occurred at all trophic levels with a shift from a relatively diverse mesotrophic' macrophyte assemblage, dominance by benthic diatoms and plant-associated Chydoridae and chironomids towards a relatively species-poor, eutrophic' macrophyte community with dominance by planktonic algae (e.g. Cyclostephanoid diatom taxa), planktonic Cladocera (Bosmina, Daphnia) and a chironomid fauna dominated by mud-associated taxa. The inferred shift in the macrophyte community from charophyte to fine-leaved pondweed and Callitriche truncata suggests a reduction in the seasonal duration of plant dominance. The multi-indicator analysis indicates that a combination of increased phytoplankton biomass and low zooplanktivorous fish predation is likely to explain the recent increases in Daphnia spp., while loss of plant habitat and increased competition for food appear to be the most likely causes of the observed decline in C.mucedo, and resistance to increased grazing pressure from invertebrates is the most probable driver of the C.placentula increase. Our study illustrates the potential of using the full array of fossil groups preserved in lake sediment cores to infer ecosystem dynamics over centennial timescales and to contribute to our understanding of the mechanisms that may link biological assemblages to a range of forcing factors. Further, this paper provides methodological guidance by demonstrating the ability of amalgamated records from three cores to reveal a strong sequence of events and coherent patterns.

（来源：FRESHWATER BIOLOGY, 2015, 60(7): 1423-1442）

How a millennium of fishing changed fish populations: a case study of Lake Peipus and the Velikaya River (NW Russia)

Yurtseva, Anastasia; Salmina, Elena; Galik, Alfred; et al.

The Velikaya River is the principal river flowing into the southern part of Lake Peipus, which is situated in the basin of the Gulf of Finland, an arm of the Baltic Sea. Lake Peipus is one of the largest and most productive freshwater bodies in Europe. An important population center in ancient Russia, the town of Pskov sits on the downstream part of the Velikaya. Here fisheries resources have been exploited for millennia. Local archaeological materials and historical documents provide unique opportunities for examining the historical ecology of this river and lake ecosystem. This study describes millennium-long

changes in fish populations in the Velikaya River and Lake Peipus and discovers the factors responsible for them. We analyzed 5,981 fish remains dating from the 4th to the 18th centuries collected at two archaeological sites in Pskov and its surroundings. During this 1500-year period, three species predominated: pike, perch and bream together composed about three-quarters of identified bone elements. Fish sizes estimated from bone remains showed that target species, particularly bream and perch, tended to be larger before 1800 than in 20th century landings. Catch composition also changed over this long period, with increased contribution from smaller species such as whitebait, ruffe and vendace, especially in the 20th century. The main driver of the observed changes was fishing, with other human-induced factors and climate change being less important.

（来源：AQUATIC SCIENCES, 2015, 77(3): 325-336）

热点关注

Science 关注水资源管理问题

水资源管理是当今社会的核心问题之一。自 2015 年 7 月 31 日起，Science 杂志将连续 3 期在其政策论坛栏目里邀请专家探讨淡水研究与管理的关键问题。首次讨论的主题是水治理的尺度问题，即全球尺度的水治理观点何时、以何种程度取代持久的区域尺度观点，或者与之共同发挥作用。

Hering 等学者认为，地理位置对于水资源管理来说至关重要，全球尺度的水治理观点并不能解决区域特有的一些问题。他们认为水资源应该在最有效的尺度范围来进行评估与管理。从全球角度提出的概念可能不能有效地移植到局地，或者不能反映变化的情况。另外，从流域尺度来看，如果系统的规模和复杂程度超越了沿流域国家的联合决策和管理的能力，那么其管理结果就会适得其反。因此，嵌套的、分层分析框架可能有助于我们确定最有效的水资源管理尺度；单一尺度可能不是最有效的。

Vörösmarty 等学者则认为，认识到"地方的水行动将继续引发全球规模的水问题"是进行有效治理所必须的第一步。但是，全球视角在为地方治理提供背景、承认问题和解决方案两者的共性、确定最需要防止或补救的地方及跟踪进展等方面至关重要。全球性的思维有助于更好地制定国际水管理协议，从而确保社会的公平性和可持续性。执着地关注于区域尺度将错失这样的机会，而这样的机会则可能在解决 21 世纪的水问题（实际上是全球性的问题）方面取得有意义的进展。

（来源：科学研究动态监测快报 2015-08-15，第 16 期总第 261 期）

Scientific Reports：中国水资源面临多重挑战

2015 年 7 月 9 日出版的 Scientific Reports 中连续发表 2 篇文章，分析了中国部

分地区的农业和水电建设对中国水资源的挑战。一篇题为《中国北方农业生产加剧土壤湿度下降》（Agriculture intensifies soil moisture decline in Northern China）的文章指出，中国北方地区农业活动强度的增加可能导致该地区土壤水分下降。另一篇题为《中国水电需求的增加致使水部门面临挑战》（China's rising hydropower demand challenges water sector）文章指出，水库和水电站的水足迹（水足迹是指生产或者消费某种商品或者服务所消耗的淡水资源）会对可用淡水资源产生压力，增加中国的水资源短缺。这两篇文章从不同的角度分析并指出了中国面临如何管理水资源和可持续发展水资源的问题。

从上世纪 80 年代开始，已对中国北方土壤水分湿度下降和三大河流（黄河、海河和辽河）流域流量减小的问题开展了大量研究，但是这种干燥趋势的原因还没有被充分证实。中国农业大学的潘志华研究团队，利用 1983~2012 年间在农田测量实际的土壤水分数据，发现土壤水分在作物生长期有明显下降，每 10 年每立方的土壤中水分减少了 11 千克，这一减少趋势不可能完全由气候变化带来的降水较少导致。研究者认为化肥使用的增加有利于作物的生长，加上从种植大豆和土豆这些作物转变为种植小麦、玉米和油菜这些需水量更大的作物，以及农业生产面积的增加都减少了土壤中可用的水分。所以，综合土壤作物管理系统和节水技术这些农业实践对于粮食生产的可持续性至关重要。

