湖泊流域动态

本期导读

- **Nature**：气候变化下的湖泊热浪
- **Science**：人类对全球淡水鱼生物多样性的影响
- **Nature Geoscience**：人类活动引起的冰川退缩，增加了帕拉科查湖突发洪水的危险
- 近 100 年(1919-2018)黄河年输沙量和径流量的变化
- 20 年来青藏高原湖泊越来越清澈

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新文速递

Lake heatwaves under climate change

Woolway, R. Iestyn; Jennings, Eleanor; Shatwell, Tom; 等.

Lake ecosystems, and the organisms that live within them, are vulnerable to temperature change(1-5), including the increased occurrence of thermal extremes(6). However, very little is known about lake heatwaves-periods of extreme warm lake surface water temperature-and how they may change under global warming. Here we use satellite observations and a numerical model to investigate changes in lake heatwaves for hundreds of lakes worldwide from 1901 to 2099. We show that lake heatwaves will become hotter and longer by the end of the twenty-first century. For the high-greenhouse-gas-emission scenario (Representative Concentration Pathway (RCP) 8.5), the average intensity of lake heatwaves, defined relative to the historical period (1970 to 1999), will increase from 3.7 +/- 0.1 to 5.4 +/- 0.8 degrees Celsius and their average duration will increase dramatically from 7.7 +/- 0.4 to 95.5 +/- 35.3 days. In the low-greenhouse-gas-emission RCP 2.6 scenario, heatwave intensity and duration will increase to 4.0 +/- 0.2 degrees Celsius and 27.0 +/- 7.6 days, respectively. Surface heatwaves are longer-lasting but less intense in deeper lakes (up to 60 metres deep) than in shallower lakes during both historic and future periods. As lakes warm during the twenty-first century(7,8), their heatwaves will begin to extend across multiple seasons, with some lakes reaching a permanent heatwave state. Lake heatwaves are likely to exacerbate the adverse effects of long-term warming in lakes and exert widespread influence on their physical structure and chemical properties. Lake heatwaves could alter species composition by pushing aquatic species and ecosystems to the limits of their resilience. This in turn could threaten lake biodiversity(9) and the key ecological and economic benefits that lakes provide to society.

（来源：NATURE 卷:589 期:7842 页: 402-+ 出版年: JAN 2021, **DOI:** 10.1038/s41586-020-03119-1）

Increased outburst flood hazard from Lake Palcacocha due to human-induced glacier retreat

Stuart-Smith, R. F.; Roe, G. H.; Li, S.;

Human-induced warming is responsible for the retreat of Palcaraju glacier and the associated increase in glacial lake outburst flood hazard, according to an analysis of observations and numerical models.

A potential glacial lake outburst flood from Lake Palcacocha (Cordillera Blanca, Peru) threatens Huaraz, a city of 120,000 people. In 1941, an outburst flood destroyed one-third of the city and caused at least 1,800 fatalities. Since pre-industrial times, Lake Palcacocha has expanded due to the retreat of Palcaraju glacier. Here we used observations and numerical models to evaluate the anthropogenic contribution to the glacier's retreat and glacial lake outburst flood hazard. We found that the magnitude of human-induced warming equals between 85 and 105% (5-95% confidence interval) of the observed 1 degrees C warming since 1880 in this region. We conclude that it is virtually certain (>99% probability) that the retreat of Palcaraju glacier to the present day cannot be explained by natural variability alone, and that the retreat by 1941 represented an early impact of anthropogenic greenhouse gas emissions. Our central estimate is that the overall retreat is entirely attributable to the observed temperature trend, and that the resulting change in the geometry of the lake and valley has substantially increased the outburst flood hazard.

（来源：NATURE GEOSCIENCE 卷:14 期:2 出版年:FEB 2021, **DOI:** 10.1038/s41561-021-00686-4）

Human impacts on global freshwater fish biodiversity

Su, GH; Logez, M; Xu, J; Tao, SL; Villeger, S; Brosse, S

Freshwater fish represent one-fourth of the world's vertebrates and provide irreplaceable goods and services but are increasingly affected by human activities. A new index, Cumulative Change in Biodiversity Facets, revealed marked changes in biodiversity in >50% of the world's rivers covering >40% of the world's continental surface and >37% of the world's river length, whereas <14% of the world's surface and river length remain least impacted. Present-day rivers are more similar to each other and have more fish species with more diverse morphologies and longer evolutionary legacies. In temperate rivers, where the impact has been greatest, biodiversity changes were primarily due to river fragmentation and introduction of non-native species.

（来源：SCIENCE 卷: 371 期: 6531 页: 835-+出版年: FEB 2021, **DOI:** 10.1126/science.abd3369）

Water column gradients beneath the summer ice of a High Arctic freshwater lake as indicators of sensitivity to climate change

Begin, Paschale N.; Tanabe, Yukiko; Rautio, Milla; 等

Ice cover persists throughout summer over many lakes at extreme polar latitudes but is likely to become increasingly rare with ongoing climate change. Here we addressed the question of how summer ice-cover affects the underlying water column of Ward Hunt Lake, a freshwater lake in the Canadian High Arctic, with attention to its vertical gradients in limnological properties that would be disrupted by ice loss. Profiling in the deepest part of the lake under thick mid-summer ice revealed a high degree of vertical structure, with gradients in temperature, conductivity and dissolved gases. Dissolved oxygen, nitrous oxide, carbon dioxide and methane rose with depth to concentrations well above air-equilibrium, with oxygen values at>150% saturation in a mid-water column layer of potential convective mixing. Fatty acid signatures of the seston also varied with depth. Benthic microbial mats were the dominant phototrophs, growing under a dim green light regime controlled by the ice cover, water itself and weakly colored dissolved organic matter that was mostly autochthonous in origin. In this and other polar lakes, future loss of mid-summer ice will completely change many water column properties and benthic light conditions, resulting in a markedly different ecosystem regime.

（来源：SCIENTIFIC REPORTS 卷:11 期:1 出版年:FEB 2021, **DOI:**10.1038/s41598-021-82234-z）

摘要精选

Spatiotemporal dynamics of succession and growth limitation of phytoplankton for nutrients and light in a large shallow lake

Liu, Xuemei; Chen, Liwen; Zhang, Guangxin; 等

Understanding the limiting factors of phytoplankton growth and competition is crucial for the restoration of aquatic ecosystems. However, the role and synergistic effect of co-varying environmental conditions, such as nutrients and light on the succession of phytoplankton community remains unclear. In this study, a hydrodynamic-ecological modeling approach was developed to explore phytoplankton growth and succession under co-varying environmental conditions (nutrients, total suspended solids (TSS) and

variable N:P ratios) in a large shallow lake called Lake Chagan, in Northeast China. A phytoplankton bloom model was nested in the ecological modeling approach. In contrast to the traditonal ecological modeling, competition between phytoplankton species in our study was modeled at both the species/functional group and phenotype levels. Six phytoplankton functional groups, namely diatoms, green algae, Anabaena, Microcystis, Aphanizomenon and Oscillatoria and each of them with three limitation types (i.e., light-limitation, nitrogen-limitation and phosphorus-limitation) were included in the bloom model. Our results demonstrated that the average biomass proportion of the three limitation types (light-limitation, nitrogen-limitation and phosphorus-limitation) in the six phytoplankton function groups accounted for approximately 50%, 37% and 23% of the total phytoplankton biomass, respectively. TSS suppressed the growth of diatoms and green algae, but favored the dominance of cyanobacteria in Lake Chagan, especially in the turbid water phase (TSS ≥ 60 mg/L). In addition, it was reported that the potential of either N-fixing or non-N-fixing cyanobacterial blooming along the gradients of N:P ratios could exist under the influence of the co-environmental factors in the lake. The proportion of non-N-fixing cyanobacteria (i.e., Microcystis and Oscillatoria) exceeded the proportion of N-fixing cyanobacteria (i.e., Anabaena and Aphanizomenon) when the N:P ratios exceeded 20. Non-N-fixing cyanobacteria would become dominant at higher TSS concentrations and lower light intensities in the turbid water. N-fixing cyanobacteria favored lower N:P ratios and higher light intensities in the clearwater phase (where TSS ≤ 60 mg/L). To sustain a good ecological status in the lake, our results suggest that nutrient and TSS levels in the lake should be maintained at or below the thresholds (TN ≤ 1.5 mg/L; TP ≤ 0.1 mg/L; N:P ratios between 15 and 20; and TSS ≤ 60 mg/L). These findings can help improve water quality management practices to restore aquatic ecosystems.

（来源：Water research 卷:194 页: 116910 出版年: 2021-Apr-15, **DOI:**10.1016/j.watres.2021.116910 ）

Climate change as the dominant driver of recent ecological changes in a semi-arid alpine lake from the Chinese Loess Plateau

Yan, Xinwei; Liu, Jianbao; Ruhland, Kathleen M.; 等.

Semi-arid areas of northern China are under increasing pressures from anthropogenic activities and climate change. Although wetland areas in these drylands have experienced dramatic, unidirectional shifts in their ecological status in recent centuries, fundamental driving forces are poorly quantified. Here, we examine changes in sedimentary proxies (diatoms, spectrally-inferred chlorophyll-a, stable isotopes) preserved in a radiometrically-dated core from Tianchi Lake, an alpine lake within the margin of the East Asian Summer Monsoon (EASM) limit in China's southwestern Loess Plateau. Our algal trends were compared with regional instrumental records, changes in EASM intensity, and with previously published paleolimnological data from this same lake to determine the principal drivers of regional ecological changes. We found no clear evidence that geochemical and biological proxies were strongly affected by deforestation and other human activities. Major environmental changes during the past similar to 200 years were found to be predominantly driven by climatic fluctuations, extreme precipitation events, and changes in EASM intensity. Prior to similar to 1965 CE, diatom assemblages indicate an oligotrophic, clear water state. Shifts in dominance between benthic Staurosirella pinnata and planktonic Lindavia comensis were likely controlled by ice-cover dynamics. Between similar to 1965 and 1980 CE an abrupt shift to a turbid water state during a period of extreme precipitation events was caused by excessive nutrient-laden soil erosion in the already susceptible deforested catchment. This turbid period was evidenced by a rapid increase to dominance of Achnanthidium minutissimum, a sharp decline in

oligotrophic Lindavia comensis, increased primary production, and peaks in sediment grain size and SiO2 content. Post- similar to 1980 CE, we provide evidence that a shift towards planktonic diatom dominance can best be explained by changes in climate and EASM intensity, despite substantial nitrogen deposition in the region during the past few decades. Specifically, a drier and warmer climate together with weakened EASM wind strength resulted in decreased erosion and a return to a clear water state, coupled with enhanced thermal stability. Collectively, these observations expand our understanding of how changes in climate, extreme precipitation events, and fluctuations in EASM intensity influence semi-arid alpine lakes in northern China, as well as climate's leading role in driving ecological change over the past two centuries, despite the intensification of human disturbances during recent decades.

（来源：JOURNAL OF PALEOLIMNOLOGY, **DOI:**10.1007/s10933-020-00167-5 在线发表日期: JAN 2021）

Contributions of external nutrient loading and internal cycling to cyanobacterial bloom dynamics in Lake Taihu, China: Implications for nutrient management

Xu, Hai; McCarthy, Mark J.; Paerl, Hans W.; 等.

Harmful cyanobacterial blooms (CyanoHABs) are linked to increasing anthropogenic nitrogen (N) and phosphorus (P) inputs. However, CyanoHABs in many large lakes continue despite extensive abatement efforts, mostly focused on external P loading. Internal nutrient cycling can modify nutrient availability and limitation; thus, understanding the relative importance of external vs. internal nutrient loading is essential for developing effective mitigation strategies for CyanoHABs. We estimated long-term nutrient budgets for Lake Taihu, China, from mass balance models using extensive monitoring of input and output nutrient data from 2005 to 2018 to quantify contributions from internal nutrient loading. The nutrient mass balance showed that 9% and 63% of annual external N and P inputs, respectively, were retained in the lake. Denitrification removed 54% of external N loading and can thus help explain rapid decreases in lake N concentrations and summer N limitation. Water column NH4+ regeneration can help sustain CyanoHABs over the short term and contributed 38-58% of potential NH4+ demand for summer-fall, Microcystis-dominated blooms. Internal P release contributed 23-90% of CyanoHABs P demand, although Taihu was a net P sink on an annual scale. Our results show that internal nutrient cycling helps sustain CyanoHABs in Taihu, despite reductions in external nutrient inputs. Furthermore, N is leaving the lake faster than P, thereby creating persistent N limitation. Therefore, parallel reductions in external N loading, along with P, will be most effective in reducing CyanoHABs and accelerate the recovery process in this and other large, shallow lakes.

（来源：LIMNOLOGY AND OCEANOGRAPHY, **DOI:**10.1002/lno.11700 在线发表日期: FEB 2021）

A coupled human-natural system analysis of water yield in the Yellow River basin, China

Yin, LC; Feng, XM; Fu, BJ; Wang, S; Wang, XF; Chen, YZ; Tao, FL; Hu, J

In response to the potential water conflict caused by climate change and increased population, an integrated water yield analysis from the perspective of the coupled human-natural system is clearly required. This paper conducted an integrated water yield analysis in the Yellow River basin (YRB), China, with applications for irrigated cropland water modeling and many field, statistical and satellite images. We found the following during 2000-2017: (1) The irrigation water consumption, rain-fed water consumption

of cropland and rain-fed water consumption of natural ecosystems all increased significantly. (2) Ecological restoration caused a consequence of the 81.7 108 m3 water consumption transfer from cropland to natural ecosystems. (3) Water consumption variability was strongly related to irrigation expansion and ecological restoration, and this variability dominated the high water yield variability in the midstream YRB (95.73% +/- 0.5%). (4) The increased downstream human water use stress was mainly affected by increased downstream water use and upstream water yield change, with contribution ratios of 1.67 and -0.72, respectively. The study declares the intense relationship between ecological restoration, crop production and socioeconomic activities within the water-limited river basin. This research also highlights that synthetic river basin management is essential to balance the water demand between different sectors and between the upper stream and downstream sections of a basin.

