

Influence of Springtime Okhotsk High on Rapid Discharge Increase Accompanied by River Ice Melt in Eastern Siberia

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Siberian rivers freeze during winter, and the river ice melts and breaks in the spring. Accompanied by the ice melt, the river discharge rapidly increases. The broken ice sheets occasionally accumulate in a river channel and induce a sudden rise of water level, which is called ice jam (Yoshikawa et al. 2018). The ice jam sometimes incurs a flood (e.g., Sakai et al. 2015, Tei et al. 2020). Therefore, the river ice condition and changes in river discharge are important information for local residents (Fujiwara 2011). While the previous studies have examined the interannual variations and long-term trends of precipitation, river discharge (e.g., Oshima et al. 2015, 2018, Oshima and Yamazaki 2019), river water temperature and river ice (Park et al. 2016, 2017) in Siberia, year-to-year variations in the timing of rapid discharge increase and associated atmospheric circulation are still unclear.

We focused here on eastern Siberia. There is a long-term daily discharge record from 1950 to 2011 at Tabaga where located in the middle reach of the Lena River. The analyzed results based on the discharge data during the past six decades were as follows: The timing of rapid discharge increase ranged from 5/15 to 5/30 with the average of 5/17. As expected, the timings were negatively correlated with air temperature in May when the temperature changes from negative to positive (Figure 1). We further examined an atmospheric circulation pattern associated with the rapid discharge increase. The sea level pressure anomalies associated with the timing of the rapid discharge increase showed positive anomalies over the Sea of Okhotsk, i.e. Okhotsk high. In conclusion, when the Okhotsk high enhances in May, it induces warming over eastern Siberia, resulting in early river ice melt and early rapid increase in discharge in this region.

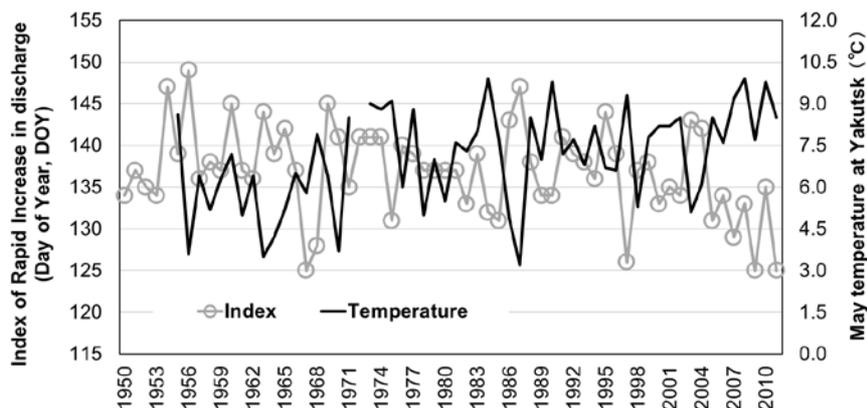


Figure 1. Index of rapid increase in discharge at Tabaga (Gray line with circle, left axis) and May temperature at Yakutsk (Black line, right axis) during the past 62 years (1950 - 2011). The index was defined as a date when the daily river discharge at Tabaga exceeds 50000 m³/s in May. The temperature denotes monthly mean observed at Yakutsk where is major city in eastern Siberia and about 20 km from Tabaga.

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