在另一项研究中，北京林业大学的刘俊国研究团队分析了中国各地具有代表性的 875 个水库的水足迹，其中 209 个水库有水力发电厂。通过计算发现，中国水库的水足迹在 2010 年大约是 279 亿立方米，占中国淡水消耗的 22%，而水电的水足迹是平均生产 10 亿焦耳的能源需要 3.6 吨的水，比煤炭、太阳能和核能的单位热量水足迹都要高。研究指出，中国政府致力于从 2012~2020 年进一步增加 70%的水力发电产能，这一政策可能会增加对于现有的淡水资源的压力，部分地区可能会出现水资源短缺。研究结论是，水电开发应该在不同地区进行协调，而且要考虑到水电开发对于水资源的可持续利用的影响。

原文来源：http://www.natureasia.com/zh-cn/research/highlight/10040/

（来源：科学研究动态监测快报 2015-08-01，第 15 期总第 260 期）

世界最大湖泊面临来自人类和环境的双重挑战

2015年6月3日，在"世界环境保护日"来临之际，蓝圈组织（Circle of Blue）发布了一项新的研究报告《世界最大湖泊因人为和环境威胁承受巨大压力》（Biggest Lakes in the World Under Pressure From Human and Environmental Threats）指出，世界最大的湖泊因人类和环境压力不断增加而正在遭受严重威胁，其供水、驱动经济活力、保护生物多样性以及维持社区可持续发展的能力受到限制。

仅仅在过去的一年中，伊朗乌尔米湖（Lake Urmia）的水位降到了历史记录的最低位，俄罗斯贝加尔湖出现了本来已经绝迹的古老海绵体爆发，北美伊利湖（Lake Erie）因为有毒藻类的爆发而停止了饮用水供给。另外，科学家警告主航道的开挖建设有可能会给中美洲的尼加拉瓜湖（Lake Nicaragua）带来严重毁坏。

该研究指出，解决上述这些问题需要在经济和政治上付出高昂的代价，但如果解决不好，将会使世界各地以支撑当地经济、环境和文化活力的大湖生态系统陷于危境。例如，美国的五大湖支撑着150万个工作岗位和620亿美元的薪资。贝加尔湖，是世界上最大和最古老的湖泊，是大约2500种动植物的家园，相当于俄罗斯的文化财富。此外，世界上最大的10个湖泊几乎占有近三分之二的地表可利用淡水资源，一种不断稀缺的资源。

原文来源：http://www.circleofblue.org/waternews/2015/world/biggest-lakes-in-the-world-under-pressure-from-human-and-environmental-threats/

（来源：科学研究动态监测快报 2015-07-15，第14期总第259期）

Science 文章揭示空气中来自于植物、土壤和地表水的水含量

2015年7月10日，发表在Science上题为《水文连通性限制全球陆地水通量的分配》（Hydrologic connectivity constrains partitioning of global terrestrial water fluxes）的文章发现了从植物、土壤和地表水中返回到大气的水分比例。

陆地上的水供养着所有的植物、农业、人类和水生生态系统。但是，对于究竟有多少水用于这些系统，科学家们一直未研究清楚。美国犹他大学的水文学家利用降雨、河流和大气样品中水的氢同位素比值和卫星测量分析出除去通过径流形式进入海洋的降水外，陆地降水通过植物、土壤和地表水返回大气的含量。

研究发现，64%的陆地降水（5.5万立方千米）通过植物的蒸腾作用释放到大气中，而其他研究的这一比值远高于此，达到80%以上；6%（5000立方千米）来源于土壤的蒸发；3%（2000立方千米）来源于湖泊、小溪和河流的蒸发；而此前的研究表明，其他的27%（2.3万立方千米）则被植物拦截。另外，研究还发现，仅有38%的降水和融雪在进入地下水、湖泊或者河流之前通过与土壤的相互作用而被植物所利用。

该研究对于理解水质、植物生产率以及气候与生态系统的相互作用具有重要的意义。由于土壤仅与38%的水循环发生作用，因此，我们在预测水质时就必须考虑这一事实。而对植物蒸腾水量的研究则有助于我们进一步理解生态系统和农业的生产力。另外，由于植物叶子释放水分时，也在消耗二氧化碳，而土壤则无法做到。因此，了解植物蒸腾的水量还有助于我们理解植物如何有助于减缓全球变暖。

原文来源：http://www.nsf.gov/news/news_summ.jsp?cntn_id=135546&org=NSF&from=news

（来源：科学研究动态监测快报 2015-08-01，第15期总第260期）

Climatic Change 文章指出全球变暖导致极端降水事件增长

2015年7月7日，《气候变化》（Climate Change）杂志在线发表题为《全球变化环境下破纪录的极端降水事件增加》（Increased Record -breaking Precipitation Events under Global Warming）的文章，指出全球范围内的极端降雨事件增加与化石燃料燃烧造成的温室气体排放导致的全球变暖相一致。

过去30年间，破纪录的极端降雨事件急速增长。在1980年前，极端降雨事件。的波动可以用自然环境的波动来解释，但在过去几十年间，不可预测的降雨事件呈增长趋势。来自德国波茨坦气候影响研究所（PIK）和波茨坦大学（University of Potsdam）的研究人员，通过分析全球数千个气象站的1901—2010年的降雨数据发现，1980—2010年间极端降雨事件数量较没有全球变暖的情况增加了12%。这些事件在全球大陆的分部是不均匀的，东南亚国家的降雨事件占了全球的56%，欧洲为31%，美国中部为24%。同时，一些地区的极端降雨事件却在下降。地中海地区降低了27%，美国西部降低了21%，这两个地区存在极端干旱的风险。

