



Mapping and Assessing Variability in the Antarctic Marginal Ice Zone, the Pack Ice and Coastal Polynyas

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Sea ice variability within the marginal ice zone (MIZ) and polynyas plays an important role for phytoplankton productivity and krill abundance. Therefore mapping their spatial extent, seasonal and interannual variability is essential for understanding how current and future changes in these biological active regions may impact the Antarctic marine ecosystem. Knowledge of the distribution of different ice types to the total Antarctic sea ice cover may also help to shed light on the factors contributing towards recent expansion of the Antarctic ice cover in some regions and contraction in others. The long-term passive microwave satellite data record provides the longest and most consistent data record for assessing different ice types. However, estimates of the amount of MIZ, consolidated pack ice and polynyas depends strongly on what sea ice algorithm is used. This study uses two popular passive microwave sea ice algorithms, the NASA Team and Bootstrap to evaluate the distribution and variability in the MIZ, the consolidated pack ice and coastal polynyas. Results reveal the NASA Team algorithm has on average twice the MIZ and half the consolidated pack ice area as the Bootstrap algorithm. Polynya area is also larger in the NASA Team algorithm, and the timing of maximum polynya area may differ by as much as 5 months between algorithms. These differences lead to different relationships between sea ice characteristics and biological processes, as illustrated here with the breeding success of an Antarctic seabird.