Supplement of Atmos. Meas. Tech., 14, 6905–6916, 2021
https://doi.org/10.5194/amt-14-6905-2021-supplement

Atmospheric Measurement Techniques
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Supplement of

On the use of reference mass spectra for reducing uncertainty in source apportionment of solid-fuel burning in ambient organic aerosol

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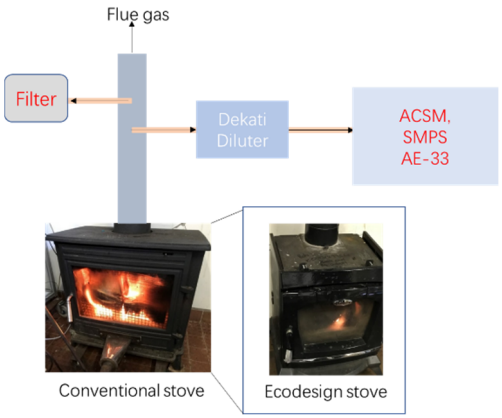

Schematic S1. Schematic of the combustion experiment set-up. The conventional stove and the Ecodesign stove (Trubetskaya et al., 2021) were alternatively tested.

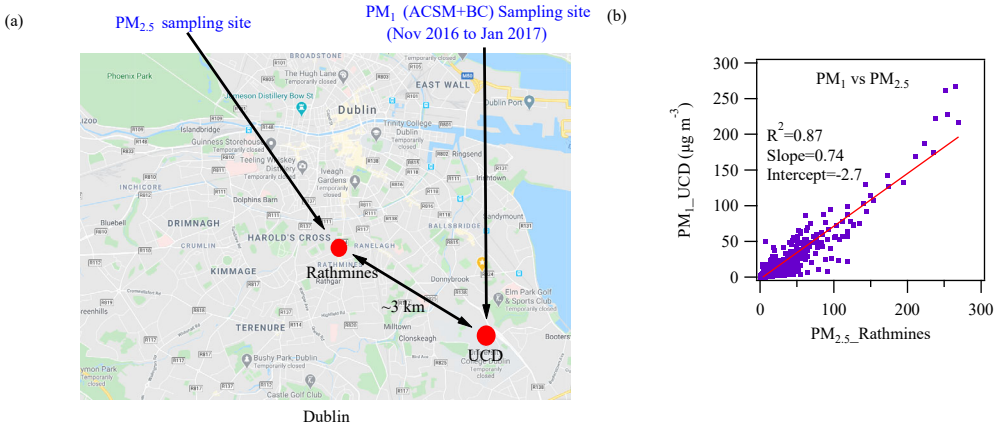

Figure S1. (a) Sampling site (© Google Maps) for PM_1 at UCD and the $PM_{2.5}$ measurement site at Rathmines marked by the red cycles; (b) scatter plot between UCD PM_1 and Rathmines $PM_{2.5}$. Also shown in (b) are the correlation (R^2), slope, and intercept for the linear relationship. The map is adapted from Google Maps.

