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Summer CO_2 fluxes from streams in the Ob River catchment, Western Siberia

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Siberia contains vast C stocks potentially vulnerable to mobilization following permafrost thawing. Yet, there is a paucity of studies on the inland waters draining these regions, despite their potential importance in regional and global C cycles. Here we present spring- and summer-time CO_2 fluxes from 58 streams and rivers within Ob, Pur and Taz river drainage basins sampled in 2015. The sampled sites cover a large range of climate and permafrost conditions (permafrost free to continuous) and span over 3000 km^2. We measured partial pressure of CO_2, gas exchange velocities (k) and net fluxes of CO_2 between water and atmosphere during 2 consequent surveys of each river network at high and low-flow hydrological regimes. Our results show that streams are net sources of atmospheric CO_2 with average annual contribution of nearly $\sim$2.7 kg C m^{-2} yr^{-1} in permafrost-free watersheds, $\sim$5 kg C m^{-2} yr^{-1} in isolated permafrost, $\sim$2.2 kg C m^{-2} yr^{-1} in rivers draining discontinuous permafrost zone and about $\sim$1 kg C m^{-2} yr^{-1} in continuous permafrost zone. These differences across zones are likely due to variation in permafrost extent, vegetation and hydrological dynamics. With climate warming the region may further increase C emissions from surface waters leading to important implications for the global C cycle.