Development of an Autonomous Buoy for Year-Round Measurement of O_3, CO_2, and BrO Over the Arctic Ocean

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Tropospheric ozone depletion events (ODEs) in the Arctic region have been observed since the mid-1980s. Ozone (O_3) has great importance as it provides the atmosphere's oxidizing power. These ODEs are believed to be the product of a bromine-catalyzed reaction where bromine is made highly available from the ocean in the form of aerosols (sea spray), frost flowers, and sea ice. To date there have been many measurements of the bromine monoxide (BrO) radical, O_3 and CO_2 over coastal Arctic land masses; however, there have been few over the ocean and sea ice, and certainly none for extended periods of time. Since sea salt is a source of bromine and sea ice is no longer considered a cap for sea-air exchange, measurements over the sea ice are of potentially extreme importance.

The goal of our research is to measure O_3, BrO, CO_2, and various meteorological parameters over Arctic sea ice for periods on the order of a year without human intervention. We have designed, tested, and recently deployed in sea ice an autonomous, self-powered, satellite-communicating O-Buoy capable of continuous measurements. Eventually multiple O-Buoys will form an Arctic network, providing an understanding of the atmospheric processes involved.