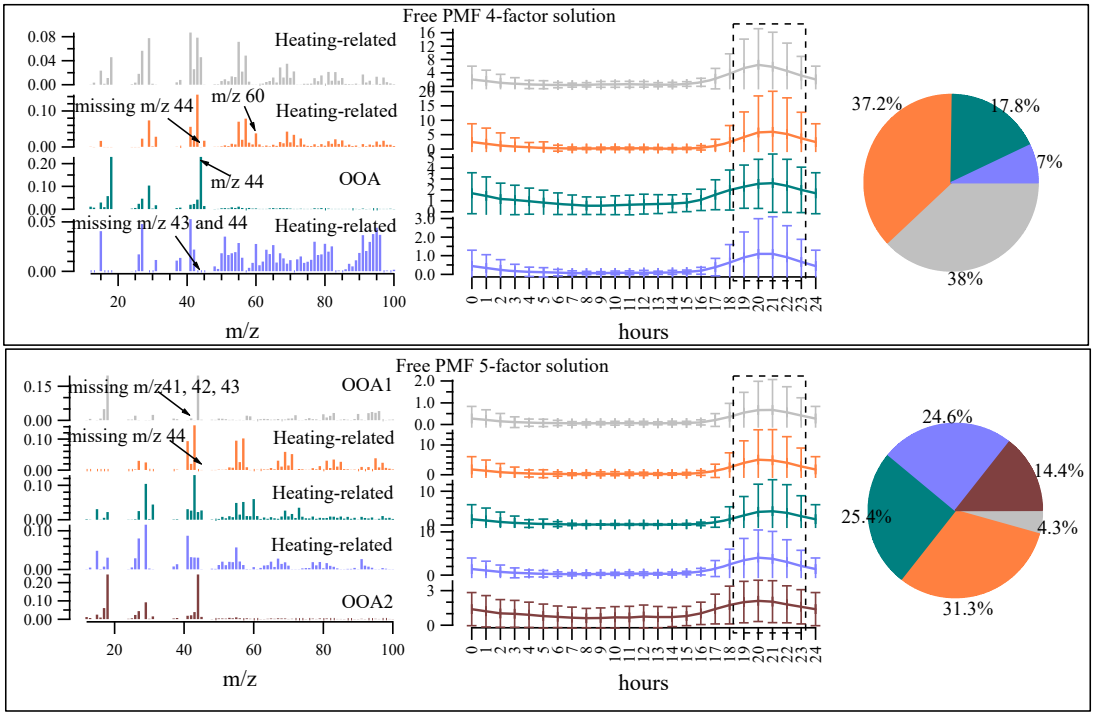

Figure S2. Mass spectral profiles and diurnal, as well as the relative contribution of the free PMF four- (top) and five- (bottom) factor solutions over the entire period. The mass spectra for some of the factors were suffering from the missing of some important *m/z's* such as m/z 43, 44, which was attributed to other factors (i.e., mixing with other factors).

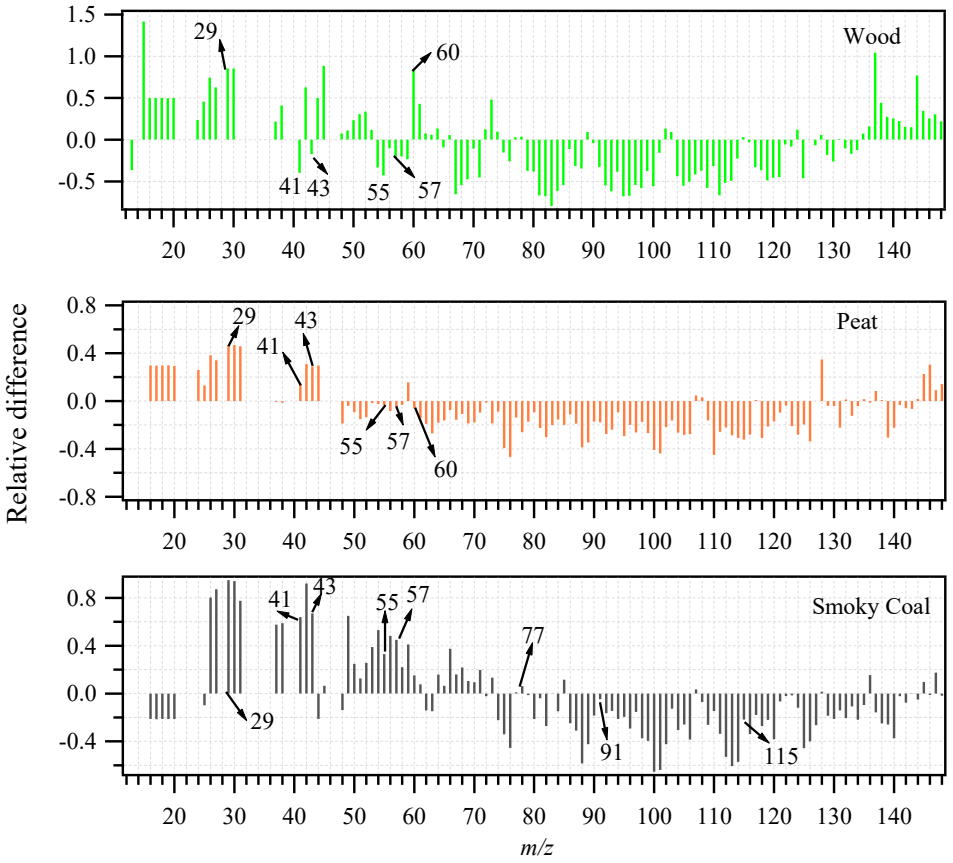

Figure S3. Relative difference at each m/z (calculated by ($f_{m/z,\ \text{stove y}} - f_{m/z,\ \text{stove x}}$) / $f_{m/z,\ \text{stove x}}$ where $f_{m/z}$ represents the fraction of the measured m/z to the total organic signal, while stove y represents the Boiler stove, and stove x represents the conventional stove) for the mass spectral profile of wood, peat, and smoky coal burning in the boiler versus the conventional stove.

