

Climate Changes and Ecological Response on the Tibetan Plateau

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Abstract : High-mountain environments are experiencing more rapid warming than lowlands. The Tibetan (Qinghai-Xizang, TP) Plateau, known as the “Third Pole” of the Earth and the “Water Tower of Asia,” is the highest plateau in the world, however, ecological response to climate change has been hardly documented in high altitude regions. In this paper, we investigated climate warming induced ecological changes on the Tibetan Plateau over the past 50 years through combining remote sensing data with a large amount of in situ field observation. The results showed that climate warming up to 0.41 °C/10 a has greatly improved the heat conditions on the TP. Lake and river areas exhibit increased trend whereas swamp area decreased in the recent 35 years. The expansion in the area of the lake is directly related to the increase of precipitation as well as the climate warming up that makes the glacier shrink, the ice and snow melting water increase and the underground frozen soil melting water increase. Climate warming induced heat condition growth and reduced annual range of temperature, which will have a positive influence on vegetation, agriculture production and decreased freeze-thaw erosion on the TP. Terrestrial net primary production and farmland area on the TP have increased by 0.002 Pg C a⁻¹ and 46,000 ha, respectively. We also found that seasonal frozen soil depth decreased as the consequence of climate warming. In the long term, accelerated snow melting and thinned seasonal frozen soil induced by climate warming possibly will have a negative effect on alpine ecosystem stability and soil preservation.

Keywords : global warming, alpine ecosystem, ecological response, remote sensing

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