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Aldehydes in Artic Snow at Barrow (AK) during the Barrow 2009 Field Campaign

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Aldehydes (RCHO) are key reactive intermediates in hydrocarbon oxidation and in OH cycling. They are also emitted and taken up by the snowpack and a combination of both physical and photochemical processes are likely involved. Since the photolysis of aldehydes is a source of HOx radicals, these exchanges can modify the oxidative capacity of the overlying air.

Formaldehyde (HCHO), acetaldehyde (MeCHO), glyoxal (CHOCHO) and methylglyoxal (MeCOCHO) concentrations were measured in over 250 snow samples collected during the Barrow 2009 campaign between late February and mid April 2009. Both continental and marine snowpacks were studied as well as frost flowers on sea ice.

We found that HCHO was the most abundant aldehyde (1 to 9 μg/L), but significant concentrations of di-carbonyls glyoxal and methylglyoxal were also measured for the first time in Arctic snow. Similar concentrations were measured for the continental and marine snowpacks but some frost flowers exhibited HCHO concentrations as high as 150 μg/L. Daily cycles in the surface snow were observed for HCHO and CH3CHO but also for the dicarbonyls and we concluded to a photochemical production of these species from organic precursors.

Additional data such as gas phase concentrations for the measured aldehydes and snow physical properties (specific surface area, density ...) will be used to discuss on the location of aldehydes in the snow. This is essential to identify and quantify the physical processes that occur during the exchange of trace gases between the snow and the atmosphere.