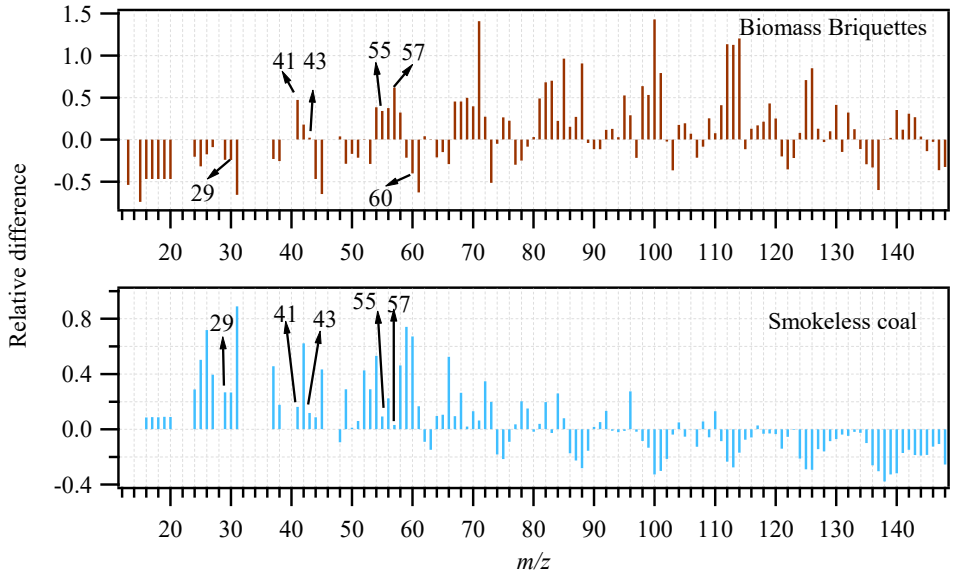

Figure S4. Relative difference at each m/z (calculated by ($f_{m/z,\ \text{stove y}} - f_{m/z,\ \text{stove x}}$) / $f_{m/z,\ \text{stove x}}$ where $f_{m/z}$ represents the fraction of the measured m/z to the total organic signal, while stove y represents the Ecodesign stove, and stove x represents the conventional stove) for the mass spectral profile of biomass briquettes and smokeless coal burning in the conventional versus Ecodesign stove.

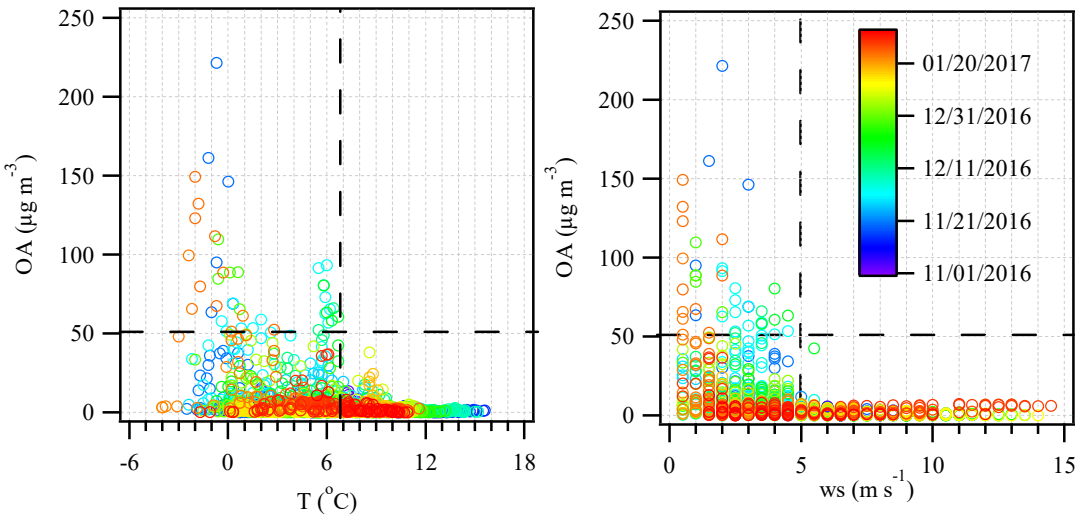

Figure S5. Scatter plot between OA and temperature (left panel); and wind speed (right panel), color-coded by date.

