

The effect of cryosphere change on hydrological process and ecosystem in China

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Our study of effect of the cryosphere change is mainly focused on hydrological process and ecosystem in China in recent years. The cryosphere, such as glacier, permafrost and snow cover, exist over China. There is 46377 glacier with 5,9425km² area and 5600km³ volume, 2.2x10⁶ km² permafrost (23% of total area of China) and 4.2x10⁶ km² snow cover (44% of total area of China) with 75km³ water. The glacier retreat lead to glacier runoff increase which contributed to about 2/3 of river discharge increase in Tarim main rivers and weaken the discharge decrease in the upper Yangtze River during last 50 years. The climate warming has also cause early snow melting and changed the hydrological regime. The monthly peak flow has moved from Jun in 1960-1980's to May in 1990-2005 in main branch Kelan River in Extix River in Northwest China during recent 40 years. There is significant relationship between basin permafrost coverage and hydrological regime (indicated by monthly maximum discharge vs. monthly minimum discharge). The relationship implies permafrost degradation will caused the discharge increase in winter and flat hydrological regime. The field investigation shows the plants coverage closely related to the active layer depth in Tibet Plateau. The ecosystem degradation may relate to active layer depth increase in Permafrost region in Tibet Plateau. This result indicates that ecosystem degradation caused by climate warming would be enhanced by the permafrost degradation. The ecosystem depredated very strongly near the boundary between permafrost and seasonal frozen ground in period 1980-2000 and related to the disappearance of relative impermeable permafrost near the boundary.