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Photooxidation and relative humidity affect the composition and optical property of organic aerosol in the haze particles from Indonesian peatland fire during long-range transport

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Recurring wildfire event in Indonesia contributed to haze episodes in the Southeast Asia region. Oxygenated organic aerosol (OA) was dominant in the haze particles suggesting the influence of atmospheric oxidation. A small fraction of OA in the haze particles was absorbing light. We hypothesize that photooxidation during long-range transport affects the chemical composition and optical property of haze particles emitted from Indonesian peatland fire.

To test the hypothesis, we conducted photooxidation and ozonolysis experiments of the primary organic aerosol and secondary organic aerosol precursors in a Potential Aerosol Mass continuous flow reactor. The experiments were conducted in low relative humidity (RH is 10–20%) and high RH conditions (60–70%). Carbon monoxide and ozone levels were monitored continuously. The chemical composition of particles was measured in real-time by a Time-of-Flight Aerosol Chemical Speciation Monitor and Scanning Mobility Particle Sizer. Integrated filter samples were collected for subsequent analysis of light-absorbing property by a UV-Vis spectrometer.

The chemical composition of peat burning OA is found to be most affected by photooxidation in high RH condition. These conditions yield a highly oxidized OA while decreasing the levoglucosan level. The light absorption of the oxidized OA from photooxidation experiment seems to be decreasing more significantly. Also, the RH condition in ozonolysis experiment seems to have less significant effects on the chemical composition and optical property of the oxidized peat burning OA.