(来源：SCIENCE OF THE TOTAL ENVIRONMENT, 2021, **DOI:**10.1016/j.scitotenv.2020.143141)

Remote sensing estimation of water clarity for various lakes in China

Zhang, Yibo; Zhang, Yunlin; Shi, Kun; 等

Water clarity (expressed as Secchi disk depth (SDD)) reflects light transmission capacity of a water body and influences growth of aquatic plants, aquatic organisms, and primary productivity. Here, we calibrated and validated a general model based on Landsat series data for deriving SDD of various inland waters across China. The quality of remotely sensed reflectance products from different Landsat series images was assessed using in situ reflectance measurements. The results indicated that the products in the visible bands are the most robust and stable to estimate SDD for inland waters. Subsequently, a simple power function model based on red band was built using 887 pairs of in situ SDD measurements and concurrent Landsat images. The model was validated with an independent dataset of 246 SDD measurements, and the results showed that the mean relative error and normalized root mean square error were 34.2% and 55.4%, respectively. Finally, the model was applied to Landsat images acquired between 2016 and 2018 to investigate the SDD spatial distribution of all lakes with water area ≥ 10 km2 (total 641 lakes) in China. The estimation results demonstrated that the Eastern Plain Lake Zone and Northeast Plain Lake zone have relatively low SDD, with multiyear average SDD of 0.56±0.17m and 0.47±0.29m, respectively. The Yunnan-Guizhou Plateau Lake Zone and Tibetan Plateau Lake Zone have relatively high SDD, with multiyear average SDD of 1.48±0.86m and 1.30±0.83m, respectively. The results indicated that the proposed model exhibits strong ability to accurately construct SDD coverage for various lakes.

（来源：Water research 卷:19 页:116844 出版年: 2021-Mar-15, **DOI:**10.1016/j.watres.2021.116844）

Variability of annual sediment load and runoff in the Yellow River for the last 100 years (1919-2018)

Wang, H; Sun, FB

Few The sediment load of the Yellow River, once the highest in the world, has decreased to a record low. The annual sediment load (ASL, t.yr(-1)) in the main stream of the Yellow River in the past 100 years (1919-2018) shows that the ASL was consistently high for the first 60 years and then decreased gradually until 1999, when the Green for Grain Project (GGP) launched on the Loess Plateau caused ASL to drop sharply. The annual runoff did not decrease as much as ASL from1919 to 2018, while it decreased significantly in themiddle reaches. With the construction of sediment storage dams, terraces, and reservoirs, especially after the GGP launched, the ASL of the Yellow River has been reduced to historic

lows. For example, the annual average Normalized Difference Vegetation Index (NDVI) of the Yellow River Basin increased significantly from 1982 to 2016, and the ASL decreased exponentially with increasing NDVI. Although the annual precipitation has a stationary behavior in the Yellow River, the daily precipitation extremes affecting erosion showed an increase of 7% per degree ofwarming but did not change the trend of ASL reduction. Therefore, the effectivemanagement on the Loess Plateau can control the trend of the sediment load of the Yellow River. Erosion, sediment load, and runoff in changing environments are affected by flood control and drought resistance, so more attention should be paid to these hydrologic processes.

(来源：SCIENCE OF THE TOTAL ENVIRONMENT,2021, **DOI:**10.1016/j.scitotenv.2020.143715)

High cadmium pollution from sediments in a eutrophic lake caused by dissolved organic matter complexation and reduction of manganese oxide

Chen, Musong; Ding, Shiming; Li, Cai; 等

Eutrophication and metal pollution are global environmental problems. The risk of metal pollution is high in the eutrophic lakes because of high mobility of metal in sediments. However, the mechanism of cadmium (Cd) mobility in sediments is still unclear. Here we study the mobilization of Cd in sediments from the eutrophic Lake Taihu via monthly field monitoring of mobile Cd using diffusive gradient in thin films (DGT) and high resolution dialysis (HR-Peeper) techniques. We found a high mobility of Cd in sediments in February and March, resulting from reductive dissolution of Mn oxide mediation by high microbial activities, as shown by the similarities in distribution patterns of DGT-labile Cd and Mn. A two orders of magnitude increase in dissolved Cd concentrations (about 28 mu g L (-1)) was observed in May and June, with dissolved Cd concentrations in overlying water about 110 times higher than the criteria continuous concentration set by Environmental Protection Agency. Hourly changes were found to coincide and correlate between dissolved Cd and dissolved organic matter (DOM) under simulated anaerobic conditions, strongly suggesting that the sudden outbreak of Cd pollution observed in the field resulted from the complexation of DOM with Cd in sediments. This was further supported by the NICA-Donnan model that more than 71% of dissolved Cd in the pore water in May and June was present as Cd-DOM complexes. Three components of DOM including humic-, tryptophan-, and tyrosine-like components in the sediments in June was identified using the fluorescence excitation emission matrix-parallel factor analysis. We found that Cd was stable complexed with tyrosine-like component. The Fourier transform infrared and two-dimensional correlation spectroscopy further revealed that Cd was bound to phenolic O-H, alkene C=C, alcoholic C-O, aromatic C-H, and alkene =CH groups. Our study effectively promotes the understanding of Cd mobilization in sediments and highlights the risk of sudden Cd pollution events in the eutrophic lakes.

（来源：WATER RESEARCH 卷:190 文献号:116711 出版年:FEB15 2021, **DOI:**10.1016/j.watres.2020.116711）

Changes in precipitation extremes in the Yangtze River Basin during 1960-2019 and the association with global warming, ENSO, and local effects

Li, X; Zhang, K; Gu, PR; Feng, HT; Yin, YF; Chen, W; Cheng, BC

Extreme precipitation events can pose great risks to natural ecosystems and human society. Investigating past changes in the frequency, intensity, and duration of such events and understanding the

possible driving factors are critical for reliable projections of future changes and for informing adaptation strategies planning. Here we analyze trends in a complete list of extreme precipitation indices (EPIs) over the Yangtze River Basin (YRB) during the period of 1960-2019. Also, we examine the possible influences of global warming, ENSO, and local effects on the spatiotemporal variability of the EPIs. Our results show that average and extreme precipitation intensities, and the frequency of extreme heavy precipitation in the YRB have significantly increased, while precipitation frequency and maximum duration of wet spells have significantly decreased. A regional difference in trend occurrence and magnitude is also observed, showing the intensity and frequency of precipitation extremes over the Middle and Lower reaches are more likely to increase and increase faster, compared with those of the Upper reach of the YRB. Furthermore, our correlation analysis shows global warming, ENSO, and local effects all are significant driving factors that control the spatiotemporal variability of precipitation extremes over the YRB. Global warming tends to enhance the frequency and intensity of precipitation extremes. The La Nina phase of ENSO often corresponds to an increase of frequency and intensity of precipitation extremes in the current year, but a decrease of frequency and intensity in the coming year. Local warming mainly exerts a reducing effect on precipitation extremes, which is likely a response to the significant decrease of relative humidity in the YRB. Our findings highlight the need for a systematic approach to examine global, regional, and local drivers of trends in precipitation extremes in the YRB, and contribute to the understanding of precipitation changes in this region.

(来源：SCIENCE OF THE TOTAL ENVIRONMENT, **DOI:**10.1016/j.scitotenv.2020.144244)

An experimental test of climate change effects in northern lakes: Increasing allochthonous organic matter and warming alters autumn primary production

Hamdan, Mohammed; Bystrom, Par; Hotchkiss, Erin R.; 等.

Climate changes are predicted to influence gross primary production (GPP) of lakes directly through warming and indirectly through increased loads of allochthonous coloured dissolved organic matter (cDOM) from surrounding landscapes. However, few studies have investigated this combined effect.

Here we tested the effects of warming (elevated 3celcius) and cDOM input (three levels of humic river water addition) on GPP in autumn (2 months including open water and ice-covered periods) in experimental pond ecosystems.

The cDOM input decreased whole-ecosystem GPP at natural temperature conditions mainly as a result of lower benthic GPP not fully counteracted by an increase in pelagic GPP, while warming increased whole-ecosystem GPP due to a positive response of mainly pelagic GPP at all levels of cDOM input.

Warming delayed autumn ice cover formation by 2 weeks but did not affect light availability in the water column compared to ambient ice-covered treatments. Gross primary production during this period was still affected by warming and cDOM.

The results stress the importance of accounting for multiple climate drivers and habitats when predicting lake GPP responses to climate change. We conclude that climate change may shift whole-ecosystem GPP through different responses of habitat-specific GPP to increasing cDOM inputs and warming.

（来源：FRESHWATER BIOLOGY, **DOI:** 10.1111/fwb.13679 在线发表日期: JAN 2021）

Phosphorus supply pathways and mechanisms in shallow lakes with different regime

Li, Hui; Song, Chunlei; Yang, Liu; 等

In order to better understand the pathways and mechanisms of phosphorus (P) supply under different regimes, 12 sampling sites from 4 basins of 2 lakes were studied seasonally from October 2017 to July 2018 in Wuhan City, China. Concentrations of different forms of P and nitrogen (N) in surface and interstitial water, contents of carbon (C), N, P and iron (Fe) compounds as well as related extracellular enzymatic activities, phosphorus sorption, abundance of phosphorus-solubilizing bacteria (PSB), total and specific (containing phosphatase gene) microbial community composition in sediments were analyzed. In lakes with macrophyte dominance, P supply pathway from sediment to water column was blocked. In lakes being early period of regime shifting from macrophyte to algae, exogenous P input was the main P supply mode. In lakes being later period of regime shifting from macrophyte to algae, organic P hydrolysis and calcium-bound P dissociation driven by PSB contributed greatly to P regeneration, which was continuous and trickling. In this process, rapid C and N cycles fueled P regeneration. In lakes with algal dominance, given the significantly higher iron-bound P (Fe(OOH)~P), equilibriums phosphorus concentration and dehydrogenase activity, the main P regeneration pathway might be the desorption of Fe(OOH)~P driven by anoxia, showing the seasonal and pulsed characteristics. In addition, during the process of regime shift from macrophyte to algae, the dominant algal species switched from cyanobacteria to Chlorophyta. P-solubilizing microorganisms correlated with environmental factors, suggesting the coupling of multiple nutrient cycles, especially C, N, P, oxygen (O) and Fe, could effectively increase the pathways diversification and the strength of P regeneration.

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Continental-scale effects of phytoplankton and non-phytoplankton turbidity on macrophyte occurrence in shallow lakes

Yuan, Lester L.

Submerged macrophytes are key components of shallow lake biological communities, and their presence has been associated with a predominantly clear-water state. Conversely, lakes lacking macrophytes are often turbid with elevated phytoplankton abundance. One main mechanism that influences the presence or absence of submerged macrophytes is turbidity that reduces the light available to macrophytes. Increases in turbidity can be caused by increased phytoplankton abundance and by increased concentrations of suspended inorganic sediment and understanding the relative contributions of these two factors can inform efforts to manage the effects of increased turbidity on macrophyte occurrence. Here, a continental scale data set is analyzed to quantify the effects of macrophytes on turbidity that originates from phytoplankton and from non-phytoplankton sources (e.g., inorganic sediment). Effects of phytoplankton assemblage composition on turbidity are also estimated. Based on this model, illustrative examples of chlorophyll concentrations needed to maintain or restore macrophytes to shallow lakes are calculated, and the difference in the magnitude of these concentrations illustrates the stabilizing effect of macrophytes on lake condition.

（来源：AQUATIC SCIENCES 卷: 83 期: 1, **DOI:**10.1007/s00027-020-00769-1 出版年: JAN 2021）

Effects of phytoplankton blooms on fluxes and emissions of greenhouse gases in a eutrophic lake

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Lakes are important sources of greenhouse gases (GHGs) to the atmosphere. Factors controlling CO2, CH4 and N2O fluxes include eutrophication and warming, but the integrated influence of climate-warming-driven stratification, oxygen loss and resultant changes in bloom characteristics on GHGs are not well understood. Here we assessed the influence of contrasting meteorological conditions on stratification and phytoplankton bloom composition in a eutrophic lake, and tested for associated changes in GHGs inventories in both the shallow and deep waters, over three seasons (2010-2012). Atmospheric heatwaves had one of the most dramatic effects on GHGs. Indeed, cyanobacterial blooms that developed in response to heatwave events in 2012 enhanced both sedimentary CH4 concentrations (reaching up to 1mM) and emissions to the atmosphere (up to 8 mmol m-2 d-1). That summer, CH4 contributed 52% of the integrated warming potential of GHGs produced in the lake (in CO2 equivalents) as compared to between 34 and 39% in years without cyanobacterial blooms. High CH4 accumulation and subsequent emission in 2012 were preceded by CO2 and N2O consumption and under-saturation at the lake surface (uptakes at -30 mmol m-2 d-1 and -1.6 mol m-2 d-1, respectively). Fall overturn presented a large efflux of N2O and CH4, particularly from the littoral zone after the cyanobacterial bloom. We provide evidence that, despite cooling observed at depth during hot summers, CH4 emissions increased via stronger stratification and surface warming, resulting in enhanced cyanobacterial biomass deposition and intensified bottom water anoxia. Our results, supported by recent literature reports, suggests a novel interplay between climate change effects on lake hydrodynamics that impacts both bloom characteristics and GHGs production in shallow eutrophic lakes. Given global trends of warming and enrichment, these interactive effects should be considered to more accurately predict the future global role of lakes in GHG emissions.

