Supporting information for

Regional heterogeneities in the emission of airborne primary sugar compounds and biogenic secondary organic aerosols in the East Asian outflow: Evidence for coal combustion as a source of levoglucosan

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Figure S1. HYSPLIT-based backward air mass trajectories as a function of arrival height (see color bar in each panel) and MODIS-firecounts for the TSP collected over Gosan according the four seasons, (a) winter, (b) spring, (c) summer, and (d) autumn.

Figure S2. Temporal variability of mass concentrations of trehalose and non-sea-salt Ca²⁺ in TSP collected over Gosan during April 2013-April 2014.

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71 **Figure S3.** Seasonal variability of molecular distributions of anhydrosugars, primary sugars, sugar
 72 alcohols, isoprene SOA tracers and monoterpene SOA tracers in their total mass concentration of
 73 respective group-types in TSP samples collected over Gosan during April 2013-April 2014.

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Figure S4. Diagnostic ratios of 2-methylglyceric acid/2-methyltetrols (2-MGA/2-MTs) and *cis*-pinonic acid+pinic acid/3-methyl-1,2,3-butanetricarboxylic acid (P+P/MBTCA) in Gosan TSP samples collected during April 2013-April 2014.

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94 **Figure S5.** PMF- resolved source contributions to the organic carbon in Gosan aerosols.

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