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Development and Results from an Autonomous Buoy for Year-Round Measurement of Ozone, BrO and CO2 above the Arctic Ocean

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Tropospheric ozone depletion events (ODEs) during Arctic spring have been observed since the mid-1980s. Ozone is highly important as it is one of the major atmospheric oxidizers. These ODEs are believed to be the product of a bromine-catalyzed reaction where bromine is made highly available from sea salt in the form of aerosols (sea spray), frost flowers, saline snowpacks, and sea ice. Though there have been numerous land-based studies, to date there have been few measurements of ODE relevant species (e.g. ozone and bromine monoxide) directly over the ocean surface, and certainly no measurements for prolonged periods of time; thus leaving a significant gap in our understanding of this process. Here we present recent results from measurements of O3, BrO, and CO2, from an autonomous buoy system capable of functioning without direct human support in an extremely harsh environment and collecting data over year-long intervals for these three species, along with wind speed, wind direction, surface temperature, solar radiation, GPS position, and orientation. Here we discuss and present details of the design, and photographs and data from the first deployment of this buoy system.