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Staining of subfossil chironomid head capsules: a method for improving the extraction process from lake sediments and peat

Cao, Yanmin; Zheng, Zijie; Luo, Xuan; 等

Subfossil chironomids are regarded as a useful biological proxy for palaeoenvironmental research, but picking chironomid head capsules from aquatic sediments is extremely time-consuming. This is often the case for finding and isolating small head capsules from the deflocculated sediment. In this study, two stains (aniline blue and cotton blue) were used to dye chironomid head capsules in lake and peat sediments to improve the traditional pretreatment method and boost the picking efficiency. The results suggested that: (1) there were sharp contrasts between chironomids and residues after staining, which could shorten picking time for both lake and peat samples; (2) different parts of head capsules showed distinctive colour in stained samples and thus facilitated identification and taxonomy of subfossil chironomids; (3) the dyeing effects of two stains were comparable and no significant effect of staining on chironomid composition has been observed compared with unstained samples. This study demonstrates that aniline blue and cotton blue stain can promote picking efficiency of subfossil chironomids, and can be widely applied to pretreatment of sedimentary chironomids in palaeoenvironmental studies on lakes and peatlands.

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Changing sources and processes sustaining surface CO2 and CH4 fluxes along a tropical river to reservoir system

Soued, C; Prairie, YT

Freshwaters are important emitters of carbon dioxide (CO2) and methane (CH4), two potent greenhouse gases (GHGs). While aquatic surface GHG fluxes have been extensively measured, there is much less information about their underlying sources. In lakes and reservoirs, surface GHG can originate from horizontal riverine flow, the hypolimnion, littoral sediments, and water column metabolism. These sources are generally studied separately, leading to a fragmented assessment of their relative role in sustaining CO2 and CH4 surface fluxes. In this study, we quantified sources and sinks of CO2 and CH4 in the epilimnion along a hydrological continuum in a permanently stratified tropical reservoir (Borneo). Results showed that horizontal inputs are an important source of both CO2 and CH4 (> 90 % of surface emissions) in the upstream reservoir branches. However, this contribution fades along the hydrological continuum, becoming negligible in the main basin of the reservoir, where CO2 and CH4 are uncoupled and driven by different processes. In the main basin, vertical CO2 inputs and sediment CH4 inputs contributed to on average 60% and 23% respectively to the surface fluxes of the corresponding gas. Water column metabolism exhibited wide amplitude and range for both gases, making it a highly variable component, but with a large potential to influence surface GHG budgets in either direction. Overall our results show that sources sustaining surface CO2 and CH4 fluxes vary spatially and between the two gases, with internal metabolism acting as a fluctuating but key modulator. However, this study also highlights challenges and knowledge gaps related to estimating ecosystem-scale CO2 and CH4 metabolism, which hinder aquatic GHG flux predictions.

(来源：BIOGEOSCIENCES,2021, 18(4):133-1350, **DOI:**10.5194/bg-18-1333-2021)

利用 GRACE-FO 重力卫星探测 2019 年长江中下游极端干旱

冉艳红；钟敏；陈威，等

2019 年夏秋季长江中下游地区持续半年的极端干旱给当地的农业生产和生态环境带来了严重的影响.目前对于干旱程度的估计主要依赖于降水、蒸散发、径流和土壤含水量等参数的监测. GRACE/GRACE-FO 重力卫星通过探测全球地球重力场变化,捕捉地表水、土壤水分和地下水储量变化信息,从而跟踪全球范围的干旱事件.虽然利用 GRACE 和 GRACE-FO 卫星观测全球和区域陆地水储量变化取得了重大成就,但利用重力卫星监测干旱程度的研究依然较少.因此基于 GRACE/GRACE-FO 卫星观测资料,通过估计 GRACE-DSI,研究分析了 2019 年夏秋季长江中下游地区的干旱强度及其时空分布.结果表明:（1） GRACE-DSI 很好地反映了 2019 年夏秋季长江中下游地区持续干旱的发生、发展过程,其中极端干旱区域位于湖北东部、江西北部、安徽南部等区域;（2）湖北、江西、安徽和湖南四省区域平均的 GRACE-DSI 指数与 6 个月时间尺度的 SPEI-Z 的时间序列吻合最好,相关性为 0.84,说明 GRACE-DSI 能够反映干旱的长期积累效应;（3）通过比较长江中下游区域 2011 年春夏和 2019 年夏秋两次极端干旱事件的监测,显示 GRACE-FO 与 GRACE 前后两组重力卫星具有等同的干旱监测能力.

今后随着重力卫星观测的空间分辨率和时间分辨率的不断提高，GRACE-DSI 将能够更为准确、快速地探测水文极端干旱事件.

（来源： 科学通报,2021,66(1): 107-117）

青藏高原草原带和荒漠带湖泊表层沉积物现代花粉研究

秦锋

花粉现代过程研究是基于化石花粉谱重建古植被和古气候变化的基础.尽管青藏高原已经有大量花粉现代过程研究,但是仅有少数关于湖泊表层沉积物现代花粉组合的报道.本研究分析了青藏高原草原带和荒漠带 34 个湖泊的表层沉积物花粉组合,结果显示,这两个高原植被带的现代花粉组合以草本、灌木花粉占优势,不过特征类群的相对丰度具有显著差别.高原荒漠带的现代花粉组合有高含量的藜科 Chenopodiaceae 花粉,而草原带以莎草科 Cyperaceae 占明显优势.花粉比值能够清楚地指示青藏高原草原带和荒漠带植被和气候的差异.蒿属/藜科比值（Artemisia/Chenopodiaceae）和乔木/非乔木花粉比值（arboreal/non-arboreal）可指示冬季降水量的变化,蒿属/莎草科比值（Artemisia/Cyperaceae）以及喜旱类群总相对丰度升高指示气候变暖、变干.按湖泊周围的植被盖度对研究点进行聚类分析,发现研究样点可以分为草甸、草原、荒漠草原、荒漠等 4 个植被组.利用随机森林算法建立花粉-植被重建模型,结果显示,随机森林模型可以准确地鉴别青藏高原的草原带和荒漠带;当研究样点植被类型按聚类分析结果分为4种时,随机森林模型准确性略降低,但仍有较可靠的预测能力.今后将更多的湖泊表层沉积物花粉组合数据作为随机森林算法的训练集时,建立的花粉-植被模型极有潜力在青藏高原古植被重建中得到广泛运用。

（来源：中国科学: 地球科学, 2021,51(3): 437-452）

Effects of nitrate on phosphorus release from lake sediments

Ma, Shuo-Nan; Wang, Hai-Jun; Wang, Hong-Zhu; 等

Phosphorus (P) release from sediment is a key process affecting the effectiveness of eutrophication mitigation. We hypothesized that high nitrate (NO3-) input may have dual effect on sediment P release: reduce the sediment P release by improving the oxidation of sediment or promote P release by stimulating the growth of phytoplankton and increase the decomposition rates and oxygen consumption at the sediment water interface. To test the effect of different NO3- concentrations, we conducted a three-month experiment in 15 cement tanks (1 m3), with five targeted concentrations of NO3-: control, 2 mg L-1, 5 mg L-1, 10 mg L-1, and 15 mg L-1. The results showed that: i) when NO3- was maintained at high levels: NO3-≥5-7 mg L-1 (range of median values), there was no effect of NO3- on net P release from the sediment, likely because the positive effects of NO3- (increasing oxidation) was counteracted by a promotion of phytoplankton growth. ii) after NO3- addition was terminated NO3- dropped sharply to a low level (NO3-≤0.4 mg L-1), followed by a minor P release in the low N treatments but a significant P release in the high N treatments, which likely reflect that the inhibition effect of NO3- on P release decreased, while the promotion effects at high NO3- concentrations continued. The results thus supported our hypotheses of a dual effect on sediment P release and suggest dose-dependent effect of NO3- loading on stimulating P release from the sediment, being clear at high NO3- exceeding 5-7 mg

L-1.

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泥炭沼泽湿地研究的若干基本问题与研究简史

陈槐；吴宁；王艳芬，等

泥炭沼泽湿地是一种独特的生态系统，因其巨大的碳储量备受关注. 关于泥炭沼泽湿地的文献记录可追溯到 17 世纪末，中国学者对于泥炭沼泽湿地的关注始于 20 世纪 40 年代末. 随着对泥炭沼泽湿地研究的不断深入，其研究态势和研究范式也随之改变. 文章通过对泥炭沼泽研究的专著和文献进行分析，从学科发展的角度出发对沼泽湿地研究历史沿革与态势进行了初步整理，主要概括为三个发展时期：自然资源学导向时期、地学导向时期及生态学导向时期. 此外，文章还梳理了泥炭沼泽的定义及界定标准，概述了雨养与矿养泥炭沼泽的区别与演变，分析了泥炭沼泽土壤分类现状，探讨了泥炭沼泽面积估算及其不确定性. 发现各国对泥炭沼泽的界定标准由于资源禀赋不同而差异较大，由矿养泥炭向雨养泥炭演替模式正在突破传统的认知；泥炭地土壤分类趋于细化，泥炭土壤分析方法更加专业；现有泥炭沼泽面积的界定过度依赖于土壤有机质含量和泥炭厚度这两个指标. 在泥炭沼泽湿地研究进程中，研究范畴更加宽泛，研究方法日新月异，对泥炭地的认知在广度和深度上进一步扩展

（来源：中国科学：地球科学, 2021,51(1): 15-26）

The Biological Assessment and Rehabilitation of the World's Rivers: An Overview

Feio, MJ; Hughes, RM; Callisto, M; Nichols, SJ; etal.

The biological assessment of rivers i.e., their assessment through use of aquatic assemblages, integrates the effects of multiple-stressors on these systems over time and is essential to evaluate ecosystem condition and establish recovery measures. It has been undertaken in many countries since the 1990s, but not globally. And where national or multi-national monitoring networks have gathered large amounts of data, the poor water body classifications have not necessarily resulted in the rehabilitation of rivers. Thus, here we aimed to identify major gaps in the biological assessment and rehabilitation of rivers worldwide by focusing on the best examples in Asia, Europe, Oceania, and North, Central, and South America. Our study showed that it is not possible so far to draw a world map of the ecological quality of rivers. Biological assessment of rivers and streams is only implemented officially nation-wide and regularly in the European Union, Japan, Republic of Korea, South Africa, and the USA. In Australia, Canada, China, New Zealand, and Singapore it has been implemented officially at the state/province level (in some cases using common protocols) or in major catchments or even only once at the national level to define reference conditions (Australia). In other cases, biological monitoring is driven by a specific problem, impact assessments, water licenses, or the need to rehabilitate a river or a river section (as in Brazil, South Korea, China, Canada, Japan, Australia). In some countries monitoring programs have only been explored by research teams mostly at the catchment or local level (e.g., Brazil, Mexico, Chile, China, India, Malaysia, Thailand, Vietnam) or implemented by citizen science groups (e.g., Southern Africa, Gambia, East Africa, Australia, Brazil, Canada). The existing large-extent assessments

show a striking loss of biodiversity in the last 2-3 decades in Japanese and New Zealand rivers (e.g., 42% and 70% of fish species threatened or endangered, respectively). A poor condition (below Good condition) exists in 25% of South Korean rivers, half of the European water bodies, and 44% of USA rivers, while in Australia 30% of the reaches sampled were significantly impaired in 2006. Regarding river rehabilitation, the greatest implementation has occurred in North America, Australia, Northern Europe, Japan, Singapore, and the Republic of Korea. Most rehabilitation measures have been related to improving water quality and river connectivity for fish or the improvement of riparian vegetation. The limited extent of most rehabilitation measures (i.e., not considering the entire catchment) often constrains the improvement of biological condition. Yet, many rehabilitation projects also lack pre-and/or post-monitoring of ecological condition, which prevents assessing the success and shortcomings of the recovery measures. Economic constraints are the most cited limitation for implementing monitoring programs and rehabilitation actions, followed by technical limitations, limited knowledge of the fauna and flora and their life-history traits (especially in Africa, South America and Mexico), and poor awareness by decision-makers. On the other hand, citizen involvement is recognized as key to the success and sustainability of rehabilitation projects. Thus, establishing rehabilitation needs, defining clear goals, tracking progress towards achieving them, and involving local populations and stakeholders are key recommendations for rehabilitation projects (Table 1). Large-extent and long-term monitoring programs are also essential to provide a realistic overview of the condition of rivers worldwide. Soon, the use of DNA biological samples and eDNA to investigate aquatic diversity could contribute to reducing costs and thus increase monitoring efforts and a more complete assessment of biodiversity. Finally, we propose developing transcontinental teams to elaborate and improve technical guidelines for implementing biological monitoring programs and river rehabilitation and establishing common financial and technical frameworks for managing international catchments. We also recommend providing such expert teams through the United Nations Environment Program to aid the extension of biomonitoring, bioassessment, and river rehabilitation knowledge globally.

(来源：WATER, 2021, 13(3) , **DOI:**10.3390/w13030371)

Unravelling winter diatom blooms in temperate lakes using high frequency data and ecological modeling

Kong, Xiangzhen; Seewald, Michael; Dadi, Tallent; 等.

In temperate lakes, it is generally assumed that light rather than temperature constrains phytoplankton growth in winter. Rapid winter warming and increasing observations of winter blooms warrant more investigation of these controls. We investigated the mechanisms regulating a massive winter diatom bloom in a temperate lake. High frequency data and process-based lake modeling demonstrated that phytoplankton growth in winter was dually controlled by light and temperature, rather than by light alone. Water temperature played a further indirect role in initiating the bloom through ice-thaw, which increased light exposure. The bloom was ultimately terminated by silicon limitation and sedimentation. These mechanisms differ from those typically responsible for spring diatom blooms and contributed to the high peak biomass. Our findings show that phytoplankton growth in winter is more sensitive to temperature, and consequently to climate change, than previously assumed. This has implications for nutrient cycling and seasonal succession of lake phytoplankton communities. The present study exemplifies the strength in integrating data analysis with different temporal resolutions and lake modeling. The new lake ecological model serves as an effective tool in analyzing and predicting winter phytoplankton dynamics for temperate lakes.

