



# 全球水循环模拟与预报团队

Hydrological Simulation and Prediction Lab

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## 研究团队介绍

团队简介：清华大学“全球水循环模拟与预报团队&r...

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## 最新论文

[108] Wang, T., Yang, D., Fang, B., Yang, W.,  
03 Sep 2018

[107] Wang, Y., Yang, H., Gao, B., Wang, T.,  
03 Sep 2018

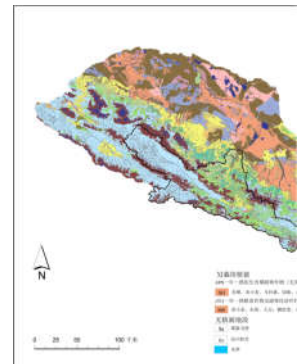
## 新闻动态



最新成果：基于统计与机器学习算法的青藏高原冻土分布及未来变化模拟

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## 应用成果



### 黑河流域上游生态水及模型研究介绍

黑河流域上游生态水文研究项目介绍 项目来源委员会重大研究计划”

Research papers

[10] **Quantifying the streamflow response to frozen ground degradation in the source region of the Yellow River within the Budyko framework**

Taihua Wang, Hanbo Yang, Dawen Yang\*, Yue Qin, Yuhua Wang

Water Resources Research, 54(10), 1015-1028, 2018

Abstract: The source region of the Yellow River (SRFR) is greatly important for water resources throughout the entire Yellow River Basin. Streamflow in the SRFR has experienced great changes over the past few decades, which is closely related to the frozen ground degradation; however, the extent of this influence is still unclear. In this study, the air freezing index (AFI) is selected as an indicator for the degree of frozen ground degradation. A water-energy balance equation within the Budyko framework is employed to quantify the streamflow response to the direct impact of climate change, which manifests as changes in the precipitation and potential evapotranspiration, as well as the impact of frozen ground degradation, which can be regarded as part of the indirect impact of climate change. The results show that the direct impact of climate change and the impact of frozen ground degradation can explain 55% and 33%, respectively, of the streamflow decrease for the entire SRFR from Period 1 (1965–1989) to Period 2 (1990–2003). In the permafrost-dominated region upstream of the Jinsha hydrological station, the impact of frozen ground degradation can explain 71% of the streamflow decrease. From Period 2 (1990–2003) to Period 3 (2004–2015), the observed streamflow did not increase as much as the precipitation; this could be attributed to the combined effect of increasing potential evapotranspiration and more importantly, frozen ground degradation. Frozen ground degradation could influence streamflow by increasing the groundwater storage when the active layer thickness increases in permafrost-dominated regions. These findings will help develop a better understanding of the impact of frozen ground degradation on water resources in the Tibetan Plateau.

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Data-froze

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