原文来源：http://link.springer.com/article/10.1007%2Fs10584-015-1434-y

（来源：科学研究动态监测快报 2015-08-01，第15期总第177期）

Nature Geoscience 文章称非洲内陆水域是重要的温室气体排放源

2015年7月20日，Nature Geoscience杂志发表题为《全球重要的温室气体排放来自非洲内陆水域》（Globally Significant Greenhouse-Gas Emissions from African Inland Waters）的文章指出，非洲内陆河流每年排放约4亿吨碳的温室气体，相当于非洲陆地净碳汇的2/3。

河流为陆地向海洋输出有机物质，细菌将其转化为温室气体。来自内陆水域（溪流、河流、湖泊和水库）的CO_2排放量几乎等同于全球海洋和陆地碳汇，内陆水域也可以是甲烷（CH_4）和一氧化二氮（N_2O）排放的重要来源。虽然已有研究分析了巴西、欧洲和北美的温室气体排放，但是对非洲的研究却是空白。研究人员通过测量2006—2014年撒哈拉以南非洲12条河流溶解的CO_2、CH_4和N_2O浓度，估算了整个撒哈拉以南非洲内陆水域的碳排放量。研究发现，每年仅来自河道的CO_2当量排放约为4亿吨碳，相当于非洲整个陆地净碳汇的2/3。如果包括刚果河湿地的排放量，那么CO_2当量排放将达到9亿吨碳左右，相当于全球海洋和陆地碳汇的1/4。河流的CO_2和CH_4排放量随着湿地范围和旱地生物量的增加而增加，表明未来湿地和旱地覆盖率的变化可能会严重影响非洲内陆水域的温室气体排放。

原文来源：http://www.nature.com/ngeo/journal/v8/n8/full/ngeo2486.html

（来源：科学研究动态监测快报 2015-08-15，第16期总第178期）

Water Resources Research 提出地下水建模的新方法

2015年7月1日，美国怀俄明大学Fred Ogden研究团队在Water Resources Research 期刊发表了题为《一种新的通用型一维包气带流解析方法》（A new general 1-D vadose zone flow solution method）的论文，提出了取代1931年以来阻碍了水文建模的困难并且不可靠的公式。该研究成果解决了近一百年来关于地下水水体流动的问题，对于农业、水文学、气候科学等领域都具有积极的意义。

1931年，Lorenzo Richards提出了计算包气带水体的公式，用来计算当雨水冲击地面并向下渗入地下含水层时，随着时间的推移，水分进入土壤的速率，称为Richards 方程（简称为RE），这是唯一严格计算渗流区（即地下水和地表之间大部分植物根系生长的不饱和土壤）水体运动的公式。从估算回流与含水层补给、到更好地管理灌溉与预测洪水，计算渗流区的水体运动都是至关重要的。RE在实际的应用中也存在不少问题，有些情况下出现不可解。因此，即使一些高功率的计算机模型可以在小尺度的区域上解析RE，但简单的计算机模型或覆盖较大区域的情况下，RE只能放弃准确性而采用估算法。

所以，研究人员在RE公式对不饱和多孔介质在均质土层中流动的描述得出的一维偏微分方程（PDE）的基础上提出了替代的新方法，即一组衍生于不饱和通量和质量守恒原理的三个常微分方程（ODEs），并利用了速矢变换、直线法和有限水离散等方法准确地模拟了在包气带通量上的渗透、下降以及地下水位动态效应。

这种方法涵盖了降水、裸土蒸发和蒸散的边界通量，也可适用于非均质土壤层水分运动的数值模拟，所得结果通过通量和水含量分布展现。通过对该方法得出的分析结果、实验数据以及Hydrus-1D解算器互相比对，认为有限水分含量常微分方程方法的预测性能与Richards方程的解析结果近似。甚至在特殊情况下，如在浅层地下水位的计算中超越了Richards方程。该常微分方程解析方法具有变革性，精确度堪比Richards 1931年偏微分方程的数值解，并且避免了Richards方程的数值复杂度，同时具有了稳健而持续的形式。它适用于较大的流域尺度和土地范围进行仿真模拟，在区域尺度耦合气候与水文的模型中也通用。

几十年来，水文学家和其他科学家都在寻求一种更好的方法来估算包气带水体，现在这种通过土壤耦合地下水的方法可靠而实用。Fred Ogden预计这一发现将极大地提高数以百计的水体模型的可靠性。这些模型不但为来自全世界的灌溉者、城市规划者、气候学家、植物学家等研究者采用，同时也引发了一波新的数据收集热潮。随着技术的进步，也推动着数据收集新方法的涌现。Fred Ogden希望将土壤科学融入到水资源管理者的相关领域，并引领新的土壤数据采集模式。

原文来源：http://www.sciencedaily.com/releases/2015/07/150701131855.htm

（来源：科学研究动态监测快报 2015-07-15，第 14 期总第 259 期）

Geophysical Research Letters 文章指出空气污染可引发洪水

2015年6月21日，Geophysical Research Letters在线发表的题为《人为空气污染对中国西南地区特大洪灾的实质性影响》（Substantial Contribution of Anthropogenic Air Pollution to Catastrophic Floods in Southwest China）的文章指出，越来越频繁的极端天气事件可能与温室气体和气溶胶的增加有关，后者改变了地球的辐射平衡和成云过程。

2013年7月，一场特大洪水侵袭了四川盆地西北部山区。在过去几十年里，四川盆地的工业活动急剧增加，研究人员认为，这场洪灾可能与人为空气污染有关。因此，以美国能源部西北太平洋国家实验室（PNNL）为首的研究人员组成研究团队，采用改进的空气质量数值预报模型（WRF-Chem），根据不同的气溶胶排放量，在暴雨期间对该地区进行了模型模拟和相关的灵敏度模拟。模型的排放量设置为20世纪70年代末和80年代初中国经济腾飞前的水平，研究人员发现，暴雨期间的降雨量最多可以比目前的排放水平降低60%。

