

## **Advancing Theory and Modelling of River Systems Working Group**

Rivers in most parts of the world are experiencing ever strong disturbances of humans, which, in combination with climate change, have made river systems adjust their morphologies significantly, resulting in a wide range of degradation in aquatic habitats, extinction of fish species, loss of flood-retaining areas, etc. To minimize these negative effects, it is necessary to provide convincing predictions of the adjustments of river systems to the public and decision makers. However, rivers are dynamic systems that are too variable and behave in very complex manners. Although a lot of theoretical and numerical modelling frameworks have been proposed and practiced for quantitatively predicting the self-adjustments of river morphologies over the last several decades, there is no universal agreement as to which scientific methodological framework is of general use. Hence, to evaluate the physical/empirical bases and practical applicability of available theoretical and modelling frameworks is the main task of our working group. By doing so, our working group aims at achieving the following objectives:

- To identify complex self-organized models of river systems through synthesizing the findings from case studies conducted in wide range of geographical areas;
- To clarify confused understandings of the physical mechanisms underlying the self-adjusting process of river systems in terms of theoretical advancements in general physics, open channel hydraulics, sediment transport mechanics and hydrological processes;
- To uncover the philosophical principles or the overarching scientific methodological frameworks governing the behaviors of river systems through evaluating the theoretical advancements and field justifications of available theoretical and modelling frameworks;
- To provide guidelines for river system management in light of the evaluation over the advancements of theoretical and modelling frameworks.

### **Past activities:**

During April 1, 2022 to March 31, 2023, our working group had carried out activities mainly on the following aspects:

#### Webinar seminars and meetings:

- Due to the effect of Covid-19 pandemic, our working group has engaged in organizing various webinar seminars focused on fluvial geomorphology. In particular, Prof. He Qing Huang, co-chair of our working group, has given presentations on advances and challenges in river studies and activities of our working group as a main speaker in webinar seminars held on July 12, Sept. 30, Oct. 27 and Nov. 3 in 2022 and on March 21 in 2023 under the organizations of Ludong University of China, Northwest University of China, Institute of Tibetan Plateau Research of Chinese Academy of Sciences, China University of Geosciences (Beijing) and Changjiang River Research Institute, respectively.
- Representing our working group, Prof. He Qing Huang, gave an online presentation on advances and challenges in river studies taking the evolution of Zhangjiajie Landscape as an example at the 7th Asia Pacific Geoparks Network Symposium organized by Satun UNESCO Global Geopark, Thailand during Sept. 7-10. In addition, Prof. Huang was invited to give a special address on river diversity on Sept. 10 in a session specially organized for celebrating the International Geodiversity Day.

- Our working group had actively engaged in the organization of 2022 Conference of the Commission on Geomorphology and Quaternary Studies of the Geographical Society of China held mainly online during October 29-30. In addition, we had tried to encourage scientists and postgraduates to participate in the online activities of International Geomorphology Week 2023 organized by IAG during March 1 to 7, 2023.

Participation of the 10th International Conference on Geomorphology:

Profs. He Qing Huang, Ian Rutherford and Paul Carling, co-chairs of our working group, had been actively promoting the 10th International Conference on Geomorphology and the activities of IAG in many circumstances and encouraging scientists and postgraduate students to participate in the conference. At the conference held during September 12-16, 2022 at Coimbra in Portugal, Prof. Ian Rutherford, representing our working group, led a group of river researchers to attend the conference and presented their latest research outcomes within the context of applied geomorphology.

Participation of the 19th ANZGG (Australia & New Zealand Geomorphology Group) Conference:

Representing our working group, Prof. Ian Rutherford had actively engaged in the organization of the 19th ANZGG Conference held during September 26-30, 2022 in Alice Springs, Australia. In particular, Prof. Rutherford led a group of river researchers to attend the conference and presented their latest research outcomes.

**Forthcoming activities:**

During April 1, 2023 to March 31, 2024, our working group plans to carry out the following activities:

- Organizing an international workshop for our working group during Oct. to Nov., 2023 in Wuhan/Zhangjiajie, China;
- Promoting our working group through organizing seminars or workshops with universities, research institutions and other relevant organizations in China, Australia, UK and other countries;
- Actively engaging in the organization of 2023 Conference of the Commission on Geomorphology and Quaternary Studies of the Geographical Society of China scheduled to be held in Taiyuan, China;
- Promoting our working group at the 10th International Conference on UNESCO Global Geoparks scheduled to be held during September 5-10, 2023 in M'Goun UNESCO Global Geopark, Morocco;
- Promoting our working group through actively encouraging scientists and post-graduate students to participate in Regional Conference on Geomorphology scheduled to be held during September 12-14, 2023 in Cappadocia, Türkiye;
- Actively engaging in the organization of 20th ANZGG conference scheduled to be held during February 12-16, 2024 in Gisborne, New Zealand.