

Third workshop on Air-Ice Chemical Interactions (AICI)



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Speciation, location, and reactivity of aldehydes in snow

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Aldehydes are key reactive species produced by photochemical processes in the snow. They have the potential to be released to the atmosphere, affecting its oxidative capacity. We have performed measurements of formaldehyde, acetaldehyde, glyoxal and methylglyoxal in polar snow, and in particular at Barrow, Alaska, where atmospheric mixing ratios of formaldehyde were also measured. The predominant aldehyde is formaldehyde, HCHO. Based on recent laboratory studies of HCHO diffusion and solubility in ice, we demonstrate that HCHO forms a solid solution with ice and that the variations of its concentrations in snow can be explained by solid state diffusion in and out of snow grains. Events are observed where HCHO concentrations in snow increase, while HCHO is also emitted by snow, demonstrating a photochemical source of HCHO in the snow. Acetaldehyde, glyoxal and methylglyoxal concentrations are correlated to those of formaldehyde. However, the lack of basic data on the interactions of those species with ice, and the absence of measurement of their atmospheric mixing ratios prevents a detailed quantitative interpretation of their concentrations. Together, these three species can be as abundant as formaldehyde, so that their role can be important and warrant further studies.

Please list some keywords

aldehydes, formaldehyde, air-snow exchange, solid solution, diffusion in ice, snow photochemistry

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