Do hypohalous acids play important roles on sulfate formation in the Antarctic atmosphere?

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Br_y (= HBr + HOBr + Br_2 + BrO + $BrNO_2$ + $BrNO_3$ + Br) is thought to play important roles in atmospheric chemistry in the Antarctic boundary layer through e.g., ozone destruction by Br atoms and oxidation of dimethyl sulfide by BrO [1,2]. A series of studies has indicated that a major source of Br_y in coastal Antarctica is blowing-snow which takes a part of brine on the sea ice surface to the atmosphere [3,4]. Therefore, it has been suggested that the importance of Br_y is limited at Dumont d’Urville (DDU; 66°40'S, 140°01'E), one of coastal Antarctic stations where the sea ice extent is relatively low compared to other coastal stations and highly exposed to the continental winds from the East Antarctic plateau [5]. Nevertheless, ^{17}O-excess ($\Delta^{17}O \fallingdotseq \delta^{17}O - 0.52 \times \delta^{18}O$) of atmospheric sulfate (SO_4^{2-}) at DDU showed relatively low values in spring compared to autumn, which indicates the possibility of a significant contribution of hypohalous acids (HOBr, HOCl) to aqueous S(IV) oxidation in the spring time [6].
To test this hypothesis, we simulate ^{17}O excess of SO_4^{2-} using 3D chemical transport model (GEOS-Chem) in which reactions of S(IV) and hypohalous acids were recently implemented. We discuss the results by comparison of the observations at DDU with those from Concordia (75°06'S, 123°33'E), the inland Antarctic station which is located more than 1,000 km away from the sea ice.

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