（来源：Water research 卷：190 页：116681 出版年：2021-Feb-15 , **DOI:**10.1016/j.watres.2020.116681）

Using Integrated Hydrological Models to Assess the Impacts of Climate Change on Discharges and Extreme Flood Events in the Upper Yangtze River Basin

Wu, YJ; Luo, G; Chen, C; Duan, Z; Gao, C

The roles of both landscape alteration and in-lake processes need to be considered in conservation strategies for shallow lakes in the prairie regions of North America. Here we focus on shallow lakes in west-central Minnesota, USA, highlighting the long-term ecological history and response to known landscape changes of a clear-water, macrophyte-dominated, shallow lake. Contemporary limnological data suggest the aquatic ecosystem has been very stable and fishless for the last similar to 15 years. Sediment proxies for primary production and ecological change confirm that a stable ecosystem likely prevailed for the last similar to 200 years. However, sedimentary indicators of catchment erosion detail a distinct response to land-use change during the conversion of native grassland to agricultural land, and following establishment of a protected waterfowl production area (WPA) around the lake. Post-WPA, the rate of sediment accrual decreased dramatically within 5-10 years and sources of organic matter were similar to those of the pre-settlement period. The aquatic ecosystem has been able to withstand nutrient enrichment and allochthonous inputs because stable trophic interactions have likely been in place for more than 200 years. We conclude that lack of hydrologic connectivity and isolated, small catchments are important factors in the promotion of clear-water shallow lake ecosystems, mainly because they prevent colonization by fish and associated ecological consequences. This study highlights the importance of managing both the landscape and in-lake processes to maintain stable, clear-water, shallow lakes.

（来源：JOURNAL OF PALEOLIMNOLOGY , 2014, 51(3): 405-420, **DOI:**10.3390/w13030299）

Can top-down effects of cypriniform fish be used to mitigate eutrophication effects in medium-sized European rivers?

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Eutrophication seriously threatens the ecological quality and biodiversity of running waters. In nutrient-enriched streams and shallow rivers, eutrophication leads to excessive periphyton growth and, in turn, biological clogging, oxygen depletion in the hyporheic zone and finally a reduction in the hyporheic habitat quality. Top-down control of the food-web by manipulating fish stocks, similar to the biomanipulation successfully applied in lakes, offers a promising approach to mitigating the effects of eutrophication in shallow rivers, especially those in which major reductions in nutrient input are not feasible. We conducted a reach-scale experiment over 4 years in a medium-sized eutrophic river to assess whether the top-down effects of two important large European cypriniform fish species, herbivorous common nase (Chondrostoma nasus) and omnivorous European chub (Squalius cephalus), would mitigate the effects of eutrophication. The enhancement of fish stocks was expected to reduce biological clogging, via the top-down control of periphyton by benthic grazing and enhanced bioturbation, thus increasing oxygen availability in the hyporheic zone as well as water exchange between the surface water and the hyporheic zone. As expected, enhancing the stocks of nase and chub increased both oxygen availability and vertical exchange flux of water in the upper layer of the hyporheic zone. However, periphyton biomass (chlorophyll a) was significantly reduced only in deeper pool habitat. Thus, while

experimental biomanipulation in a shallow river significantly mitigated the effects of eutrophication in the hyporheic zone, top-down effects on periphyton biomass were rather small. Overall, to our knowledge, our results provide first evidence that the biomanipulation achieved by enhancing herbivorous and omnivorous fish stocks has the potential to mitigate the effects of eutrophication in medium-sized European rivers.

(来源：SCIENCE OF THE TOTAL ENVIRONMENT, 2021, **DOI:** 10.1016/j.scitotenv.2020.142547)

Contrasting effects and mode of dredging and in situ adsorbent amendment for the control of sediment internal phosphorus loading in eutrophic lakes

Yin, Hongbin; Yang, Chunhui; Yang, Pan; 等.

Dredging and in situ adsorbent inactivation are two methods which are frequently used in eutrophic water bodies such as ponds, lakes and estuaries to control internal phosphorus (P) loading from sediments. However, their effects and modes on the control of sediment P loading has been seldom compared. In this study, a long-term sediment core incubation experiment in the field was undertaken to investigate changes in sediment P loading (P fluxes, supply ability and forms of P and transformation) comparing two remediation techniques, that of lanthanum-modified bentonite (LMB) addition or dredging to a control. A 360-day field investigation indicated that LMB addition more effectively reduced pore water P concentrations and sediment P fluxes than dredging in comparison with the control. On average, dredging and in situ LMB inactivation reduced the P flux by 82% and 90%, respectively relative to the control sediment. Whilst both the LMB inactivation and dredging can reduce the mobile P concentration, the impact of LMB in reducing mobile P was demonstrated to be more prolonged than that of dredging after 360 days. The P fraction composition in the LMB inactivated sediment differed significantly from the dredged and control sediment. Contrary to physical removal of dredging, chemical transformation of sediment mobile P and Al-P into Ca-P is the main function mode of LMB for sediment internal P control. Both LMB addition and dredging caused changes in the composition of sediment bacterial communities. Whilst LMB addition increased bacterial diversity, dredging temporarily reduced it. This study indicates that in situ inactivation by LMB is superior to dredging in the long-term control of sediment P loading.

（来源：WATER RESEARCH 卷:189 出版年: FEB 1 2021, **DOI:** 10.1016/j.watres.2020.116644）

Uncovering process domains in large rivers: Patterns and potential drivers of benthic substrate heterogeneity in two North American riverscapes

Scholl, EA; Cross, WF; Baxter, CV; Guy, CS

Identifying and understanding functional process domains (sensu Montgomery, 1999) in rivers is paramount for linking the physical habitat template to ecosystem structure and function. To date, efforts to do this have been rare, especially in large rivers, as they require appropriate tools for quantifying habitat heterogeneity with fine-scale resolution across broad spatial extents. In this study, we used side-scan sonar technology to map riverbed substrate at six sites in the Yellowstone and Missouri rivers. Substrate maps were then analyzed and visualized using geospatial analysis to relate fine-grained spatial substrate patterns to process domain structure. Our findings revealed two distinct nested domains of substrate patchiness, suggesting that different factors are responsible for shaping patterns of substrate at different scales. Although small-scale patchiness in substrate was likely driven by internal, or

autogenic, physical processes, patterns at larger segment extents (>3 km) were often driven by abrupt transitions in habitat related to exogenous factors such as lateral erosion of talus, tributary inputs, and bank armoring. Additionally, we found that heterogeneity in benthic substrate increased with spatial extent at all of our study sites; however, this relationship was lower in the Missouri River, which is altered by impoundment. Our study represents one of the first efforts to relate benthic habitat heterogeneity to nested process domain structure in large riverscapes, and offers a unique perspective for linking landscape processes, geomorphological habitat heterogeneity, and biological structure and function in large rivers.

(来源：GEOMORPHOLOGY, 2021, **DOI:**10.1016/j.geomorph.2020.107524)

Total phosphorus and climate are equally important predictors of water quality in lakes

Shuvo, Arnab; O'Reilly, Catherine M.; Blagrave, Kevin; 等.

Water quality degradation is one of the largest threats to freshwater ecosystems. Nutrient inputs, land use changes, and climate are expected to be the most important drivers of water quality degradation. Here, we quantify the relative influence of nutrient inputs, climate, and lake geomorphometry on primary production in freshwater lakes globally, using chlorophyll a (chla) as a proxy. We used a large lake chlorophyll database that included chla and total phosphorus, in addition to lake geomorphometric variables (mean depth, watershed area, elevation, surface area, volume, residence time) and climate (air temperature, precipitation, cloud cover, solar radiation) for 2561 freshwater lakes around the globe. Our model was able to explain 60% of the variation in chla concentrations. Of that, total phosphorus (TP) explained 42%, a combination of climate variables explained 38%, and geomorphometrics explained 20% of the variation. Although there have been increased efforts and regulations in place for land use and farming, nutrient inputs continue to be the leading cause of primary production in lakes. However, the influence of climatic variables acting synergistically (temperature, precipitation, cloud cover and solar radiation) is nearly equal to that of total phosphorus, suggesting nutrient management efforts are not sufficient alone to mitigate water quality degradation. Our findings underscore the critical need to incorporate climate factors into water quality management given current climate change.

（来源：AQUATIC SCIENCES 卷: 83 期: 1, **DOI:**10.1007/s00027-021-00776-w 出版年: JAN 2021）

Photochemical Pathways of Rotenone and Deguelin Degradation: Implications for Rotenoid Attenuation and Persistence in High-Latitude Lakes

Redman, Zachary C; Wesolowski, Joshua; Tomco, Patrick L

The direct and indirect photochemical degradation of rotenone (ROT) and deguelin (DEG), the primary reduced nicotinamide adenine dinucleotide-inhibiting rotenoid components of the piscicide CFT Legumine, were investigated under simulated sunlight conditions relevant to their dissipation from high-latitude surface waters. Photochemical degradation dominated the elimination of ROT and DEG from surface waters with half-lives ranging from 1.17 to 2.32 and 4.18 to 20.12 h for DEG and ROT, respectively, when the rotenoids were applied in the formulation CFT Legumine. We assessed enhanced degradation processes using argon-purged and cesium chloride-amended water, which demonstrated the rotenoids to rapidly decompose from excited triplet states. We further assessed the influence of reactive oxygen species by hydroxyl radical quenching and thermal generation of singlet oxygen. The

studied reactive oxygen species did not significantly contribute; however, alcohols such as isopropanol may inhibit degradation by quenching ROT excited states or preventing intersystem crossing. Finally, we compared photochemical degradation in water collected from Hope Lake, Alaska, to a solution of Suwanee River fulvic acids, which demonstrated that dissolved organic matter (DOM) quality is a major factor that modulates ROT attenuation through a combination of shielding (light attenuation) and excited-state quenching mechanisms and is temperature-dependent. Molecular-level characterizations of DOM may help account for the site-specific degradation of these rotenoids in the environment.

（来源：Environmental science & technology，2021, **DOI:**10.1021/acs.est.1c00129）

Intense methane ebullition from urban inland waters and its significant contribution to greenhouse gas emissions

Wang, GQ; Xia, XH; Liu, SD; Zhang, L; Zhang, SB; Wang, JF; Xi, NN; Zhang, QR

The evasions of methane (CH4) and carbon dioxide (CO2) from inland waters represent substantial fluxes of greenhouse gases into the atmosphere, offsetting a large part of the continental carbon sink. However, the CH4 and CO2 emissions from urban inland waters are less constrained. In particular, ebullitive CH4 emissions from these waters are poorly understood. Here, we measured the concentrations and fluxes of CH4 and CO2 in rivers and lakes in the megacity of Beijing, China, between 2018 and 2019. The CH4 concentration ranged from 0.08 to 70.2 umol L-1 with an average of 2.5 +/- 5.9 umol L-1. The average CH4 ebullition was 11.3 +/- 30.4 mmol m(-2) d(-1) and was approximately 6 times higher than the global average. The average total CH4 flux (14.2 +/- 35.1 mmol m-2 d-1) was 3 times higher than the global average, with ebullition accounting for 80% of the flux. The high surface water CH4 concentrations and ebullitive fluxes were caused by high sediment organic carbon/dissolved organic carbon contents, high aquatic primary productivity and shallow water depths in the urban inland waters. The CH4 emissions accounted for 20% of CO2 emissions in terms of the carbon release and were 1.7 times higher in terms of CO2 equivalent emissions from Beijing inland waters. Furthermore, the CH4 ebullition and its contribution to the total carbon gas emissions increased exponentially with the water temperature, suggesting a positive feedback probably occurs between the greenhouse gas emissions from urban inland waters and climate warming. This study confirms the major role of CH4 ebullition from urban inland waters in the global carbon budget under the rapid progress of global urbanization.

(来源：WATER RESEARCH,2021, **DOI:**10.1016/j.watres.2020.116654)

Climatic versus Anthropogenic Controls of Decadal Trends (1983-2017) in Algal Blooms in Lakes and Reservoirs across China

Song, Kaishan; Fang, Chong; Jacinthe, Pierre-Andre; 等.

The proliferation of algal blooms (ABs) in lakes and reservoirs (L&Rs) poses a threat to water quality and the ecological health of aquatic communities. With global climate change, there is a concern that the frequency and geographical expansion of ABs in L&Rs could increase. China has experienced rapid economic growth and major land-use changes over the last several decades and therefore provides an excellent context for such an analysis. About 289,600 Landsat images were used to examine the spatiotemporal distribution of ABs in L&Rs (>1 km2) across China (1983-2017). Results showed significant changes in the temporal slope of the sum of normalized area (0.26), frequency (2.28), duration (6.14), and early outbreak (-3.48) of AB events in L&Rs across China. Specifically, AB-impacted water bodies expanded longitudinally, and the time range of AB observation has expanded starting in the 2000s. Spearman correlation and random forest regression analyses further indicated that, among climatic

factors, wind speed and temperature contributed the most to AB expansion. Overall, anthropogenic forces have overridden the imprints of climatic factors on the temporal evolution of ABs in China's L&Rs and therefore could inform policy decisions for the management of these resources.

（来源：Environmental science & technology,2021,55(5):2929-2938, **DOI:**10.1021/acs.est.0c06480）

Water-level fluctuations affect the alpha and beta diversity of macroinvertebrates in Poyang Lake, China

Tan, Chaozhong; Sheng, Tianjin; Wang, Lizhu; 等.

