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Vertical Migration of Sodium and Chloride Ions on Ice Film

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In order to understand thermochemical stability and mobility of sodium and chloride ions at the surface of sea-salt aerosols, an issue related to ozone depletion in the marine boundary area, we have measured the relative abundances of Na^+ and Cl^- ions on the top layer of a thin ice film. A D_2O amorphous ice film was grown on a Ru(001) single crystal at 130 K. Then NaCl vapor was exposed to the ice film at various temperatures between 100 and 140 K. Reactive ion scattering (RIS) and low energy sputtering techniques were used to identify Na^+ and Cl^- species on the surface. The relative abundance of Na^+ decreases from 0.5 at 100 K to zero at 140 K, while that of Cl^- increases from 0.5 to 1.0. This result proves that Na^+ diffuses into the sublayers of ice, whereas Cl^- resides on the surface.