Production of bromoform in sea ice and emission to the atmosphere

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Bromoform ($CHBr_3$) is one of the important bromine containing volatile halocarbons that are involved in ozone depletion in the atmosphere. Although the possible source of reactive bromine species from snow and sea ice has been discussed, mechanisms that control $CHBr_3$ production within sea ice and emission to the atmosphere remain unclear. Here, we show evidence of massive $CHBr_3$ production at sea ice surface-snow interfaces and its strong emission to the atmosphere from five field-campaigns to the Arctic Ocean, the Southern Ocean, and the Sea of Okhotsk in the winter and spring, in addition to supporting laboratory experiments. We found that the ice-related strong $CHBr_3$ emission was linked to the production of the $CHBr_3$ at the snow-sea ice interface through the haloform reaction. Our results suggest that sea ice acts as a strong $CHBr_3$ source for the atmosphere, indicating a significant contribution to the atmospheric bromine cycle.

Keywords: sea ice, bromoform, polar ocean

