Impact of biomass burning on Arctic aerosol composition

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During the most recent years, fire activity from biomass burning has become more frequent [1]. The emissions from such events contain aerosol particles composed of organic material and black carbon that can be transported to pristine environments, i.e., the Arctic, while undergoing atmospheric aging [2]. The changes in the physicochemical properties during the aging process can have implications for the cloud-forming ability of the particles, and thereby for the climate.

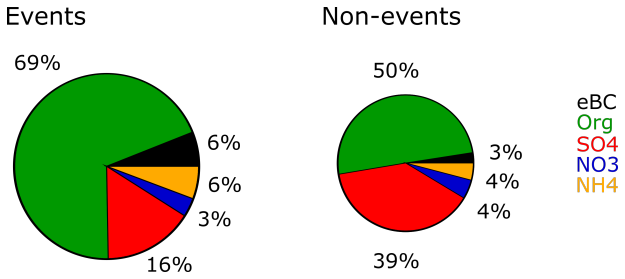

Figure 1: Bulk chemical composition of submicron particles during the biomass burning events (Events) compared to the rest of the year (Non-events), scaled to the total mass concentration.

By using in situ observations in 2020 in Ny-Ålesund, Svalbard, we investigate how the properties of submicron aerosol particles reaching the Arctic change when influenced by biomass burning. We compare the aerosol physical and chemical characteristics between times impacted by biomass burning with the rest of the year and observe a shift from a sulfate- and organic-dominated composition to an organic-dominated composition (Figure 1), resulting in a significantly lower hygroscopicity of the biomass burning aerosol. Signals from biomass burning tracer compounds indicating agricultural and wildfire activity were observed when the air mass passed over fires in Eastern Europe. Our results show that the largest impact on the Arctic aerosol occurs from fires potentially linked to agricultural land burning in Eastern Europe.

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