Decadal variance of summer near-surface temperature maximum in Canada Basin of Arctic Ocean

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In the summer Arctic, bump-like vertical temperature profiles of the upper layer in the Canada Basin suggest a near-surface temperature maximum (NSTM) beneath the mixed layer. This paper concentrates on describing the decadal variance of these NSTMs. Essentially, the temporal evolution of the summer NSTM revealed three decadal phases. The first period is before 2003, when the summer NSTM could rarely be observed except around the marginal of the Canada Basin. The second period is between 2003 and 2015, when the summer NSTM nearly occurred over the whole basin as accelerated decline of summer sea ice. The third period is from 2016 to 2017, when the summer NSTM almost disappeared due to prevailing warm surface water. Furthermore, for the background behind the decadal variance of summer NSTM, linear trends of the September minimum sea ice extent and surface water heat content in the Canada Basin from 2003 to 2017 were $-2.75\pm1.08\times10^4\text{km}^2\text{yr}^{-1}$ and $2.29\pm1.36\text{MJ m}^{-2}\text{yr}^{-1}$, respectively. According to a previous theory, if we assume that the trend of the summer surface water heat content was only contributed by NSTM, it would cause a decrease in sea ice thickness of approximately 13 cm. The analysis partially explains the reason for sea ice decline in recent years.