大气模拟利用气溶胶与化学物质的对流,发现严重的空气污染集中在盆地内部。据此，研究人员提出了"增强的气溶胶的条件不稳定性"这一机制，认为被束缚在盆地中的气溶胶吸收了太阳辐射，增强了盆地白天的大气稳定性，抑制了空气对流，而过量的潮湿空气被运送至下风向的山区和高地，在夜间产生了强对流和强降水，这种效应可能导致对流发展成极端天气事件。然而，该机制与天气尺度的大气环流和极端降水事件有关，因此不能笼统地认为降水仅受当地山谷环流的影响。研究表明，减少污染，尤其是可吸收的气溶胶，在污染地区可以有效地缓解下风向地区的极端降水。四川的洪水事件中，由人类活动产生的黑炭是大气中主要的吸收气溶胶。黑炭不仅会带来健康和环境问题，而且还会对气候产生重要影响。

研究人员认为，气溶胶与气象的耦合对于提高污染地区的天气预报质量至关重要。最新研究认为，生物燃烧烟雾可以通过吸收辐射从而加强覆盖逆温，使龙卷风。的强度增加，因此建议在数值灾害性天气预报中考虑气溶胶的影响。

原文来源：http://onlinelibrary.wiley.com/doi/10.1002/2015GL064479/abstract?wol1URL=/ doi/10.1002/2015GL064479/abstract&regionCode=CN-AH&identityKey= a82ee535-0a63-412f-8cf6-4bed28c5f116&isReportingDone=true

（来源：科学研究动态监测快报 2015-07-15，第 14 期总第 259 期）

美德联合研究称风暴潮和降雨复合会提高城市洪水风险

2015年7月27日，《自然——气候变化》（Nature Climate Change）在线发表题为《美国主要城市由风暴潮和降雨共同造成的洪水风险不断增加》（Increasing Risk of Compound Flooding from Storm Surge and Rainfall for Major US Cities）的文章指出，强风暴和强降雨一起发生会导致大西洋和墨西哥湾沿岸城市的洪水风险升高。在海

平面上升导致美国城市洪水风险不断增加的同时，天气模式造成的风暴潮提高了洪水发生的可能性。

美国大约40%的人口居住在沿海郡县，这些低洼、人口密集并高度发达的地区一旦发生洪水会带来毁灭性的后果，并造成广泛的社会、经济和环境影响。以美国南佛罗里达大学（University of South Florida）的科研人员为首的研究小组，调查了美国主要沿海城市的洪水风险，研究了美国城市地区发生洪水的原因。分析数据包括美国人口超过100万的17个港口城市中的大多数，这些城市的洪水原因以前没有评估过。研究使用的数据开始于20世纪50年代，其中一些地点的数据开始于20世纪初。研究主要关注沿海地区两种不同的洪水驱动力——风暴潮和强降雨同时发生的情况，二者会分别导致直接径流和河流流量的增加。除此之外，研究团队还分析了三种主要的复合型洪水机制的影响：河口水位升高、暴雨造成的风暴潮、阻止或减缓排水的中度风暴潮。

研究结果表明，风暴潮和强降雨复杂的相互作用可以通过多种机制导致或者恶化洪涝对沿海地区的影响。这些机制是否起作用取决于具体地区所在的位置，相对于太平洋沿岸，大西洋和墨西哥湾沿岸的城市发生这种复合洪水的风险更高。研究人员随后更详细地分析了大西洋沿岸城市的洪水风险，结果表明，纽约的风暴潮往往与强降雨伴随发生，2012年飓风桑迪期间该地区的极端洪水是极端风暴潮造成的。研究人员强调，研究结果证实了评估复合洪水及其与天气和气候的关系的重要性，并指出未来更多需要在地方层面分析复合洪水的具体影响。

原文来源：http://www.nature.com/nclimate/journal/vaop/ncurrent/full/nclimate2736.html

（来源：科学研究动态监测快报 2015-08-15，第 16 期总第 261 期）

气候变化或严重影响英国湿地

新华社8月3日电，英国利兹大学研究人员新发布的一份报告说，英国湿地生态系统对该国环境具有不可替代的作用，但随着气候变化加剧，这一生态系统或许会受到严重影响，这对鸟类和当地居民来说都不是好消息。

报告说，英国的湿地是多种鸟类的栖息地，并且是当地人饮用水的一个重要来源，湿地本身还具有非常重要的"储碳"作用。但在气候变化影响下，降雨频率和夏季干旱的发生几率都出现不小变化，这会改变湿地的水文体系，从而影响湿地中的昆虫和鸟类。

在湿地内栖息的鸟类可能受到较大影响。研究人员利用地理和气候数据模型进行分析后发现，如果气候变化导致更长的夏季干旱期，英国许多沼泽中的大蚊数量会急剧下降，这无疑会影响到那些以这种昆虫为食的鸟类。

报告作者之一约瑟夫·霍顿说，气候变化会对英国湿地生态系统带来很大威胁，需要采取更多措施来保护它们。

（来源：《科技日报》 2015-08-05）

业界动态

中央财政支持 81 个水质较好湖泊保护

8 月 27 日，在第十二届全国人民代表大会常务委员会第十六次会议上，全国人大常委会副委员长陈昌智作全国人民代表大会常务委员会执法检查组关于检查《中华人民共和国水污染防治法》实施情况的报告。报告指出，自水污染防治法颁布实施，特别是"十二五"以来，各重点领域水污染防治工作力度不断加大。

一是重点流域和重点行业治理不断加强。中央财政投入资金 440 亿元支持重点流域治污规划项目建设，系统推进水污染防治、水生态保护和水资源管理，南水北调工程等重点流域水质不断改善。各地持续推进落后产能淘汰、工业清洁生产和工业节水，对造纸、焦化等 10 大重点行业开展专项整治，共有 3700 个造纸印染等行业项目实施废水深度治理及回收工程。