Water-level fluctuations (WLFs) are a key influence on aquatic biodiversity in seasonally inundated freshwater ecosystems. However, how unregulated WLFs affect macroinvertebrates in lake-floodplain systems experiencing considerable annual fluctuations remains unclear. We explored spatial and temporal variability in taxonomic alpha and beta diversity in the largest fluctuating lake in China, Poyang Lake, during two hydrological seasons. We hypothesized that taxa richness (alpha diversity) is greater in the floodplain than in the lake channel due to greater availability of trophic resources, and that variability in assemblage composition (beta diversity) in the channel is greater during the high-water season (HWS) than the low-water season (LWS) due to increased habitat heterogeneity. Benthic macroinvertebrate assemblages were sampled, water physicochemical and hydrological variables were measured, and geographical coordinates were determined at 34 sites during the HWS (October 2017) and LWS (January and April 2018). A total of 74 taxa were recorded. Macroinvertebrate alpha diversity was comparable in the floodplain and the lake channel. Beta diversity in the channel was greater during HWS than LWS. Hydrological variables influenced beta diversity during LWS and geographical distance between sites increased beta diversity during HWS, whereas physicochemical variables did not influence beta diversity in either hydrological season. Our results suggest that extensive WLFs altered macroinvertebrate biodiversity among hydrological seasons by extending water into floodplains during HWS and reducing substrate heterogeneity in the lake channel during LWS. We thus highlight the importance of WLFs that maintain such environmental seasonality in supporting the biodiversity of benthic macroinvertebrates in naturally dynamic freshwater ecosystems.

（来源：FUNDAMENTAL AND APPLIED LIMNOLOGY, 2021,194(4):321-334, **DOI:**10.1127/fal/2020/1297）

Spatial and temperal patterns in bacterioplankton communities across a river-lake continuum

Wang, Yan-Shan; Tong, Zhong-Hua; Fan, Yang-Yang

Bacterioplankton play critical roles in biogeochemical cycling. Although spatial and temporal variations in bacterioplankton community compositions (BCCs) within individual habitat have been reported, knowledge gaps remain for studies conducted within different habitats. In this work, we examined the seasonal and spatial variability of BCCs in Nanfei River and Lake Chaohu which had significant environmental heterogeneity using a high-throughput sequencing technique of 16S rRNA gene amplicons. The results showed that spatial variation has a more obvious impact on the BCCs than seasonal changes. The microbial diversity gradually decreased and BCCs changed obviously along water flow direction from Nanfei River to the western and estern parts of Lake Chaohu over all seasons. LEfSe analysis showed that Nanfei River had higer abundance of species belonging to the orders Rhodocyclales, Methylococcales, Campylobacterales and Flavobacteriales, samples from eastern part of Lake Chaohu were abundant in taxonomies including the order Rickettsiales, while the western part had

high abundance of taxonomies belonging to the order Chroococcales. The redundancy analysis (RDA) indicated that BCCs in Nanfei River were associated with high nutrient (TP, PO4-P, TN, NH3-N, NO2-N and NO3-N) concentrations and electrical conductivity. Variance partitioning RDA analysis indicated that the combined effects of all variables may be most important affecting BCCs. This study may provide a framework for modeling the change in bacterioplankton communities through different habitats from a river to lake.

（来源：LIMNOLOGICA 卷: 87, **DOI:** 10.1016/j.limno.2021.125863 出版年: MAR 2021）

Climate and Nutrient-Driven Regime Shifts of Cyanobacterial Communities in Low-Latitude Plateau Lakes

Zhang, Hanxiao; Huo, Shouliang; Xiao, Zhe; 等.

Cyanobacterial blooms that form in response to climate warming and nutrient enrichment in freshwater lakes have become a global environmental challenge. Historical legacy effects and the mechanisms underlying cyanobacterial community succession are not well understood, especially for plateau lakes that are important global freshwater resources. This study investigated the temporal dynamics of cyanobacterial communities over centuries in response to nutrient enrichment and climate warming in low-latitude plateau lakes using high-throughput DNA sequencing of sedimentary DNA combined with traditional paleolimnological analyses. Our results confirmed that nutrients and climate warming drive shifts in cyanobacterial communities over time. Cyanobacterial community turnover was pronounced with regime shifts toward new ecological states, occurring after exceeding a tipping point of aquatic total phosphorus (TP). The inferred species interactions, niche differentiation, and identity of keystone taxa significantly changed after crossing the aquatic TP ecological threshold, as demonstrated by network analysis of cyanobacterial taxa. Further, the contribution of aquatic TP to cyanobacterial community dynamics was greater than that of air temperature when lakes were in an oligotrophic state. In contrast, as the aquatic TP threshold was exceeded, the contribution to community dynamics by air temperature increased and potentially surpassed that of aquatic TP. Overall, these results provide new evidence for how past nutrient levels in lacustrine ecosystems influence contemporary cyanobacterial community responses to global warming in low-latitude plateau lakes.

（来源：Environmental science & technology,2021,55(5): 3408-3418，**DOI**:10.1021/acs.est.0c05234）

Ecological adaptability and population growth tolerance characteristics of Carex cinerascens in response to water level changes in Poyang Lake, China

Yao, Xiaochen; Cao, Yun; Zheng, Guodi; 等

Water level conditions are the key factors that affect the growth and distribution of wetland plants. Using Carex cinerascens(C. cinerascens) as the study species, we employ indoor simulations and field surveys. Our results show that C. cinerascens can adapt to rhythmic changes in the water level through different adaptation strategies. Compared to that of the control group, plant growth was better with a 0-0.4cm/d water level rate, and plant growth was in the 42-56cm range to that a 1.0-1.4cm/d water level rate. Furthermore, it was observed that 0-0.4cm/d was the most suitable growth rate, with 0.6-1.0cm/d and 0-32cm being the ideal plant tolerance ranges, and increasing to 1.0-1.4cm/d and 32-56cm exceeds the plant tolerance threshold. In the middle and late period of the experiment (25-45 d), the ecological characteristics of the plants changed significantly. For example, the root-to-shoot ratio of the plant in the

stable water level reached 26.1. In our field observations, plant biomass can be influenced by a variety of environmental factors. The frequency of the species was the largest at an elevation of 15m, and the growth status of the dominant and companion species of C. cinerascens was weakened with an increase in soil moisture content. The suitable water content for C. cinerascens growth was 27.6-57.3%, the distribution elevation was 12.54-16.59m, and the optimum elevation was 13.56-15.54m. The study is expected to provide a reference for wetland ecology research and wetland protection and restoration, a theoretical reference for the coordination of water resource development and utilization of Poyang Lake and ecological protection of important lakes and wetlands, and an important scientific basis for wetland hydrologic regulation, ecological restoration and biodiversity conservation.

（来源：Scientific reports,2021,11(1):488, **DOI**: 10.1038/s41598-021-84282-x）

Effects of hydrological change on the risk of riverine algal blooms: case study in the mid-downstream of the Han River in China

Shen, LS; Dou, M; Xia, R; Li, GQ; Yang, BH

Algal blooms usually occur in semi-closed water bodies such as lakes or estuaries; however, it has occurred frequently in the mid-downstream of the Han River (MSHR) in China since the 1990s. We made a comparative analysis of the hydrological conditions and identified the hydrological condition thresholds that induce algal blooms. From the hydrodynamic point of view, the changes and characteristics of the hydrological conditions in the MSHR were analyzed. Furthermore, the influence on the risk of algal blooms under different design water transfer schemes for the middle route of the South-to-North Water Diversion Project (SNWDP) was studied. The results indicated that (1) the flow in the MSHR less than 900 m3/s and water level in the Yangtze River higher than 14 m provided a suitable hydrological environment for diatoms multiply. (2) The flow of the MSHR showed a downtrend, while the water level of the Yangtze River showed an uptrend. There were variations in hydrological processes. Through specific IHA index analysis, the fact of flow reduction in the MSHR was demonstrated, and further indicated that algal bloom outbreak was in low flow period. (3) The water transfer in the middle route of SNWDP affected the risk probability of algal blooms. The more the amount of water transfer, the greater the risk probability of algal blooms. It was the Water Diversion Project from Yangtze River to Han River (WDPYHR) that replenished flow of the MSHR and was conducive to the prevention and control of algal bloom risk.

(来源：ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH, 2021, **DOI** :10.1007/s11356-020-11756-2)

Water quality prospective in Twenty First Century: Status of water quality in major river basins, contemporary strategies and impediments: A review

Giri, S

Water quality improvement is one of the top priorities in the global agenda endorsed by United Nation. In this review manuscript, a holistic view of water quality degradation such as concerned pollutants, source of pollution, and its consequences in major river basins around the globe (at least 1 from each continent and a total of 16 basins) is presented. Additionally, nine contemporary techniques such as field scale evaluation, watershed scale evaluation, strategies to identify critical source areas, optimization strategies for placement of best management practices (BMPs), social component in watershed modeling, machine learning algorithms to address water quality problems in complex natural systems concomitant with

spatial heterogeneity, establishing a total maximum daily loads (TMDLs), remote sensing in monitoring water quality, and developing water quality index are discussed. Next, the existing barriers to improve water quality are classified into primary and secondary impediments. A detail discussion of three primary impediments (climate change, urbanization and industrial activities, and agriculture) and ten secondary impediments (availability of water quality data, complexity of system, lack of skilled person, environmental legislation, fragmented mandate, limitation in resources, environmental awareness, resistance to change, alteration of nutrient ratio by river damming, and emerging pollutants) are illustrated. Finally, considering all the existing knowledge gaps pertaining to contemporary strategies, a future direction of water quality research is outlined to significantly improve the water quality around the globe.

(来源：ENVIRONMENTAL POLLUTION, 2021, **DOI:**10.1016/j.envpol.2020.116332)

Effects of land use change, wetland fragmentation, and best management practices on total suspended sediment concentrations in an urbanizing Oregon watershed, USA

Chang, H; Makido, Y; Foster, E

While many different watershed management strategies have been implemented to improve water quality, relatively few studies empirically tested the combined effects of different strategies on water quality in relation to land cover changes using long-term empirical data at the sub-basin scale. Using 10 years of total suspended solids (TSS) data, we examined how the conversion of wetland, wetland fragmentation, beaver dams, and Best Management Practices (BMPs) affect wet season TSS concentrations for the 25 monitoring stations in the Tualatin River basin, USA. Geographic information systems, FRAGSTATS, and correlation analysis were used to identify the direction of land cover change, degree of wetland fragmentation, and the strength of the relationship between TSS change and explanatory variables. Improvement in TSS concentrations was tightly coupled with the aggregation of wetlands, presence of beaver dams, particularly during the mid-wet season when flows were highest. Other BMPs effectively reduced TSS concentrations for the early and late-wet seasons when flows were not as high as in the middle wet-season. Aggregated wetlands were more effective for improving water quality than smaller disaggregated wetlands of similar total area when combined with the presence of beaver dams and BMPs. These findings offer important scientific and practical implications for management of urbanizing watersheds that seek to achieve the dual goals of improving environmental quality and land development.

(来源：JOURNAL OF ENVIRONMENTAL MANAGEMENT, 2021, **DOI:**10.1016/j.jenvman.2021.111962)

Basin-scale high-resolution extraction of drainage networks using 10-m Sentinel-2 imagery

Wang, ZF; Liu, JG; Li, JB; Meng, Y; Pokhrel, Y; Zhang, HS

Extraction of drainage networks is an important element of river flow routing in hydrology and large-scale estimates of river behaviors in Earth sciences. Emerging studies with a focus on greenhouse gases reveal that small rivers can contribute to more than half of the global carbon emissions from inland waters (including lakes and wetlands). However, large-scale extraction of drainage networks is constrained by the coarse resolution of observational data and models, which hinders assessments of terrestrial hydrological and biogeochemical cycles. Recognizing that Sentinel-2 satellite can detect surface water

up to a 10-m resolution over large scales, we propose a new method named Remote Sensing Stream Burning (RSSB) to integrate high-resolution observational flow location with coarse topography to improve the extraction of drainage network. In RSSB, satellite-derived input is integrated in a spatially continuous manner, producing a quasi-bathymetry map where relative relief is enforced, enabling a fine-grained, accurate, and multitemporal extraction of drainage network. RSSB was applied to the Lancang-Mekong River basin to derive a 10-m resolution drainage network, with a significant reduction in location errors as validated by the river centerline measurements. The high-resolution extraction resulted in a realistic representation of meanders and detailed network connections. Further, RSSB enabled a multitemporal extraction of river networks during wet/dry seasons and before/after the formation of new channels. The proposed method is fully automated, meaning that the network extraction preserves basin-wide connectivity without requiring any postprocessing, hence facilitating the construction of drainage networks data with openly accessible imagery. The RSSB method provides a basis for the accurate representation of drainage networks that maintains channel connectivity, allows a more realistic inclusion of small rivers and streams, and enables a greater understanding of complex but active exchange between inland water and other related Earth system components.

(来源：REMOTE SENSING OF ENVIRONMENT, 2021, **DOI:**10.1016/j.rse.2020.112281)

A case study of factors controlling water quality in two warm monomictic tropical reservoirs located in contrasting agricultural watersheds

Lopes, MC; Martins, ALM; Simedo, MBL; Martins, MV;等.

The integration of internal (e.g., stratification) and external (e.g., pollution) factors on a comprehensive assessment of reservoir water quality determines the success of ecosystem restoration initiatives and aids watershed management. However, integrated analyses are scarcer than studies addressing factors separately. Integration is likely more efficient in studies of small well-characterized (experimental) reservoir watersheds, because the isolation of factor contributions is presumably clearer. But those studies are uncommon. This work describes the water quality of two small 5.5 m-deep reservoirs (MD-Main and VD-Vocoroca dams) located in Pindorama Experimental Center, state of Sao Paulo, Brazil, considering the interplay between reservoir dimension, seasonal thermal stratification, chemical gradients, erosive rainfall events, presence of natural biofilters, and land uses and landscape patterns around the reservoirs and within the contributing watersheds. The monitoring of agricultural activities and water quality parameters occurred in October 2018-July 2019. A 4 degrees C thermal stratification occurred in October (difference between surface and bottom water temperature), which decreased until disappearance in January (VD) or April (MD). The longer stratification period of MD was justified by its larger area relative to VD (approximate to 10x). Thermal stratification triggered hypoxia at the bottom of both reservoirs (DO approximate to 1 mg/L), more prolonged and severe in MD. Hypoxia activated Ec and TDS peaks in January likely explained by bottom-sediment nutrient releases, presumably phosphorus. The Ec peak reached 560 mu S/cm in MD and 290 mu S/cm in VD. The smaller VD peak was probably explained by the action of macrophytes. In March, a 240 NTU turbidity peak occurred in MD, caused by precedent erosive rainfall and the lack of vegetation protection alongside the south border. As expected, the study accomplished clear isolation of factor contributions, verified by Factor and Cluster analyses. Our results can subsidize studies on larger reservoir watersheds requiring restoration, where the isolation of factors is more challenging.

