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Mackenzie River Delta morphological change based on Landsat time series

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Arctic rivers are sensitive and yet quite unexplored river systems to which the climate change will impact on. Research has not focused in detail on the fluvial geomorphology of the Arctic rivers mainly due to the remoteness and wideness of the watersheds, problems with data availability and difficult accessibility. Nowadays wide collaborative spatial databases in hydrology as well as extensive remote sensing datasets over the Arctic are available and they enable improved investigation of the Arctic watersheds. Thereby, it is also important to develop and improve methods that enable detecting the fluvio-morphological processes based on the available data. Furthermore, it is essential to reconstruct and improve the understanding of the past fluvial processes in order to better understand prevailing and future fluvial processes.

In this study we sum up the fluvial geomorphological change in the Mackenzie River Delta during the last $\sim$30 years. The Mackenzie River Delta ($\sim$13 000 km^2) is situated in the North Western Territories, Canada where the Mackenzie River enters to the Beaufort Sea, Arctic Ocean near the city of Inuvik. Mackenzie River Delta is lake-rich, productive ecosystem and ecologically sensitive environment. Research objective is achieved through two sub-objectives: 1) Interpretation of the deltaic river channel planform change by applying Landsat time series. 2) Definition of the variables that have impacted the most on detected changes by applying statistics and long hydrological time series derived from Arctic-HYPE model (HYdrologic Predictions for Environment) developed by Swedish Meteorological and Hydrological Institute. According to our satellite interpretation, field observations and statistical analyses, notable spatio-temporal changes have occurred in the morphology of the river channel and delta during the past 30 years. For example, the channels have been developing in braiding and sinuosity. In addition, various linkages between the studied explanatory variables, such as land cover, precipitation, evaporation, discharge, snow mass and temperature, were found. The significance of this research is emphasised by the growing population, increasing tourism, and economic actions in the Arctic mainly due to the ongoing climate change and technological development.