二是不断推动城镇污水处理工程建设。累计安排中央基建投资 554 亿元和污水管网专项资金 493 亿元，支持城镇污水垃圾处理设施和管网建设，全国新增城镇污水日处理能力 4600 万吨，总设计处理能力已达 1.7 亿吨/日，处理率达 90％以上，再生水日利用能力超过 2000 万吨。

三是逐步加强农业面源污染防治，将规模化畜禽养殖污染纳入主要污染物总量控制范畴，中央基建投资累计安排 135 亿元，各地累计投入资金 40 多亿元，完成 4.1 万个规模化畜禽养殖场改造。

四是开展水质较好湖泊保护工作，环境保护部、财政部等部门联合印发了《水质较好湖泊生态环境保护总体规划（2013—2020 年）》，中央财政安排专项资金 158 亿元，用于支持 81 个水质较好湖泊保护。

（来源：人民网 2015-08-27）

水污染防治法实施情况检查结果显示我国水污染形势严峻

8 月 27 日在十二届全国人大常委会第十六次全体会议上，全国人大常委会副委员长陈昌智做水污染防治法实施情况报告时表示，2014 年，全国地表水 972 个国控断面中，劣 V 类水质断面比例比 2005 年减少 17 个百分点，基本丧失水体使用功能的为 9.2%；24.6%的重点湖泊呈富营养状态，不少流经城镇的河流沟渠黑臭，近海海域污染状况不容乐观。

根据 2015 年监督工作计划安排，全国人大常委会组织开展了水污染防治法实施情况检查。

"污染物排放量大、水生态受损重、水环境隐患多。" 陈昌智说，2014 年，我国化学需氧量、氨氮排放量分别为 2294.6 万吨和 238.5 万吨。农业源和生活源已

上升为主要的水污染物排放源。工业结构性污染特征明显，造纸、化学原料和化学制品制造业、纺织业等四个行业占到工业源排放量的一半以上。一些地方产业布局不合理，约 80%的化工、石化企业布设在江河沿岸，带来较高环境风险隐患，还有一些缺水地区、水污染严重地区和敏感地区仍未有效遏制高耗水、高污染行业的快速发展。2014 年，环境保护部直接调查处理的重大及敏感突发环境事件中，超过 60%涉及水污染。

农业和农村水污染防治问题突出。我国水产品养殖产量已占总产量的 73.6%，养殖过程中饲料投喂、药物使用不规范，对水环境造成污染。

饮用水水源保护区制度落实不够到位。全国 329 个城市中，集中式饮用水水源地水质全部达标的城市为 278 个，达标比例为 84.5%。86 个地级以上城市 141 个水源一级保护区、52 个水源二级保护区内未完成整治工作，且缺乏明确的考核制度和责任规定。

"当前，我国水污染形势非常严峻，水污染防治任务十分艰巨。" 陈昌智在报告中建议，进一步深化认识、落实责任，加大水污染防治工作力度；强化饮用水水源保护，依法保障饮用水安全；加强农业和农村水污染防治；强化工业和船舶水污染防治；建立健全水污染防治长效机制；加快完善水污染防治法律制度。

（来源：《科技日报》2015-08-28）

第五届中国湖泊论坛在长春举行

9月22-23日，以"湖泊湿地与绿色发展"为主题的第五届中国湖泊论坛在吉林

长春市举行。22 日上午，中国科协党组成员、书记处书记王春法，吉林省副省长隋忠诚出席开幕式并致辞。吉林省科协主席、中国科学院院士冯守华主持开幕式。中国工程院院士王浩、美国南佛罗里达州水资源管理署高级专家古滨河、中国环境科学研究院副院长郑丙辉、中国科学院东北地理与农业生态研究所副所长张平宇等应邀为论坛作主题报告。

与会专家和代表围绕湖泊与湿地流域生态环境管理、湖泊与湿地水污染防治理论与技术、湖泊与湿地生态环境恢复与保护、河湖水系连通与流域水资源优化配置理论与技术4个专题，开展跨学科、跨行业、综合性的交流和研讨。

中国湖泊论坛是中国科协围绕党和国家中心工作设立的全国性的学术品牌活动，从 2011 年以来已成功举办四届，对于提高我国湖泊科学研究水平，推动湖泊治理与保护发挥了积极作用，产生了良好的社会影响。

（来源：http://www.cast.org.cn 2015-09-24）

我国湖泊湿地保护与修复决策报告顺利完成

近日,由中科院南京地理与湖泊研究所联合相关单位完成的有关全面推进我国湖泊湿地保护与修复的决策咨询报告顺利完成，并已递交国务院，这是继今年年初递交国务院的有关内蒙古呼伦湖生态环境综合治理与保护报告后，南京地湖所参与完成的又一份战略咨询报告。

我国湖泊与湿地众多，广布全国，占国土面积的 6.5%，涵养了全国 96% 的可利用淡水资源，具有巨大的洪水调蓄能力；湖泊湿地维系了高等植物 3 门 239 科 1255 属 4220 种，繁育了脊椎动物 5 纲 51 目 266 科 2312 种，发挥着多元的、不可替代的生态服务功能；湖区粮食产量达到全国粮食总产量的 50%，并提供了我国主要的淡水水产品。

湖泊与湿地在保障供水、防洪，保护生物多样性和维护区域生态平衡方面发挥了不可替代的作用。当前，我国湖泊与湿地正面临着严峻的生态破坏与环境恶化问题，已严重制约了周边地区和流域社会经济发展与人民安居乐业。目前完成的这份咨询报告，重点围绕我国湖泊与湿地的水环境恶化与水生态退化问题，分析了问题的成因，提出了依法保护与修复湖泊湿地、促进生态文明建设的对策和建议。