(来源：SCIENCE OF THE TOTAL ENVIRONMENT, 2021, **DOI:**10.1016/j.scitotenv.2020.144511)

Evaluating combined effects of socio-economic development and ecological conservation policies on sediment retention service in the Qiantang River Basin, China

Zhou, MM; Deng, JS; Lin, Y; Zhang, LJ; He, S; Yang, W

The rapid socio-economic development and various ecological conservation policies in China have significantly affected sediment yield in the large basin. However, how these two aspects of influencing factors jointly drive the dynamics of sediment retention service is still poorly understood, although it is critical to evaluate ecosystem service dynamics and realize the balanced relationships between human activities and aquatic ecosystem health. Integrating the revised universal soil loss equation (RUSLE) model and sediment delivery ratio (SDR) model, this study evaluated dynamics of sediment retention service driven by combined factors of socio-economic development and ecological conservation policies. Furthermore, the relative contribution analysis identified contributions of these drivers to sediment dynamics. Results indicated that (1) sediment retention service improved from 2000 to 2015 in the Qiantang River Basin, with a 39.89% reduction in sediment export. (2) Ecological conservation policies played a more critical role in this improvement than socio-economic development. (3) In particular, the Green Project made the major contribution to controlling sediment export among all the drivers, additionally, increasing grain yield (per unit area) benefited sediment retention service because it mitigated the substantial demand for farmland and the excessive deprivation of ecological lands. (4) The emerging Ecological Conservation Red Line (ECRL) policy could reduce sediment export inside the redline regions by 84.13% through future scenario analysis, providing practical guidance for exploring more ecological benefits. Finally, suggestions for formulating targeted ecological protection policies and sustainable socio-economic plans were proposed to promote aquatic ecosystem services and strengthen ecological security in the large basin.

(来源：JOURNAL OF CLEANER PRODUCTION, **DOI:**10.1016/j.jclepro.2020.124961)

Tracking lake surface elevations with proportional hypsometric relationships, Landsat imagery, and multiple DEMs

Weekley, David; Li, Xingong

Multidecadal inland surface water dynamics are of increasing interest due to their importance to climate, ecology, and society, yet several key challenges impede long-term monitoring of inland surface waters globally. This research investigates two novel methods, one addressing subhydroflattened surface estimate uncertainty issues, and a second addressing temporal resolution issues, using 46 water bodies across the western United States. First, low water level estimate uncertainty was reduced using multiple digital elevation models (ALOS, SRTM, and NED) to derive the hypsometric relationship for each lake from the digital elevation model with the lowest hydroflattened water surface. This technique reduced the number of images with subhydroflattened water surfaces by at least 549 over the best individual DEM resulting in higher water surface elevation estimate accuracy. Second, this paper introduces proportional hypsometry which dynamically generates surface area/elevation relationships for every image using clear pixels only by removing contamination from both the image and DEM. Proportional hypsometry was found to be ill-suited for subhydroflattened water surface levels but produced comparable accuracy to clear images for above hydroflattened water levels. Overall, using the lowest hydroflattened surface

along with proportional hypsometry improved temporal resolution enabling analysis of nearly 10,000 additional images while maintaining similar accuracy levels as images with <1% contamination (2.35 m RMSE vs. 2.17 m RMSE). This research increases lower water elevation estimate accuracy and temporal resolution and is scalable enabling regional and global water dynamic analysis.

（来源：WATER RESOURCES RESEARCH,2021, 57(1) , **DOI:**10.1029/2020WR027666）

Nonstationary Ecological Instream Flow and Relevant Causes in the Huai River Basin, China

Wen, QZ; Sun, P; Zhang, Q; Li, H

Based on the daily precipitation data during 1960-2016 at 72 stations and the daily streamflow data during 1956-2016 at 7 hydrological stations in the Huai River Basin (HRB), China, eco-surplus and eco-deficit under influences of abrupt streamflow behaviors were analyzed using Flow Duration Curve (FDC). The relations between indicators of hydrological alteration (IHA) and ecological indicators (Shannon Index, SI) were quantified, investigating impacts of altered hydrological processes on the evaluations of the ecological instream flow. Besides, we also quantified fractional contributions of climatic indices to nonstationary ecological instream flow using the Generalized Additive Models for Location Scale and Shape (GAMLSS) framework. While the possible impact of human activities on ecological instream flow will be revealed based on land use changes data. The results indicated that: (1) FDC is subject to general decrease due to hydrological alterations, and most streamflow components are lower than 25% FDC. We found increased eco-deficit and decreased eco-surplus due to altered hydrological processes. The FDC of the streamflow in the main stream of the HRB is lower than that along the tributaries of the HRB. Eco-surplus (eco-deficit) changes are in good line with precipitation anomaly changes during the Spring, Autumn and Winter periods. However, the hydrological alterations due to hydrological regulations by the reservoirs are the primary cause behind the mismatch between ecological instream flow and precipitation anomalies during summer; (2) Annual and seasonal eco-surplus (eco-deficit) is decreasing (increasing) and that during winter season is an exception. Although higher eco-surplus in winter than in other seasons, the eco-surplus is decreasing persistently and the 21st century witnessed the lowest eco-surplus along the main stream of the HRB. Meanwhile, the Shannon index indicated decreased ecological diversity across the HRB; (3) The ecological instream flow is highly sensitive to The Pacific Decadal Oscillation (PDO), North Atlantic Oscillation (NAO) and Nino 3.4 Sea Surface Temperature Index (Nino3.4). Meanwhile, the ecological instream flow along the mainstream of the HRB is highly sensitive to climate indices. While the ecological instream flow by GAMLSS model has better fitting performance in describing the extreme values and local trends.

(来源：WATER, 2021, 13(4) , **DOI:**10.3390/w13040484)

The effects of water-level changes on periphytic alga assemblages in Poyang Lake

Qian, Kuimei; Dokulil, Martin; Lei, Wan; 等

Poyang Lake, which is the largest freshwater lake in China, has a seasonal flooding cycle that significantly changes the water level every year. The aim of this study was to research the effects of water-level changes on periphytic algal assemblages in Poyang Lake. Dynamic shift of periphytic algal biomass were studied from November 2016 to July 2019. Periphytic algal biomass and species composition were analyzed microscopically, and physicochemical conditions were measured. There

were significant seasonal variations in the community distribution of periphytic algae. The biomass of the periphyton ranged from 8 to 22,636 mg m-2. Periphytic algal biomass ranged from 30 to 622 mg m-2 with the average of 204 mg m-2 in the LWL phase; periphytic algal biomass ranged from 8 to 21,839 mg m-2, with the average of 3,399 mg m-2 in the IWL phase. It ranged from 166 to 22,636 mg m-2, with the average 4,320 mg m-2 in the HWL phase and from 16 to 3,231 mg m-2 with the average of 585 mg m-2 in the DWL phase. There were temporal variations in periphytic algal community structure in Poyang Lake. Cryptophyceae dominated in algal periphyton from November 2016 to February 2017. Bacillariophyceae dominated from March to July 2017 (increasing water-level phases). Pynephyceae and Euglenophyceae were dominant from August and September (high-water-level phase) in 2017. Bacillariophyceae dominated through 2018 with occasional dominance of Cryptophyceae from January to June and the occasional dominance of Chlorophyceae from July to December. Chlorophyceae dominated from January to July in 2019 with occasional dominance of Bacillariophyceae. The water-level variations led to environmental heterogeneity in Poyang Lake, creating heterogeneous habitats for algal periphyton. Our study revealed the primary importance of water level, water temperature, conductivity, total nitrogen, nitrite and total phosphorus as abiotic local factors structuring the periphytic algal community in Poyang Lake. The water-level changes did not prevent growth of periphytic algae, but it did change the periphytic algal community assemblages. This research provides data on the periphytic algae in Poyang Lake and will be useful for establishing biological indicators of environmental changes and protecting Poyang Lake in the future.

（来源：FUNDAMENTAL AND APPLIED LIMNOLOGY,2021,194(4): 311-320 , **DOI:** 10.1127/fal/2020/1349）

科学视点

Science：未来破解“林水关系”奥秘有了系统研究设计方向

电子科技大学资源与环境学院教授张明芳近日在国际著名学术期刊《科学》（Science）主刊上发表论文，阐明了对不同尺度流域森林变化可能造成的水文影响及其变异机制的独特见解，提出了未来破解复杂“林水关系”奥秘的系统研究设计方向，并指出有限的水文变量不足以反映森林水文整体功能。

过去，科学家们对“林水关系”的部分研究都集中在小流域尺度，越来越多的大流域研究让“林水关系”的复杂性更加突出。此次研究表明，受气候、流域特征和森林经营管理的影响，流域对森林变化的水文响应存在高度的变异，至今尚不清楚这些因素在不同时空尺度上作用于林水关系的机制。

作为论文的第一作者，张明芳全面分析了不同尺度流域森林变化对年径流和枯水径流的影响及其时空变异性，并在此基础上进一步系统地阐明森林水文响应变异性的影响因素，即森水关系复杂性的根源，提出了未来研究林水复杂关系的系统框架设计。在她提出的系统框架设计下，未来森林水文研究应选取径流的五大特征参数表征水文功能的整体性，水文功能影响因素也充分考虑气候、流域特点、森林以及三者的交互和反馈作用。在流域水文过程方面，结合地表水和地下水过程，进行

关键带水流路径、流域储水和持水的研究。同时，张明芳指出，未来的流域管理应遵循这种系统性框架设计，以实现更加科学的评估和决策。

（来源：科技日报，http://www.stdaily.com/index/searcht/soiusuo.html，2021-03-08）

Nature Climate Change：保护泥炭地对减缓气候变化至关重要

2020 年 12 月 7 日，《自然·气候变化》（Nature Climate Change）发表题为《全球泥炭地碳汇未来脆弱性的专家评估的文章指出，保护世界泥炭地及其所包含的大量碳汇对减缓气候变化至关重要。

预计 21 世纪泥炭地的碳平衡将从汇向源转变。但是，用于未来气候变化预测的主要地球系统模型中仍然忽略了泥炭地生态系统，并且在影响和减缓研究中使用的综合评估模型中并未考虑到泥炭地生态系统。美国德州农工大学（Texas A&M University ）的科研人员领导的国际研究小组，基于文献综述与专家调研，定义并量化在全新世期间影响泥炭地碳储存变化的主要驱动因素，并预测其在 21 世纪和未来的影响。研究还确定了科学界的不确定性与知识差距，并提供了将泥炭地更好地整合到建模框架中的见识。

研究结果表明，2020-2100 年，全球泥炭地可能会释放超过 1000 亿吨碳，尽管不确定性仍然很大。考虑到泥炭地对全球碳循环贡献的重要性，这项研究表明泥炭地科学是一个至关重要的研究领域，要充分理解泥炭地-碳-气候关系，未来还有很长的路要走。

（来源：中国科学院兰州文献情报中心《气候变化科学动态监测快报》2021 年第 01 期）

科学家首次证实南极冰川临界点

研究人员首次证实，南极洲西部的松岛冰川可能会越过临界点，导致其迅速且不可逆地后退，这将对全球海平面产生重大影响。

松岛冰川是南极洲西部一个快速流冰的区域，其流失的面积约为英国的2/3。该冰川尤其令人担忧的是，相比南极洲其他冰川，它流失得更多。目前，松岛冰川及其邻近的思韦茨冰川的流失量占全球海平面上升量的10%。

科学家一直认为，南极洲的这一地区可能会达到一个临界点，从而进入不可逆的后退阶段。这样的后退一旦开始，可能会导致整个南极西部冰盖的崩塌，那里的冰层足以使全球海平面上升3米以上。

现在，英国研究人员首次证明了事实确实如此。相关研究成果日前发表于《冰冻圈》。利用自主研发的先进冰流模型，诺森比亚大学冰河学研究小组开发出了能够识别冰原内临界点的方法。研究表明，松岛冰川至少有3个明显的临界点。第三个也是最后一个由海洋温度上升1.2摄氏度引发，将导致整个冰川不可逆转地后退。研

究人员说，环极地深水的长期变暖和浅滩化，加之阿蒙森海风向的变化，可能使松岛冰川的冰架在温暖的海水中暴露更长时间，使温度变化幅度越来越大。

“全世界不同的计算模型都在试图量化气候变化对南极洲西部冰盖的影响，但在这些模型中确定一段时间的后退是否为一个临界点具有挑战性。”该研究的主要作者、诺森比亚大学地理和环境科学系的Sebastian Rosier解释说，“然而，这是一个至关重要的问题。我们在这项新研究中使用的方法使我们更容易识别未来潜在的临界点。”

“松岛冰川进入不稳定后退状态的可能性以前就有人提出过，但这是这种可能性首次得到严格确定和量化。”参与这项研究的冰川和极端环境学教授Hilmar Gudmundsson补充说，“但这项研究结果也让我担心。如果冰川开始不可逆地后退，对海平面的影响将以米为单位衡量，正如这项研究显示的那样，一旦退缩开始，就不可能阻止它。”

