

Organic aerosol tracer records in NGRIP ice core during the period from MCA to LIA

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Secondary organic aerosol (SOA) formed by the photooxidation of biogenic volatile organic compounds (BVOCs) and biomass burning organic aerosol are major components of organic aerosol in the atmosphere. Those aerosols are thought to play an important role in atmospheric chemistry and physics, as well as regional and global climate via direct and indirect effects on radiative balance. However, substantial impact of those aerosols on the Earth's climate remains unclear. To better understand the substantial role of those aerosols in the climate system, it is vital to investigate long-term variability of those aerosol components and property in a past. Here we for the first time report biogenic SOA- and biomass burning- (levoglucosan) tracers and UV absorption spectra of organic matter in ice cores from Greenland ice core (NGRIP) during the period from Medieval Climate Anomaly (MCA) to Little Ice Age (LIA). We find that the concentrations and composition of biogenic SOA- and biomass burning- tracers relate to climate with increases in the organic aerosol concentrations during MCA. On the other hand, UV absorption spectra of organic matter in NGRIP ice core also drastically changes associated with climate change. These results suggest dramatic changes in source, loading and property of organic aerosol from the warm MCA to cold LIA.

Keywords: ice core, organic aerosol, Medieval Climate Anomaly, Little Ice Age