（来源：《中国科学报》 2015-08-20）

污泥无害化处置利用有了新技术

7 月 10 日，在湖北咸宁市对桑德集团"电渗透污泥高干脱水技术"技术成果鉴定会上，清华大学环境学院副院长王凯军教授等认为，该技术为污泥减量提供了新技术和设备。

市政污水厂处理后产生的污泥，含水率高达 80%—95%，并富含有机质、易腐败、产恶臭，有病原微生物和重金属等污染物，处理处置不当就会成为二次污染源。

"该技术由桑德旗下湖北合加、海斯顿联合开发，将电渗透和板框压滤相结合属国内首创，污泥高干脱水技术整体水平达国际领先。"王凯军说。

桑德环境资源股份有限公司高级工程师孟龙说，脱水干化是污泥处理处置的关键，也是难题。电渗透污泥高干脱水技术是把污泥置直流电场中，使污泥颗粒和水分分别向阳、阴极定向迁移，外加挤压过滤，实现固液分离，能脱除污泥的间隙水、毛细水、吸附水等。根据不同用途，污泥含水率降至 40%—60%，并无需投加任何化学药剂。

"该技术运行成本约 97 元/吨，但现在最常用的隔膜压滤脱水运行成本达 116 元/吨，其他技术的更是高达 205—257 元/吨。"孟龙说，该技术能杀灭病原微生物、去除部分重金属，所产泥饼异味小；使泥饼低热值大幅提升，无需加煤等燃料就能焚烧，回收热能。

北京市政工程设计研究总院总工李艺表示，该技术稳定性、电能转换效率高、工艺系统简单，可与现有常规脱水设备直接衔接，不用配套庞大加药系统，占地面积小，操作管理方便，为污泥后续处理处置和利用提供了保障。

（来源：《科技日报》 2015-07-13）

国内首座"中国污水处理概念厂"宜兴筹建

水宜兴污水处理技术示范厂建设专题筹划会，日前在中国宜兴环保科技工业园举行，中国城市污水处理概念厂专家委员会秘书处单位——江苏（宜兴）环保产业技术研究院负责人介绍了示范厂建立的具体方案。同时，清华大学环境科学与工程系教授施汉昌，以及环保企业家们还就概念厂的选址规划，建设周期、技术工艺，商业运营及合作模式等提出了各自的建议和意见。

由曲久辉等六位国内水污染控制领域专家发起成立的"中国城市污水处理概念厂专家委员会"，于 2014 年提出，用 5 年时间建设一座（批）面向 2030—2040 年、以水质永续、能量自给、资源回收、环境友好为建设目标的城市污水处理概念厂。核心是实现污水到饮用水的深度回用，实现中国水业跨跃式发展，在我国环境保护领域具有里程碑的意义。

概念厂专家委员会通过深入调研和实地考察，全面剖析国内外成功经验，汇聚中外有识之士，广泛征求各方意见，经过一年多的工作开展，明晰了概念厂的具体内涵和建设形式，并计划在年内完成概念厂的厂址选择，针对有代表性的城市和服务区域，创新机制，整合资源，全面启动我国城市污水处理概念厂的建设工作。

作为"中国环保之都"的宜兴，一直是引领全国水处理事业发展的标杆。中国污水处理设备制造企业十强中，宜兴企业就占了 6 席。"中国污水处理概念厂"的

第一个技术示范厂选址在宜兴有其得天独厚的优势和意义。宜兴污水处理技术示范厂预计日处理污水 2 万吨、污泥 100 吨，将推动新技术和管理经验的普及，推动中国环保产业的升级与转型换代。

（来源：《科技日报》 2015-08-07）

环保部公布生态环境损害赔偿方案已初步完成

环境保护部8月10日公布，已牵头编制完成生态环境损害赔偿改革试点方案（送审稿），并开展了环境损害鉴定评估技术方法研究，指导地方开展典型案例评估等，如备受社会关注的甘肃武威荣华工贸腾格里沙漠污染事件环境损害评估等。

据悉，为配合生态环境损害赔偿改革，环保部开展了生态环境损害鉴定评估工作，推进环境损害鉴定评估纳入司法鉴定管理体系等。据安排，今年下半年，还将继续推进环境损害鉴定评估管理体系与司法鉴定管理体系的衔接，探索成立国家环境损害鉴定评估专家委员会，推进土壤、地下水环境损害评估等相关领域的研究与模型工具开发，编制环境损害鉴定评估技术指南—总纲等技术规范。

除生态环境损害赔偿改革方案外，环保部还着力完善一系列法规、规定。新《环保法》要求，地方政府对辖区环境质量负责，建立资源环境承载能力监测预警机制，实行环保目标责任制和考核评价制度等。为落实这些要求，环保部重启了绿色GDP研究项目，致力于把资源消耗、环境损害、生态效益等指标纳入经济社会发展评价体系。现已完成绿色GDP核算有关技术规范，确定在安徽、海南、四川、云南、深圳、昆明、六安市7个地区开展试点工作。

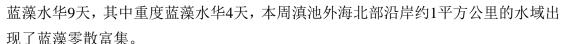在立法层面，为衔接新环保法，除《大气污染防治法（修订草案）》立法进程加快外，环保部还开展《水污染防治法》《环境影响评价法》《土壤污染防治法》《核安全法》制（修）订调研、论证。

在依法行政层面，数据显示，上半年，环保部共办理行政复议案75件、行政诉讼案21件、行政裁决案10件；行政应诉案件增长迅速，今年上半年的行政诉讼案件数是去年全年应诉案件数（12件）的1.75倍；立法、执法强化的同时，环境司法也在持续发力。截至今年3月的数据显示，全国各级法院设立了382个环境资源审判庭、合议庭、巡回法庭等。