（来源：中国科学报，相关论文信息：https://doi.org/10.5194/tc-15-1501-2021）

滨海湿地的固碳能力：全球统计、估算与预测

滨海湿地“蓝碳”生态系统单位面积的固碳能力远超陆地和海洋。中科院华南植物园小良热带海岸带生态系统研究站王法明研究员与澳大利亚南十字大学 Sanders 教授合作，并联合了华东师大崇明生态院唐剑武院长和李秀珍教授、华南植物园李志安研究员、复旦大学袁嘉灿研究员、武汉植物园刘文治研究员、瑞典 Gothenburg 大学 Santos 教授、英国林肯大学 Schuerch 教授、美国罗格斯大学 Kopp 教授、美国威廉姆和玛丽学院 Kirwan 教授、美国加州大学 Zhu Kai 教授等国内外科学家，利用滨海湿地碳沉积数据和全球滨海湿地分布数据，系统估算了当前全球尺度上的滨海湿地蓝碳固碳能力。研究人员利用已发表的 564 个全球样点数据，以及 49 个新测定的非洲和南美洲滨海湿地的碳累积速率，构建了共包含 613 个滨海湿地样点的数据库。利用全球 613 个样点的数据，首次系统估算了全球滨海湿地的碳埋藏速率、分析了影响固碳速率的因素，并对未来 80 年中滨海湿地的固碳情况进行了模拟预测（《国家科学评论》National Science Review, NSR，https://doi.org/10.1093/nsr/nwaa296）。

在上述估算与分析的基础上，科研人员结合人类干扰影响下的滨海湿地面积模型（Schurech 等 2018 Nature），利用 CMIP5 的 33 气候模型和海平面上升速率模型，建立了固碳速率与气候和环境因子的经验模型，并推演了在不同气候变化情境下，未来 80 年（2020 年-2100 年）的滨海湿地蓝碳功能。结果显示，无论在何种气候变化情景和人类干扰模式下，全球的滨海湿地碳埋藏速率都将稳定增加，显示出滨海湿地对气候变化的负反馈效应，即，随着降水、温度和相对湿度的增加，滨海湿地的碳埋藏速率也将增加。这意味着，在全球变暖的背景下，海岸带蓝碳生态系

统将在应对气候变化中发挥重要作用。该项研究是首个有关全球尺度上滨海湿地蓝碳固碳速率（碳通量）的系统估算与预测，其结果对于指导全球和各国对滨海湿地等蓝碳生态系统的管理与恢复、履行《巴黎协定》所规定的减排增汇目标具有重要的指导意义。

（来源：科学网， 2020年12月25日，根据相关资料编译）

20 年来青藏高原湖泊越来越清澈

中科院青藏高原研究所湖泊与环境变化团队在《环境遥感》上发表研究论文，指出青藏高原湖泊透明度过去 20 年总体呈上升态势。

湖泊水质是青藏高原区域水环境和水生生态系统的重要组成要素，是“第二次青藏高原综合科学考察研究”专项中评估亚洲水塔功能的重要研究内容。目前，对青藏高原湖泊水质的大范围长时间序列调查极为缺乏。利用水质遥感（水色遥感）方法对水质参数进行反演，在海洋水色、内陆其他地区湖泊水质研究中已得到广泛应用，但在青藏高原地区的研究中尚未见，其原因在于缺乏实测水质数据、实测水色光谱和卫星遥感数据间建立的可靠反演模型及其充分验证。

该团队基于 2012—2019 年野外工作采集的 100 多个湖面水质及反射光谱数据，利用 Google Earth Engine 遥感大数据云处理平台，验证了青藏高原湖泊透明度遥感反演模型，并分析了过去 20 年湖泊透明度时空变化特征及原因。

结果表明，MODIS-MODOCGA 反射率产品的蓝绿波段较好地指示了青藏高原湖泊水面反射率，湖泊透明度反演模型达到较高精度。反演结果显示，湖泊透明度主要介于 3~10 米之间，并且与湖泊面积呈现显著的正相关关系。2000-2019 年期间，大于 50 平方千米的 152 个湖泊透明度主要呈上升趋势，平均变化速率为 0.033 米/年。湖泊透明度年际变化受降水影响较大，并与水体光学组分悬浮物、荧光溶解有机物、叶绿素 a 浓度存在不同强度的相关性。

该研究有助于进一步理解气候变化背景下青藏高原及内陆水体透明度变化特征，并且为湖泊水—气界面热量交换相关研究提供基础数据与研究参考。

（来源：《中国科学报》，https://doi.org/10.1016/j.rse.2020.112199，2020-12-30 第4版 综合）

基于 Landsat 系列卫星的我国湖泊透明度遥感估算模型研究

在国家自然科学基金项目资助下，中国科学院南京地理与湖泊研究所张运林研究组近日在 Water Research 上发表了题为“Remote sensing estimation of water clarity for various lakes in China”的研究论文。

水体透明度表征水体清澈程度和透光能力，是描述水质好坏最直观的参数及水体富营养化评价的主要指标。水体透明度的大小直接决定着水体真光层深度和水下

光场的分布，进而影响浮游植物初级生产力和水生植被最大分布深度。此外，透明度决定光的吸收利用，影响热量收支、水温垂直分布和热力分层，对生物的新陈代谢和物质分解具有重要的作用。另外，透明度影响游客对水体景观的审美，改变其旅游兴趣和价值。研究表明，水体透明度每上升 1 m，游客愿意多停留 56 分钟，等同于多消费 22 美元。因此，无论从生态环境还是经济价值来看，开展水体透明度研究均具有十分重要的意义。

目前研究已成功构建了众多基于经验和半分析方法的透明度遥感模型，但模型形式和参数千差万别，反映出湖泊水体透明度遥感反演具有一定的复杂性。有限的建模样本很难保证目前已有透明度模型在研究区以外水体的适用性；加之湖泊水体光学特征的复杂性，构建适用于内陆水体差异化的透明度遥感估算模型仍是目前研究的挑战。

因此，基于全国 225 个湖泊的现场透明度观测数据和 Landsat 卫星遥感反射率，分析了透明度的敏感波段以及模型相关系数随间隔时间变化情况，构建大陆尺度（105 - 106 km2）的透明度遥感估算模型，分析了该模型在不同湖区以及全国湖泊的适用性，并简单探索了中国湖泊透明度的 1986 年-2018 年空间变化。

结果表明，由红光波段构建的幂函数模型具有较好的估算效果，模型的平均相对误差和归一化均方根误差分别为 34.2%和 55.4%。将该模型应用于 2016 年至 2018 年间全国湖泊面积≥10 km2 湖泊（共 641 个湖泊）结果表明，东部平原湖区和东北平原湖区的透明度相对较低，多年平均透明度分别为 0.56±0.17m 和 0.47±0.29m。云贵高原湖区和青藏高原湖区透明度较高，多年平均透明度分别为 1.48±0.86m 和 1.30±0.83m。最后，我们对青藏高原地区 Landsat 系列数据透明度估算值在影像重叠区一致性进行了评估，结果表明 Landsat 系列卫星（Landsat 5 TM、Landsat 7 ETM+ 和 Landsat 8 OLI）透明度估算结果具有高度一致性。因此，结合 Landsat 系列卫星与所构建的估算模型可以用于我国湖泊透明度长期变化监测及驱动机制研究。

（来源：http://www.niglas.ac.cn/xwdt_1_1/yjjz/202101/t20210128_5878485.html，2021-01-28）

应用湖泊沉积物定量评估西昆仑山全新世冰川融水变化

以青藏高原为核心的第三极地区，广泛分布着陆地冰川和湖泊，被称为“亚洲水塔”，其冰川融水变化与世界三分之一人口的水资源安全息息相关。但是受现有冰川和古冰川研究方法限制，很难对青藏高原长时间尺度（如全新世或更老）冰川消融机制开展系统研究，不同区域冰川对气候变化的响应存在差异，对青藏高原冰川消融变化机制的认识仍存在不足。

为获得长时间尺度冰川定量消融记录，中科院青藏高原所古生态与人类适应团队侯居峙研究员及其合作者利用湖泊沉积物重建青藏高原过去长时间尺度、连续、

高分辨率的冰川消融量记录，选择青藏高原西北部的郭扎错开展研究。郭扎错位于极端严酷的高寒干旱气候区，海拔 5086 米，年降水小于 100mm，年均温在零摄氏度以下。而青藏高原湖泊具有强烈的碳库效应，尤其在高原西部的西昆仑山地区，陆地植被稀疏，在湖泊沉积物中没有明显的陆生植物残体可用于 14C 定年；郭扎错主要受西昆仑冰川消融补给，冰川融水使得碳库效应更加复杂。研究团队通过郭扎错沉积物古地磁长期变(PSV)与区域 PSV 合成记录对比，建立了可靠的年龄控制（图 1），为进一步重建冰川消融量奠定基础。关于郭扎错的年代学研究成果在线发表于《Quaternary Geochronology》(https://doi.org/10.1016/j.quageo.2020.101146)。

在获得可靠年龄控制基础上，研究团队将沉积物岩芯中细粒碳酸盐氧同位素(δ18O)作为评估入湖冰川融水水量的指标，定量重建全新世西昆仑山冰川消融记录。相比于郭扎错湖水，冰川融水的δ18O 显著偏负。因此，当较多的冰川融水进入湖泊时，湖水δ18O 偏负；当较少的冰川融水进入湖泊时，湖水δ18O 偏重。基于此，研究团队利用水文-同位素平衡模型，应用郭扎错沉积物全新世δ18O 记录计算冰川融水量的变化，通过郭扎错流域冰川面积与西昆仑冰川面积的比值估算全新世西昆仑冰川消融量（图 2）。计算结果显示，9.5-8.5 ka 西昆仑冰川消融量比现今多~28.62 ± 25.76 Gt；1.3-0.5ka 西昆仑冰川消融量比现今少~24.53±25.02 Gt。全球夏季温度重建记录表明，伴随着热带辐合带的北移，全新世早期夏季温度较高，这些变化可以通过正积温（PDD）模型得到验证。在青藏高原全新世早期，较高的夏季温度与夏季 PDD 将产生更高的冰川消融潜力。由于全新世 PDD 主要受轨道参数控制，而轨道参数的变化会导致夏季的长短和强度改变，因此 PDD 模型与冰川融水记录之间的相关性同样表明全新世西昆仑山冰川消融受太阳辐射量控制。这一研究不仅获得全新世西昆仑冰川消融量变化，也扩宽了高寒区古湖沼学的研究领域。该成果在线《Earth and Planetary Science Letter》(https://doi.org/10.1016/j.epsl.2021.116766)。

（来源：http://www.itpcas.cas.cn/new_kycg/new_kyjz/202102/t20210222_5892830.html, 2021-02-22）

湖泊洪泛水文连通的新定义及对生态环境评估的意义和框架

在中国科学院战略性先导 A 专项和国家自然科学基金等项目资助下，中国科学院南京地理与湖泊研究所李云良、谭志强等在 Water Research 上发表了以洪泛水文连通与生态环境意义为主题的研究论文。

在我国长江中下游地区，水文连通在河湖洪泛系统中担当重要角色，水文连通动态变化与转换导致了河湖洪泛水动力条件的改变，具有极其重要的环境意义，对水质、水生态、水环境和生境状况造成联动影响并触发反馈作用，最终导致洪泛区系统结构与功能的退化与丧失。叠加洪泛区系统外部洪水脉冲的干扰，水文连通进

一步促进了洪泛区新陈代谢及生物地球化学循环进程，对维系洪泛区系统的物质流和能量流起关键作用，是水文、生态和环境等跨学科领域的研究热点和前沿问题。

目前对水文连通的概念和定义还不够清晰，本研究基于湖泊洪泛水文水动力学，采用水面积、水深、流速等阈值方法，考虑连通与生态环境指标之间的耦联关系，对水文连通进行了重新定义，即定义为总体连通性（Total Connectivity）、一般连通性 GC（General Connectivity）和有效连通性 EC（Effective Connectivity）。通过水动力模型和地统计学分析，探讨了洪泛区不同连通定义的差异及其贡献，从系统角度，揭示了洪泛区连通状况的时空动态特征，最终结合典型生态环境因子，评估了水文连通的新定义与生态环境要素之间的联系。本研究提出的阈值方法和定义将会提升对洪泛区水文连通及其生态环境服务功能的进一步认识。基于本项研究，目前正在研发基于生态环境因子的洪泛水文连通评估模型，计划短期内免费公开提供给广大科研工作者、学生等使用。

（来源：http://www.niglas.ac.cn/xwdt_1_1/yjjz/202103/t20210325_5984638.html，2021-03-25）

我国北方过去 5000 年定量气候变化研究取得重要进展

中国是历史悠久的文明古国，在过去 5000 年的历史长河中，经历了一系列的王朝兴盛与衰落、分裂与统一、战争与和平，而气候变化常被认为是影响历史文化演替的重要因素之一。20 世纪 70 年代，竺可桢先生根据历史文献记载首次重建了我国过去 5000 年的温度变化，就此掀开了关于过去气候变化及其与历史朝代演替之间关系研究的序幕。几十年间，大量的研究在温度重建方面取得了积极进展，但是重建的结果分辨率相对较低且多以定性记录为主，限制了对气候变化与历史文化关系的深入理解。因此，重建我国过去 5000 年高分辨率的定量气候变化记录具有重要的意义。

中科院南京地理与湖泊所赵成研究员和张灿博士等研究人员选取中华古文明的核心地带—黄土高原地区，基于六盘山北联池沉积物中甘油二烷基甘油四醚酯（GDGTs）指标，结合现代过程研究，利用全球湖泊拟合方程，定量重建了我国北方过去 5000 年以来高分辨率的暖季（4-10 月）温度变化序列。结果显示：过去 5000 年，中国北方温度整体呈下降趋势，前 3000 年下降缓慢，降幅仅为 0.5°C，之后的 2000 年下降较快，降幅高达 4°C；并且，中国北方温度还经历了 4 次明显的降温事件，对应于北大西洋冰筏事件（Bond 0-3），降幅约为 2-3°C。

