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Editorial: The impacts of atmospheric and environmental changes of Urban Cities and suburbs on the Tibetan Plateau and other Northern hemispheric cryosphere

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Editorial on the Research Topic

[The Impacts of Atmospheric and Environmental Changes of Urban Cities and Suburbs on The Tibetan Plateau and other Northern Hemispheric Cryosphere](#)

Due to its ability to spread in the atmosphere, air pollution is considered an alarming global phenomenon, having a significant impact on global climate, the environment, and human health. The Tibetan Plateau is sparsely populated and has little human activity. Its atmospheric and cryospheric environment is thus relatively pristine and highly sensitive to atmospheric emissions. In recent years, the atmospheric environment of central and western China has undergone profound changes related to significant industrial and economic growth. Considering the sensitivity of the cryosphere to atmospheric composition, atmospheric emissions from the abovementioned region can potentially impact the cryosphere of the Tibetan Plateau region. Despite much research being focused on the production and transport of pollutants in South Asia, relatively few studies have been concerned with the atmospheric and environmental changes occurring in central and western China and their impacts on the Tibetan Plateau cryosphere. This Research Topic, “The Impacts of Atmospheric and Environmental Changes of Urban Cities and Suburbs on The Tibetan Plateau and other northern Hemispheric Cryosphere,” hosted by

Frontiers in Environmental Science, focuses on atmospheric pollution and contamination of the cryosphere (glaciers and snow). The papers in this Research Topic discuss the kinds of pollutants deposited, the processes controlling the deposition and transport of these pollutants in the cryosphere, and the impacts of these pollutants on climate change.

Moreover, the goal of this Research Topic is to improve our understanding of the impacts of the atmospheric and environmental changes in urban areas on the cryosphere of remote regions, with a particular focus on the cryosphere of the Tibetan Plateau. This area is surrounded by heavily industrialized and inhabited regions, and the studies of the present Research Topic focus on the transport routes and sources of atmospheric pollution toward glaciated areas as well as the characterization of cryosphere-related samples (ice, snow, cryoconite) to monitor the environmental quality of glacial and peri-glacial areas.

An et al. provide new insights into the concentrations, compositions, and deposition rates of dissolved nitrogen in Western China from snow records (mainly on the Tibetan Plateau). The authors found that the mean concentration of total dissolved nitrogen in the snowpit samples is $12.6 \mu\text{mol L}^{-1}$ ($8.0\text{--}17.8 \mu\text{mol L}^{-1}$) and is constituted of 59% ammonium nitrogen, 35% nitrate nitrogen, and ~6% dissolved organic nitrogen. Moreover, the authors estimate a total dissolved nitrogen deposition flux of $0.56\text{--}1.3$ (mean 0.88) $\text{kg ha}^{-1} \text{a}^{-1}$ in the mountain area of Western China.

Chen et al. studied the characteristics of chemical pollutant solutes and mineral dust deposition in the ice of the ablation area of a glacier in the Tien Shan Mountains, central Asia. They show that the mean dust concentration in the glacial ice is about 2.5×10^5 number ml^{-1} , with a high level in the Asian dust source region. Additionally, the influence of pollutant deposition on the glacier watershed is presented in the paper “Heavy metal levels and sources in suspended particulate matters of the glacier watersheds in Northeast Tibetan Plateau” (Wu et al.). This paper analyzes the heavy metal pollutants over a broad area of the northern Tibetan plateau, and shows that the enrichment factors (EFs) of SPM heavy metals have a significantly higher value in the downstream region of the watershed compared to the upper glacier region of the watershed.

This Research Topic is also encompasses articles that reveal the recent change in climate that can be attributed to pollutant transport. Long-term and high-resolution gridded products of precipitation and temperature data are highly important to study the changes in climate and environment under global warming. Li et al. present a long-term evaluation of high-resolution gridded precipitation and temperature products in the Qilian Mountains, Qinghai–Tibet Plateau. Du et al. investigated the monsoon fringe area moisture transportation by considering water-stable Isotopes in Lanzhou River Valley as a case study. There are also insights into the response of seasonally frozen ground to climate change in the Northeastern Qinghai-Tibet Plateau. Permafrost thawing will also release a large amount of organic matter and pollutant gases (Zhao et al.), resulting in changes in the atmospheric environment of glacial regions. Thus, this Research Topic will provide a basis for predicting the future connections between the climate, human activities, and the cryospheric environment.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

Conflict of interest

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