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Satellite monitoring of spring snowmelt patterns between 2000-2016 on the Upper Irtysh River Basin, Altai Mountains, Central Asia

Shamshagul Mashtayeva (1), Benjamin Brock (2), and Thomas Shaw (3)

(1) L.N. Gumilyov Eurasian National University, Astana, Kazakhstan (shamsha2001@mail.ru), (2) Northumbria University, Newcastle Upon Tyne, United Kingdom (benjamin.brock@northumbria.ac.uk), (3) Universidad de Chile, Santiago, Chile (thomas.shaw@amtc.cl)

Spring snowmelt floods have claimed the lives of 50 people and led to considerable infrastructural damage and economic costs in eastern Kazakhstan in the past 10 years. This project aims to improve forecasting of damaging flows on the Irtysh River by integrating satellite snow cover monitoring with a hydrological runoff model. Here, we present an analysis of patterns of spring (February – June) snow cover change in five tributary basins of the Irtysh River between 2000 and 2016, derived from MODIS MOD10A2 snow cover grids. The study area covers ~175,000 km2 of the Altai mountain region of China, Kazakhstan, Russia and Mongolia (44-54°N, 80-94°E). Snow cover area is assessed in 500 m elevation intervals following spatio-temporal filtering of cloud cover. During late March/early April, snow cover disappearance is rapid below 2000 m a.s.l., particularly for the largest basin (Kara Ertis, 143,859 km2), where >50% of the snow covered area typically melts within a 3 week period. There is a sizeable inter-annual variability in the timing of the rapid spring snowmelt period in all five basins. For the smaller basins, the disappearance of snow cover can vary by around 4 weeks in late spring, emphasizing the potential benefits of satellite monitoring of snow cover extent for flood forecasting.