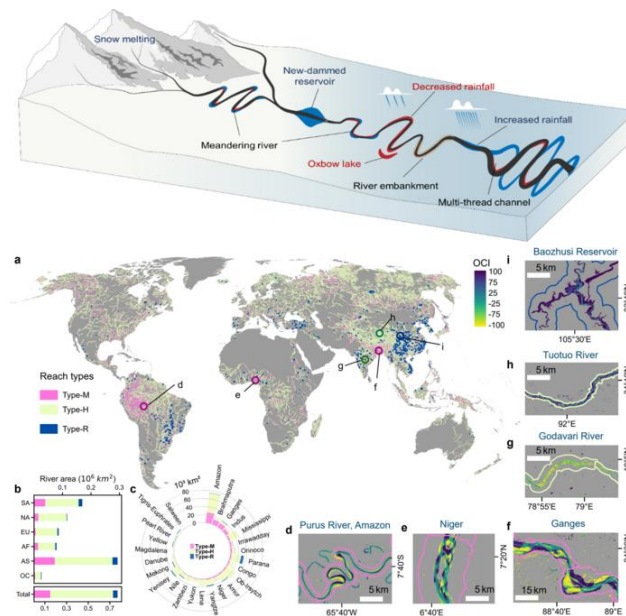


Satellites reveal hotspots of global river extent change

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Rivers are one of the most dynamic components of the water cycle on Earth's surface and play a significant role in the development of human societies, ecosystem sustainability, and regional climate. However, their natural balance has been threatened by human disturbances and ongoing climate change, as evidenced by changes in river extent over recent decades.

In order to better understand what is behind these changes, researchers led by Prof. SONG Chunqiao from the Nanjing Institute of Geography and Limnology of the Chinese Academy of Sciences and their collaborators from China and the United States have analyzed water extent variations using four decades' worth of Landsat imagery in order to globally attribute recent changes in river regimes to morphological dynamics or hydrological signals.

The study was published in Nature Communications on March 22.

For quantifying and interpreting multi-decadal changes in river extent on large spatial scales, the researchers used information from two major state-of-the-art surface water databases: the Surface Water and Ocean Topography River Database (SWORD) and the Global Surface Water (GSW) database.

They compiled a new reservoir inventory to define new reservoir-type river reaches (Type-R). The remaining basin-wide river changes were classified into two types—morphological dynamics (Type-M) and hydrological signals (Type-H)—using a machine learning classification approach.

"We provide the first-ever attribution of different types of river extent changes on a global scale," said Prof. SONG.

The results showed that changes based on morphological dynamics prevailed in about 20% of the global river area. In this type of river basin, high percentages of narrowing and widening were observed along different banks of river reaches, which are associated with meandering, braided, and branching or wandering river channels—all variations of flow regimes.

Globally, dam construction emerged as a major contributor to river widening. "New dams, mostly skewed in Asia and South America, contributed to 32% of the river widening," said Prof. KE Linghong, a primary author of the study.

Changes attributed to hydrological signals were revealed in contrasting hotspots, including areas characterized by prominent river widening in alpine and pan-Arctic regions and by narrowing in arid or semi-arid continental interiors. "These phenomena were driven by varying trends in climate forcing, cryospheric response to warming, and human water management," said WU Qianhan, a student from NIGLAS and another primary author of the study.

The study provides global-scale but spatially explicit guidance for better prioritizing future river protection and restoration efforts under the UN 2030 Agenda for Sustainable Development, which calls for international action to track the spatial extent of water-related ecosystems and their condition.

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