（来源：《科技日报》 2015-08-12）

滇池近期蓝藻暴发引发各界关注

连日来，滇池外海北部沿岸蓝藻暴发，引发各界关注。昆明市滇池管理局已采取机械除藻等应急措施。

根据昆明市滇池管理局统计，截至7月8日，今年滇池外海北部沿岸已发生中度

蓝藻水华9天，其中重度蓝藻水华4天，本周滇池外海北部沿岸约1平方公里的水域出现了蓝藻零散富集。

昆明市环境监测中心副主任房晟忠称，影响蓝藻水华的因素包括湖泊水体营养状况、水生生态系统状况、水温及气象条件等，滇池综合营养状态指数与去年同期持平，部分指标略有下降，而滇池外海的平均水温比往年同期高出约1℃，日照时间增加170.6小时，因此滇池水域已进入蓝藻水华发生的高峰期。

昆明市滇池管理局副局长王丽华介绍说，针对今年的滇池蓝藻水华情况，主要采取了将龙门藻水分离站及所有移动除藻船运行时间由每天8小时延长至每天12小时，集中调度现有除藻设备，重点加强滇池北岸沿线蓝藻收集处置能力，抢修龙门村水体置换通道等八项应急措施。

昆明滇池投资有限责任公司董事长徐增雄告诉记者，6月24日起所有设施全部开动，每天可以处理4.6万立方米的富藻水。

"尽管采取了这些应急措施，但面对庞大的蓝藻数量，无法从根本上解决，只能从一定的时间和规模内解决。"滇池生态研究所副所长韩亚平表示，目前采取的应急措施能避免蓝藻造成更大的危害，但要从根本上解决蓝藻问题，还需要恢复生物多样性，"以草为主的生态修复是下一步滇池治理的必经之路。"

蓝藻水华多发生在夏季，由于蓝藻大量繁殖且很难消化，会在水面形成一层蓝绿色而有恶臭味的浮沫，称为"水华"，会引起水质恶化，甚至造成鱼类死亡。韩亚平称，自2008年以来，今年滇池蓝藻水华首发时间已经是最晚的。

滇池位于云南省昆明市，上世纪80年代中后期以来，滇池成为中国污染最严重的淡水湖泊之一，水质下降到劣V类。近年来滇池治理取得明显成效，与2010年相比，2014年滇池已由重度富营养变为中度富营养。

（来源：《科技日报》2015-07-10）

湖南启动深水湖泊富营养化防治研究工作

9月8日至10日，湖南首个深水湖泊水环境保护院士工作站——东江湖水环境保护院士工作站对东江湖进行抽水取样送检，健康湖泊监测与深水湖泊富营养化防治研究工作稳步推进。

位于湖南省资兴市境内的东江湖，是国家"七·五"重点工程东江水电站建成后形成的人工湖，平均水深近百米，水域面积24万亩，蓄水量81.2亿立方米，周边植被覆盖率达80%以上，水质长期保持在地表水Ⅱ类标准。东江湖是长株潭"两型社会"建设的重要战略资源，在预防和缓解湘江干流水污染、保障湘江流域居民饮用水安全等方面起到了重要作用。它是湖南省生态保护红线试点区域，并被纳入国家重点良好湖泊治理和亚行贷款项目。东江湖流域也是国家"一湖一策"试点流域，被列入全国湖泊生态环境保护总体规划。

据了解，近年流域内渔业开发加速，东江湖生态系统结构与功能面临挑战，部分水域在枯水季节开始出现富营养化现象。为保护好东江湖水资源，资兴市坚持"在保护中开发，在开发中保护"原则，积极推进湖区环保设施、保护生态公益林、关闭湖区采矿企业、网箱退水上岸等系列工程，并在5月启动湖南省东江湖水环境保护院士工作站，成为高层级水环保科研技术直接服务地方生态文明建设的先例。工作站由中国工程院院士、中国环境科学研究院院长孟伟领衔，将利用团队长期从事流域水污染控制原理与技术等科学研究，在东江湖开展监测、分析、评估，重点突破和解决湖泊富营养化、重金属污染防治等问题，促进东江湖水生态保护与水资源利用的深度融合。孟伟表示，工作站将尽快发布东江湖水生态健康评估报告样本，为当地转型发展、绿色发展提供可复制、可推广的科研成果和经验模式。

（来源：《科技日报》 2015-09-18）

江苏扬州 42.68 亿保护湖泊生态

为贯彻落实环保部、发改委、财政部印发的《水质较好湖泊生态环境保护总体规划(2013-2020年)》要求，避免再走"先污染、后治理"的老路，江苏省扬州市环保局牵头组织各县(市、区)政府、各功能区管委会及市水利、渔业等相关职能部门，按照保护优先、自然恢复为主的原则，编制了高邮湖、宝应湖、邵伯湖《生态环境保护规划》。

据了解，扬州市将实行"一湖一策"，拟投资42.68亿元实施环湖截污治污、产业结构调整、立体生态修复、基础设施建设、湿地生物保护建设等57项工程，建立健全湖泊生态环境保护长效机制，切实保护和改善湖泊水质，维持湖泊生态健康，同时积极向国家、省争取推进扬州市湖泊纳入国家水质良好湖泊生态环境保护试点。

（来源：国际能源网 2015-09-11）

南水北调后北京地下水位十六年来首次回升

近日，从南水北调办公室获悉，近日北京市地下水位16年来首次出现回升。此次地下水位回升不仅仅是一两个监测点的情况，而是全面系统的回升。其主要原因是南水北调所调之水缓解了北京市水资源紧张状况，同时也是开源节流、严控地下水开采的成效。

全市885个地下水位监测点数据显示，7月31日，北京市地下水埋深为26.55米，较6月30日26.7米回升了15厘米，地下水储量增加了8000多万立方米，这是1999年以来地下水位首次回升。其中，大兴区地下水位回升最多，从19.89米到19.47米，回升了0.42米。

