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Detection of Organic Compounds in Ice Cores for Application to Palaeoclimate Reconstruction – Methodological Development

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Records of inorganic chemicals trapped in ice core layers have provided some of the most important contributions to our understanding of climate during the last 800,000 years. Organic compounds within ice, however, are an untapped reservoir of information. In particular, two groups of compounds emitted from the terrestrial biosphere, fatty acids and terpene secondary oxidation aerosols (SOAs), display characteristics suitable for ice core paleoclimate reconstruction. Emission rates depend on the environment (e.g. vegetation density, temperature), compounds survive long-distance transport in the atmosphere to high latitudes (Fu et al., 2013, Pokhrel et al, 2016, among others), and some compounds are shown to survive in ice layers up to 450 yrs old (Kawamura et al., 1996). Here, we first quantify possible contamination sources for these specific organic compounds in ice, followed by core-diffusion tests of these contaminants. We then aim to develop a single, robust method of quantification for all compounds of potential using liquid chromatography coupled with high resolution mass spectrometry (HPLC-MS) for detection of trace-levels of these compounds in ice.