Investigation of air mass origin during tropospheric ozone depletion events at Arrival Heights, Antarctica

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Surface ozone (O$_3$) measurements, performed between 1997 and 2008 at Arrival Heights, Antarctica (77.8°S, 166.7°E), show sudden decreases in O$_3$ mixing ratios during Antarctic springtime. These low O$_3$ events were often correlated with elevated concentrations of bromine oxide (BrO) indicating that similar processes of halogen activation, involving sea ice surfaces as proposed for Arctic and other Antarctic regions, also take place at Arrival Heights.

The air mass origin during these O$_3$ depletion events was investigated by calculating 5-day and 7-day backwards trajectories. Trajectory analysis showed that most commonly air masses had contact with sea-ice, which was correlated with enhanced BrO columns. In the case when O$_3$ depletion events were observed without elevated BrO concentrations no sea-ice contact was observed, suggesting that ozone depleted air masses must have been transported to the site.

Mainly changes in wind velocities lead to the correlation of ENSO and sea ice coverage of the Ross Sea. BrO measurements at Arrival Heights were below average during the El Niño years 1997-1998 when sea ice coverage in the Ross Sea region was heavier than usual. In contrast 2 and 3 high BrO events were observed in the La Niña years 1999-2000, when sea ice coverage was below average.