Submitted Abstract

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Abstract

High Mountain Asia (HMA) contains the largest concentration of glaciers outside the polar regions. These glaciers play an essential role in terms of water supply for the surrounding densely populated lowland areas. During summer months, the contribution of glacier meltwater to fresh water supply for households, agriculture and industry can increase to more than 50%. The retreat of these glaciers consequently can have a major impact. However, few detailed modelling studies exist that examine in detail how individual ice bodies in the area are responding to climate change. Further, different climatic and topographic settings ensure a heterogenous impact on ice masses in the area. In this study, we focus on the Tien Shan mountain range in the northwest of HMA. During the Soviet era, various glaciological measurements were carried out in this region. After abandonment in the nineties, different measurement programs have reinitiated in the last decades. We use several recent measurements and reconstructions of the ice thickness, surface elevation, surface mass balance and ice temperature to study in detail six different ice masses in the Kyrgyz Tien Shan: 5 valley glaciers and 1 ice cap. The selected ice bodies are located in different sub-regions of the Tien Shan with different climatic settings, and they are all characterised by detailed recent glaciological measurements. A 3-dimensional higher-order model is calibrated and applied to simulate the evolution of the ice masses since the Little Ice Age and to make a prognosis of the future evolution up to 2100 under different climate scenarios.