EGU2020-2857
https://doi.org/10.5194/egusphere-egu2020-2857
EGU General Assembly 2020

Seasonal variability of fast ice edge in the McMurdo Sound between 2017 and 2019 based on Sentinel-1 SAR

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The fast ice in the McMurdo Sound plays an important role in the coastal ecological systems and climate changes, but its seasonal and interannual variations are poorly understood. In this study, the fast ice phenology and extent variation are investigated using Sentinel-1 Synthetic Aperture Radar (SAR) images from 2017 to 2019, and the factors controlling the fast ice development are explored. The results showed that the fast ice edge presented obvious seasonal change. In 2017/2018 and 2018/2019 years it arrived at northernmost during May – July, and keeps north until the end of December or January, and then moves south, arriving at most south on February or March. However, there are some difference between these two years. The date the fast ice edge arrived at northernmost in 2018 was about two months later than in 2017, but the ending time at the northern edge was about one month earlier (31 Dec 2018 vs 30 Jan 2018). The time when it retreated to the southernmost in 2019 was about one month before that in 2017 or 2018. It seems the longer the edge stays in the northernmost, the later it retreats to the southernmost, and it may not completely disappear; the shorter the edge stays in the northernmost, the earlier it retreats to the southernmost, and it may completely disappear. The dominant factor controlling the beginning and end dates are air temperature. This statement still needs to be confirmed when more data will be processed and analyzed in near future.