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Major 20^{th} century changes of carbonaceous aerosol components (EC, WinOC, DOC, and carboxylic acids) derived from Alpine ice cores

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Reconstruction of the changing atmospheric aerosol over Europe from present back to pre-industrial era and evaluation of the subsequent radiative impact are needed to improve our understanding of climate. The high-elevated glaciers present in Europe offer the possibility to derive information on past changes of aerosol. Simulations made with the EMEP model using past emission inventories of SO_2 in Europe reproduce fairly well the long term trends of sulfate extracted from Alpine ice cores, suggesting that these cold archives can indeed help to reduce uncertainties in past emission which are particularly large for carbonaceous aerosol species.

Elemental carbon (EC), water insoluble organic carbon (WinOC), dissolved organic carbon (DOC), and carboxylic acids were investigated together for the first time in Alpine ice cores extracted from Mt Rosa and Mt Blanc glaciers. Among carbonaceous components, EC reveals an outstanding increase with a sharp summer increase after 1940. This result is discussed against EMEP simulations using past EC emission inventories in Europe. Information on past atmospheric changes of OC was successfully obtained using the suitable array of organic compounds we investigated here. It is shown that the atmospheric load of OC, particularly its secondary biogenic component, have increased by a factor of 2 after 1950 likely as a result of the enhancement of the oxidative capacity of the atmosphere.