从有完整气象资料记录的1956年至1999年，北京多年平均降雨量达到585毫米，

较为丰沛。自1999年起，北京市多年持续干旱，至2014年，多年平均降雨量仅479毫米。2014年，全市降雨量439毫米，水资源量仅21亿立方米。与此同时，北京城市快速发展，人口急骤增加。据市统计局的数据，1999年北京市常住人口为1200余万人，2014年常住人口2100余万人，用水压力逐年增加。

2014年年底，南水北调中线一期工程正式通水，位于北京市城南的郭公庄水厂成为第一批全部使用南水水源的水厂，每天供水50万立方米。今年七八月份，北京正处盛夏，城区日供水量持续高位运行，连续数周维持在300万立方米以上。7月13日，用水量更是达到了破纪录的333万立方米。

随着输水管网的运行稳定,南水北调所调之水的用量正在不断加大。截至8月底，南水进京已达5亿立方米,今年用量将达到8.18亿立方米,预计明年可以达到10.5亿立方米,远期规划中除个别远郊区县外,北京市大部分区县都将喝上千里而来的南水。

截至9月10日8时，南水北调中线一期工程干渠入渠水量累计15.43亿立方米，累计分水量约14.30亿立方米。"

（来源：《科技日报》 2015-09-11）

中国湖泊第一馆——洞庭湖博物馆将于年内开工

日前岳阳市召开的重大项目建设专题会明确，作为全市重大项目重中之重的洞庭湖博物馆建设项目，也将于年内开工建设。据市规划局相关负责人介绍，经过前期 7 轮 21 个建筑设计方案反复比选、深化和评审论证，由清华大学建筑设计研究院洞庭湖博物馆暨洞庭湖生态经济区规划馆项目设计方案，目前已基本完成。"洞庭湖博物馆定位为综合型、开放性、现代化、多功能、国内第一、国际领先的湖泊博物馆，并力争成为中国湖泊第一馆。"市规划局规划编制科相关负责人说，洞庭湖博物馆除了具有专题博物馆的藏品展览、学术交流、科普教育、文化研究等功能外，还复合了洞庭湖生态经济区规划展示、资源保护、政策宣传等功能。

洞庭湖博览园选址于君山濠河北岸，洞庭湖博物馆项目位于洞庭湖博览园内，是洞庭湖博览园的核心项目。根据建筑设计方案，洞庭湖博物馆的主要场馆包括一个主馆和两个副馆。其中，主馆为综合馆即洞庭湖生态经济区规划馆，两个副馆分别为江豚馆与鸟类馆。洞庭湖博物馆总占地约 15 公顷（约 225 亩，含入口停车场及入口至博物馆的道路 105 亩）；总建筑面积约 4.1 万平方米，其中综合馆即洞庭湖生态经济区规划馆 3.1 万平方米，江豚馆 6300 平方米（含室外机房及检测用房 800平方米），鸟类馆 3200 平方米。

（来源：东方网 2015-08-26）

NOAA 提供应急资金应对藻华爆发事件

2015 年 7 月 23 日，美国国家海洋与大气管理局（NOAA）宣布提供 8.8 万美元的事件应急资金，以监测和分析华盛顿州海岸异常大规模爆发的有毒藻类。

大规模爆发的海藻、拟菱形藻等藻类，会产生一种对人体、鱼类和海洋哺乳动物有害的强有力毒素。到目前为止，存在于华盛顿州沿海水体中的毒素已导致渔场关闭，同时也为经济和生态带来了巨大影响。蛏子养殖场关闭已导致预计 920 万美元的收入损失。该州的商业螃蟹捕捞业受其影响每年将损失约 8400 万美元的产值。自 2015 年 5 月以来，拟菱形藻的爆发已经蔓延到从南加利福尼亚到阿拉斯加的整个西海岸，对公共健康造成了严重威胁。还一些种类的拟菱形藻能产生强毒性的神经毒素和软骨藻酸，积累在沙丁鱼、贝类等滤食性鱼类和海洋哺乳动物体内，会对其造成影响。当软骨藻酸超出规定限值，州政府官员会密切关注贝类养殖区和一些渔业捕捞区。

应急资金中有 7.5 万美元将拨付给网络化海洋观测系统西北地区协会（NANOOS），用以监测和分析华盛顿州藻类的爆发情况。其余 1.3 万美元将用来支持多个合作伙伴的数据收集工作。对这些数据再结合海洋和气象条件进行分析，将有助于确定导致爆发的影响因素及其严重程度，同时分析结果还能够帮助研究人员预测 2015 下半年藻华是否会持续或在未来几年再次发生。此外，支持该项工作的合作伙伴还将提供相关配套资金和大约 10 万美元服务项目。

Vörösmarty 等学者则认为，认识到"地方的水行动将继续引发全球规模的水问题"是进行有效治理所必须的第一步。但是，全球视角在为地方治理提供背景、承认问题和解决方案两者的共性、确定最需要防止或补救的地方及跟踪进展等方面至关重要。全球性的思维有助于更好地制定国际水管理协议，从而确保社会的公平性和可持续性。执着地关注于区域尺度将错失这样的机会，而这样的机会则可能在解决 21 世纪的水问题（实际上是全球性的问题）方面取得有意义的进展。

原文来源：http://www.noaanews.noaa.gov/stories2015/072315-noaa-awards-88000-in-grant-funding-to -respond-to-west-coast-harmful-algal-bloom-outbreak.html

（来源：科学研究动态监测快报 2015-08-15，第 16 期总第 261 期）

西藏：高原上的湖泊测量

7月上旬，位于藏北尼玛县的我国西部重要湖泊——当惹雍错外业测量完成，结束了该湖无基础资料的历史，填补了我国国情资料的又一历史资料空白。图为测量人员在进行测量作业。

（来源：《科技日报》 2015-07-08）