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Preliminary Measurements of Boundary Layer Reactive Halogens Based on MAX-DOAS Technique Over Salt Lake in West China

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The reactive halogens play key roles in the destruction of boundary layer ozone by catalytic reactions and provide a fast pathway to the sedimentation of elemental gaseous mercury. The presence of bromine oxides in the lower troposphere has been observed at the polar region during spring and surface of large salt lake, such as the Dead Sea (for detail, see table 1). The formation of these reactive species are attributed to the photolysis of halogen-rich frost sea ice, salt aerosol or organo-halogens emitted by algae. But only few direct measurement of its existence has been reported, especially in China.

Table 1 The presence of bromine oxides in troposphere

Location	Concentration
Volcanic plumes	~200-1000 ppt
Antarctic and Arctic BL	~5-30 ppt
Salt Lakes (Dead Sea, Utah great salt lake, Salar de Uyuni)	~55-176 ppt
MBL (Mace Head, Canary Island, Cape Verde)	~2-6 ppt

In recent years, as the developing of spectroscopy technique, the direct in-situ observations of active halogen species become achievable with preferable sensitivity and resolution. In this research, we present the first direct spectroscopic observations of OCIO and BrO over salt lakes in Qaidam basin.

The column densities of trace gases were monitored by Multi Axis- Differential Optical Absorption Spectroscopy (MAX-DOAS). The Slant Column Density (SCD) was retrieved by scattered sunlight at different elevation angles (the schematic of the observation, please see figure 1). The characteristic spectrum absorption of each trace gas are applied to quantify the measurement by determining the difference between the reference and target spectrum.

The results of dSCD indicated that the maximum concentrations of BrO and OCIO might exist from the surface of wet saline, mainly the evaporation salt lake and

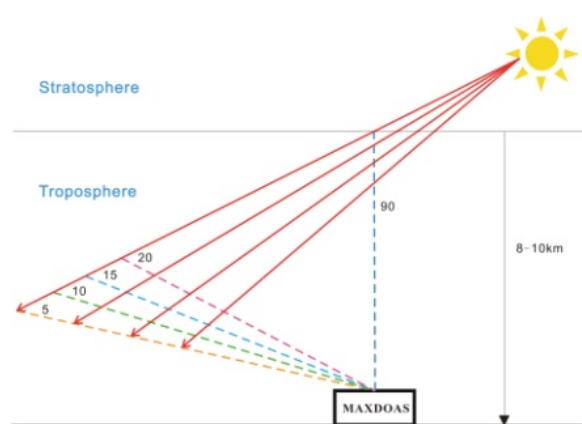


Fig. 1. Schemas of the MAX-DOAS observation.

the formation of salt aerosol. Assuming that the average light path (related to the visibility) was 10 km, the average Vertical Column Density (VCD) of BrO and OCIO are about 140 ppt. However, the current measurement was not last for long period of time, which were not enough for the daily fluctuations.

This was the first ground-based measurement of BrO and OCIO column density at salt lake in west China area. In order to understanding the mechanism of the halogen-ozone relation, the measurement of boundary layer ozone is the next step accompanied.

Salt lakes are widely distributed in West China with large diversity and different characters. From these measurements, continues and real time variation of BrO column densities will be derived. The influence factors, storage form and the rule of distribution will be analyzed. The source, sink and the release mechanisms will be discussed, and the environment influence such as temperature, salinity, radiation intensity and the ratio of Br/Cl in the saline water will be evaluated.

Key words: reactive halogens, MAX-DOAS, salt lake

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