4-year (2018-2021) variations of river surface temperature and channel width in the Arctic region derived from GCOM-C/SGLI

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The Arctic rivers play important roles in the continental hydrological cycles as well as the ocean-atmosphere energy exchange in the Arctic (Park et al., 2020). Recently, the snow cover extent in the Northern Hemisphere has been declining during the past 40 years (Hori et al., 2017). Thus, the temporal pattern of fresh water and heat inflow into the Arctic Ocean through the continental rivers can be considered to change drastically. This study aims to derive river surface temperature and channel width of the six Arctic rivers (Ob, Yenisei, Lena, Kolyma, Yukon, and Mackenzie) from remotely sensed images using optical sensor SGLI onboard GCOM-C satellite launched in 2017. SGLI has spectral channels in the visible to thermal infrared wavelength regions at the spatial resolution of 250 m, which enables us to monitor river surface temperature (RST) and river channel width (RCW) on the continental scale. Analysis of the first two-year SGLI data (2018-2019) revealed that RST and RCW can be retrieved successfully on a near-daily basis (Hori, 2021). In this study, the period of data analysis was extended to four years from 2018 to 2021 in order to capture seasonal and yearly changes in RST and RCW. Figure 1 indicates daily anomalies of RST and RCW along the Lena River from 2018 to 2021. SGLI-derived RST and RCW varies coincidently. That is, when RST becomes lower, RCW tends to be wider, and vice versa. This can be considered due to that the occurrence of precipitation within river basins leads to the increase of river discharge (i.e., RCW) together with the decrease of RST, because cloudy condition reduces the temperature of land surface on which surface runoff flows into the river channel. The amplitude of RST and RCW variations also varies year by year. Thus, heat flux flowing into the Arctic Ocean through the Lena River is also considered to vary year by year and could affect sea surface temperature and sea ice distribution in the Arctic Ocean.

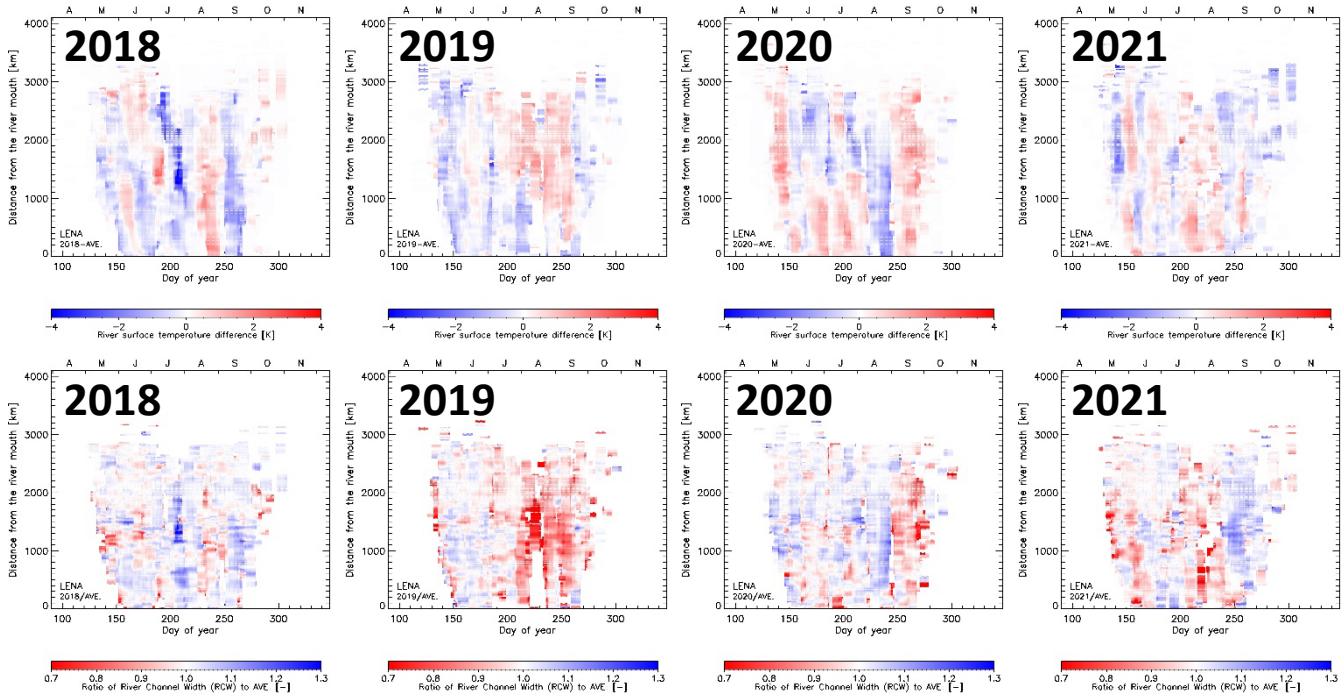

Figure 1 Spatio-temporal distribution of SGLI-derived river surface temperature (RST, upper figures showing as anomalies from 4-year average) and river channel width (RCW, lower figures as the ratio to 4-year average) along the Lena River channel from 2018 to 2021.

References

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