



Bromine explosion events observed at Arrival Heights, Antarctica, since 1995

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Ground-based measurements of BrO (bromine oxide) using zenith-sky UV/vis absorption spectroscopy have been made at Arrival Heights, Antarctica (78°S, 167°E) since 1995. These observations have been complemented with multi-axis measurements since 1999 and direct-sun BrO retrievals during spring 2002. All three BrO data sets are investigated for sudden strong increases which together with a corresponding decrease in surface ozone are clear indicators for bromine explosion events.

These episodic bromine explosion events occur during polar springtime, when heterogeneous processes on the snow pack and sea ice lead to an autocatalytic release of reactive bromine from sea-salt. The bromine is then photolysed, yielding free bromine atoms which react with ozone to form BrO. With the return of sunlight in spring, the rate of bromine photolysis sharply increases and this in turn results in very high concentrations of BrO and substantial boundary layer ozone depletion.

In this study, we present an overview of all bromine explosion events observed during the last 11 years at Arrival Heights. The three BrO data sets are used together with simultaneous O₄ measurements and surface ozone observations to identify bromine explosion events occurring during clear sky conditions. The observed O₄ columns (corresponding to light path enhancement in the troposphere) and BrO columns show a clear correlation during springtime, when high amounts of BrO are present in the boundary layer, while during the autumn season no such correlations are observed.