此外，综合重建的暖季温度与同区域公海孢粉量化的季风降水数据，为我国过去 5000 年历史文化演化提供了更加完整的定量气候背景。通过对比历史朝代，发现在商朝之前，气候相对稳定，商朝之后，温度和降水都呈现较大的波动；值得注意的是，我国历史上三次较大的社会动乱（春秋战国、魏晋南北朝和五代十国）均发

生在低温时期，唐朝、宋朝和明朝晚期的气候也均快速趋于冷干化。另外，进一步比对气候变化与战争频次、人口波动和北方游牧民族迁移等数据，发现在冷干气候时期，全国的战争频次增加，人口数量锐减，北方游牧民族向南迁移。因此，历史时期文化演化（王朝的灭亡、社会的动荡、战争的频次及游牧民族的南移）与气候变化之间较好的对应关系，表明快速冷干的气候条件（尤其温度变化）可能会通过降低土地生产力、增加生态环境脆弱性等，影响社会经济的波动及文化发展的方向，但气候变化对历史文化演替影响的机理仍需开展深入的研究。

该研究近期发表在国际第四纪领域著名期刊 Quaternary Science Reviews 上。该研究得到了国家自然科学基金，中科院先导专项，国家重点研发计划等项目的资助。

（来源：http://www.niglas.ac.cn/xwdt_1_1/yjjz/202104/t20210406_5990071.html，2021-04-05）

业界动态

水利部：批复 57 条跨省江河流域水量分配方案

水利部批复珠江流域九洲江等 5 条跨省江河流域水量分配方案，至此珠江流域开展的 12 条跨省江河流域水量分配方案已全部批复，目前全国共批复了 57 条跨省江河流域水量分配方案。

水利部相关负责人表示，批复跨省江河流域水量分配方案，明确了这些江河流域及相关省区地表水开发利用相关指标，为发挥水资源刚性约束作用提供重要支撑。水量分配方案以流域为单元，明确了不同来水条件下流域相关省区的水量分配份额，确定了重要控制断面及下泄水量等控制指标。

水利部要求将方案实施纳入地方经济社会发展规划和国土空间规划，全面加强水资源节约保护与高效利用，实行水资源消耗总量和强度双控，加强流域水资源统一调度，促进流域生态保护和高质量发展。

（来源：新华社，http://www.slwr.gov.cn/mtjj/202103/t20210331_47705.html, 2021-03-31）

长江流域生态环境司法保护典型案例发布

最高人民法院发布《最高人民法院关于贯彻<中华人民共和国长江保护法>的实施意见》，以及长江流域生态环境司法保护 10 个典型案例。本次发布的典型案例，包括刑事案件 1 件、刑事附带民事公益诉讼案件 2 件，行政案件 2 件，还有环境民事公益诉讼 4 件、检察行政公益诉讼 1 件。

最高人民法院环境资源审判庭负责人李明义指出，本次发布的典型案例聚焦长江流域生态环境保护最突出的水污染、尾矿库治理、非法采砂、野生动植物保护等案件类型，涉及森林、湿地、湖泊、自然保护区等重要生态系统保护和修复；强调

不同诉讼类型案件统筹适用刑事、民事、行政三大责任方式，加大对破坏生态环境违法犯罪惩处力度。

典型案例显示，人民法院惩治各类破坏长江流域生态环境犯罪，坚持严字当头、全面担责。如，被告人李绪根非法捕捞水产品刑事附带民事公益诉讼案，江苏法院发挥环境资源“9+1”审判机制作用，判令李绪根在承担刑事责任的同时还承担增殖放流的生态修复义务，确保长江十年禁渔的有效实施。

此外，人民法院通过案件审理，力争实现环境有效保护和及时修复，切实保障生态环境公共利益和人民群众环境权益。如，北京市朝阳区自然之友环境研究所诉中国水电顾问集团新平开发有限公司等环境污染责任民事公益诉讼案，中国生物多样性保护与绿色发展基金会诉雅砻江流域水电开发有限公司环境民事公益诉讼案，云南、四川法院支持公益组织的诉请，将生态优先的原则贯穿到水电规划开发的全过程，保护绿孔雀、五小叶槭等珍贵濒危野生动植物的生存环境。

值得注意的是，人民法院指出，要依法保障各类诉讼主体合法权益，妥善平衡各方利益。如，中华环境保护基金会诉中化重庆涪陵化工有限公司环境污染民事公益诉讼案，重庆法院探索以法院为主导的案件执行机制，邀请人大代表、政协委员对案件执行工作进行监督，确保长江边尾矿库环境整治落到实处。再比如，宣城市恒泰金属铸件有限公司诉安徽省宣城市宣州区人民政府未依法履行行政补偿职责案，安徽法院支持政府责令企业退出自然保护区行政行为的同时，对企业的实际损失予以合理补偿，实现了公共利益保护与企业合法权益保护的平衡。

（来源：科技日报，http://www.stdaily.com/index/kejixinwen/2021-02/25/content_1083396.shtml，2021-02-25）

黄河流域入河排污口排查整治专项行动启动

生态环境部以视频方式启动黄河流域入河排污口排查整治专项行动，就推进入河排污口排查整治工作进行部署。会议指出，国家高度重视黄河流域生态环境保护，强调要坚持山水林田湖草沙综合治理、系统治理、源头治理。开展入河排污口排查整治，是从源头推动污染治理、改善水生态环境的重要举措，是推动黄河流域生态环境保护的关键基础性工作。

会议强调，黄河流域生态环境保护取得积极进展，但生态环境治理任务依然艰巨繁重，必须扎扎实实推进各项工作。生态环境部 2019 年以来先后开展了长江、渤海排污口排查整治以及黄河入河排污口试点排查，为开展黄河全流域排查整治打下了基础，积累了经验。在黄河排污口排查整治工作中，要进一步提高政治站位，各级地方政府要坚决扛起排污口排查整治主体责任；要周密组织实施排查，做到应查尽查、有口皆查，实现全流域入河排污口“一本账”“一张图”；要继续强化技术帮扶，让专家深入一线，提供技术指导；要严守工作纪律，做好疫情防控。

会议明确，此次排查整治范围确定为黄河干流（从青海河源至山东入海口）和渭河、汾河、湟水河等重要支流，涉及青海、四川、甘肃、宁夏、内蒙古、山西、陕西、河南、山东 9 省（自治区）54 市（州、盟），排查岸线（两侧岸线）全长 1.9 万公里并覆盖河岸两侧 1 公里区域。同时，综合考虑黄河流域上中下游差异，生态环境部将有序推进排污口“排查、监测、溯源、整治”。计划 2 年时间完成全流域排查，到 2025 年底前基本完成排污口整治工作。通过排查整治，将构建具有入库、管理、查询、统计、分析、共享等功能的黄河流域入河排污口大数据系统，提升黄河流域生态环境监管效率和水平。

生态环境部相关司局，山西、内蒙古、四川、甘肃、青海、宁夏等省区生态环境厅和相关地市（州、盟）人民政府及生态环境局负责同志参加会议。

（来源：科技日报, http://www.stdaily.com/index/kejixinwen/2021-03/27/content_1097549.shtml ,2021-03-27）

全球生态环境遥感监测 2021 年度报告“全球典型湖泊生态环境状况”专题启动会召开

由中国科学院南京地理与湖泊研究所主持的全球生态环境遥感监测 2021 年度报告“全球典型湖泊生态环境状况”专题在南京召开项目启动暨实施方案论证专家咨询会。

会上，专题负责人、项目组成员分别就专题的背景和总体目标、专题实施的技术路线、数据产品和已有研究进展进行了详细汇报。专家组充分肯定了全球典型湖泊生态环境遥感监测的重要意义，在细化技术路线、完善报告章节结构、强化国际广泛关注的热点地区和敏感地区湖泊环境变化的研究等方面提出了意见和建议。

南京地理所所长张甘霖表示，南京地理所在湖泊水文和湖泊生态环境演化等方面具有深厚积累，该专题在全球范围开展 20 年尺度典型湖泊水量和环境变化的研究，符合研究所学科定位和研究所“十四五”规划方向。专题的实施对推动研究所学科交叉与融合、提升研究所全球综合观测和模拟能力、培养人才和拓展研究区域等方面具有重要意义。

（来源：http://www.cas.cn/yx/202101/t20210118_4774975.shtml,2021-01-19）

黄河水科学研究联合基金正式设立并启动实施

水利部会同国家电投集团与国家自然科学基金委员会签订合作协议，共同设立黄河水科学研究联合基金。

黄河流域是我国重要的生态屏障，是连接青藏高原、黄土高原、华北平原的生态廊道，在我国经济社会发展和生态安全保障方面具有十分重要的地位。黄河水科学研究联合基金主要围绕“黄河流域生态保护和高质量发展”重大国家战略需求，重点支持水资源节约集约利用、水沙调控、水旱灾害防御、水生态保护等领域的研

究项目，促进研究成果在黄河保护、治理中的应用，为保障黄河流域水安全提供科技支撑。

黄河水科学研究联合基金的设立，在前期长江水科学研究联合基金成功设立基础上，进一步开辟了水利科研资金支持新渠道。实施黄河水科学研究联合基金，有助于更好地发挥行业部门需求引导和国家自然科学基金平台作用，吸引和调动全国优势科技资源投入黄河流域重大水问题研究，开拓新的研究方向，培养优秀科技人才，促进国家水安全相关领域源头创新能力的提升。

作为国家自然科学基金的组成部分，黄河水科学研究联合基金项目资助工作按照国家自然科学基金运行机制和有关项目管理办法执行。根据合作协议，黄河水科学研究联合基金实施期限暂定 3 年，资金规模 2.5 亿元，每年支持约 24 项重点支持项目。

（来源：科技日报, http://www.nsfc.gov.cn/publish/portal0/tab442/info79942.htm ,2021-03-03）

《长江保护法》实施研讨会在南京召开

守护母亲河——作为我国首部流域法律，《中华人民共和国长江保护法》从 2021 年 3 月 1 日起施行。“守护母亲河——《长江保护法》实施研讨会”日前在江苏南京召开，中华环保联合会法律专家委员会主任王树义、江苏省高级人民法院原一级巡视员刘亚平、河海大学校长助理邢鸿飞教授、武汉大学教授罗吉、东南大学教授杨春福、南京工业大学教授刘小冰、南京环境资源法庭庭长陈迎、河海大学教授晋海、南京大学教授吴卫星、中华环保联合会法律专家委员会秘书长韩旗等出席了研讨会。

王树义报告的主题是《依法保护长江、保障长江流域经济社会的可持续发展——<长江保护法>主要内容解读》，王树义从为什么要制定《长江保护法》、《长江保护法》的主要内容以及《长江保护法》重点内容解读三个方面，谈《长江保护法》的相关问题。

他还进一步提出，《长江保护法》的立法目的，是加强长江流域保护和修复，《长江保护法》的立法理念，不是不利用的保护，也不是不开发，而是让长江“恢复健康”“绿色发展”，更好地为社会主义经济建设服务。

晋海教授以《<长江保护法>基本原则及其对法律实施的意义》做主题报告，他从学理的视角详细解读了《长江保护法》的基本原则，主要包括五个方面：《长江保护法》基本原则的识别，“生态优先，绿色发展”原则及其指导意义，“预防为主，系统治理”原则及其指导意义，“政府主导，多元共治”原则及其指导意义，“协同合作，损害担责”原则及其指导意义。

吴卫星教授以《<长江保护法>法律责任章的特色》做主题报告，报告内容是针对《长江保护法》第八章法律责任做了深入的分析，主要包括三个方面特色：法律责任条文数量相对较少，法律责任规定更严厉，法律责任规定更精准。

陈迎庭长以《长江保护的司法现状》做主题报告。他从自身审判工作经验出发，分别从环境污染、非法捕捞、非法采砂、非法狩猎等四类案件阐述了审判实践中遇到的问题，从民事、行政、刑事措施逐一分析审判实践中的现状，陈迎指出《长江保护法》在解决地区分割、部门分割上有重大的保障作用，《长江保护法》的出台，让裁判标准得到基本统一，打破区域的分割，实现整个流域的系统保护，一体保护，让审判工作在整个长江流域都能够实施，帮助法院有全局的视野和眼光看问题，并且促进审判专业化水平的再提升。

在沙龙研讨环节，嘉宾围绕《长江保护法》实施进行了交流。刘小冰教授提到，长江是中华文化的代表，文化色彩浓厚，长江如何进入新时代，长江文化传承、继承发展是要考虑的问题；杨春福教授认为《长江保护法》是长江流域全面系统保护的法律、一体性保护的法律，既要从可持续发展的角度统筹协调，又要因地制宜、突出重点，坚持多元共治、严格执法、全民守法的理念；南京市律师协会环境与资源保护法律委员会主任祝红律师提出《长江保护法》是流域法、绿色发展法，是民族情感的体现，我们要参与其中多思索、多学习；中虑律师事务所副主任赵丽敏律师提出实施中的问题，引发对《长江保护法》落地、制度完善、行政执法怎么做、公益诉讼如何开展、检察机关的权力和责任问题做了探讨和交流；罗吉教授提到与黄河不同，长江更具有流域性，她以生动案例揭示了全流域治理的重要意义，要从国家战略布局出发，正确处理中央和地方的关系；江苏省高级人民法院原一级巡视员刘亚平做总结发言并指出法是国家管理、社会规则层面的内容，作为司法工作者需要有家国情怀，为创造更好生活环境而努力。

本次研讨会由中华环保联合会主办，中华环保联合会法律专家委员会、江苏省新的社会阶层人士联谊会、江苏省法学会生态法学研究会、南京市律师协会、南京同心律师服务团、无党派人士韩旗工作室承办，南京市律师协会环境与资源保护法律专业委员会、江苏中虑律师事务所协办。会议进行了全网同步直播，向社会大众传递《长江保护法》的专家声音，讲述长江故事，让更多人关注《长江保护法》，学习《长江保护法》。

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