

Sources of atmospheric black carbon and related carbonaceous components at Rishiri Island, Japan

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A field study was conducted to clarify sources of atmospheric black carbon and related carbonaceous components at Rishiri Island, Japan. We quantified equivalent black carbon (eBC) particle mass and the absorption Ångström exponent (AAE), atmospheric CO and CH₄, in addition to levoglucosan in total suspended particles, a typical tracer of biomass burning. Sixteen high eBC events were identified attributable to either anthropogenic sources or biomass burning in Siberia/China. These events were often accompanied by increases of co-emitted gases such as CH₄ and CO. Specifically, we observed pollution events with elevated eBC, AAE, levoglucosan, and CH₄-CO slope in late July 2014, which were attributed to forest fires in Siberia by reference to the FLEXPART model footprint and fire hotspots. In autumn, drastic increases of eBC, AAE, and levoglucosan were observed, accompanied by an eBC-CO slope of >15 ng m⁻³/ppb, resulting from long-range transport of emissions from extensive burning of crop residue on the Northeast China Plain. Other than the sources of fossil fuel combustion in China and forest fires in Siberia, we also report that pollution events in northern Japan are caused by crop residue burning in China. This study elucidated valuable information that will improve understanding of the effects of biomass burning in East Asia on atmospheric carbonaceous components.

Keywords: Aerosols, Biomass burning, Levoglucosan, Black carbon, FLEXPART