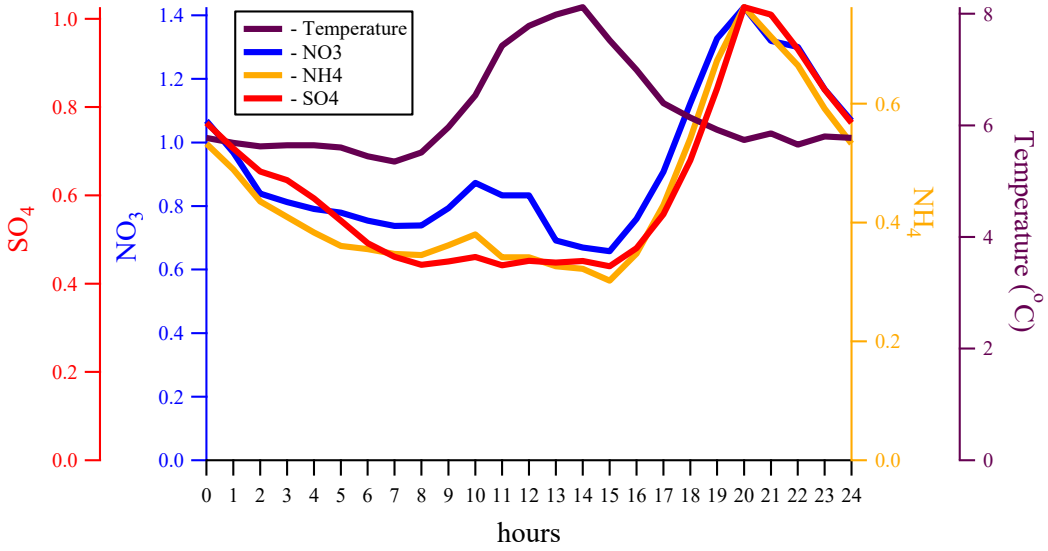

Figure S6. Zoomed-in plot of the averaged diurnal cycle of sulfate (SO_4), ammonium (NH_4), and nitrate (NO_3) in µg m^{-3}, as well as the temperature (°C) over the entire sampling period.

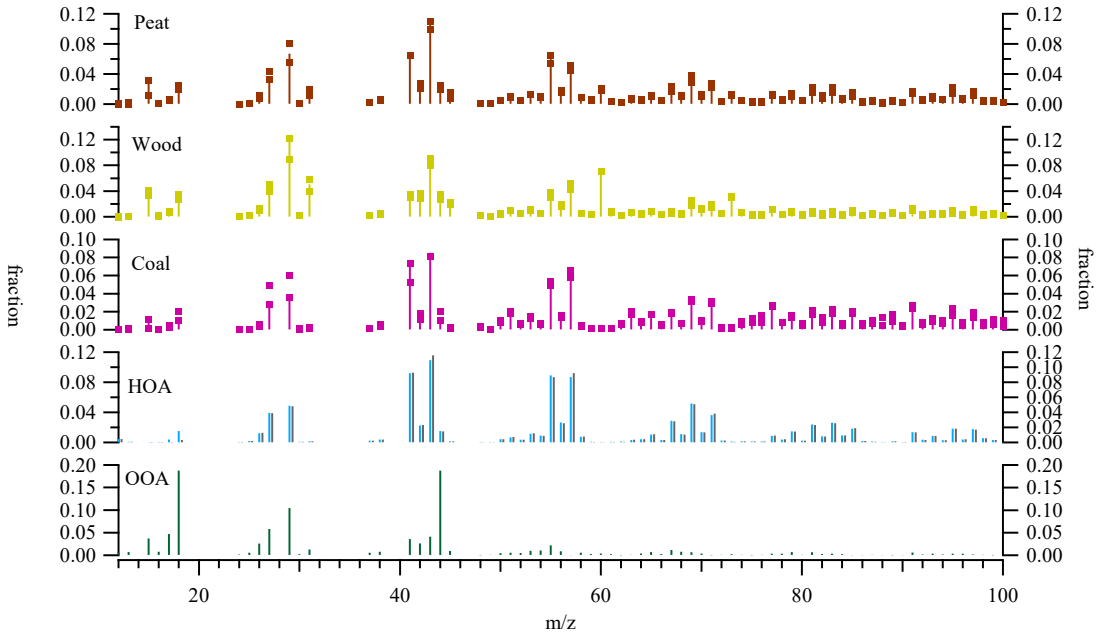

Figure S7. Mass spectra (left axis) of the OA factors of peat, wood, coal, HOA, and OOA. The dots shown for the peat, wood, coal OA factors were the upper/lower limits allowed to vary. Also shown is the reference HOA profile (great sticks in Fourth row) from Crippa et al. (2013)

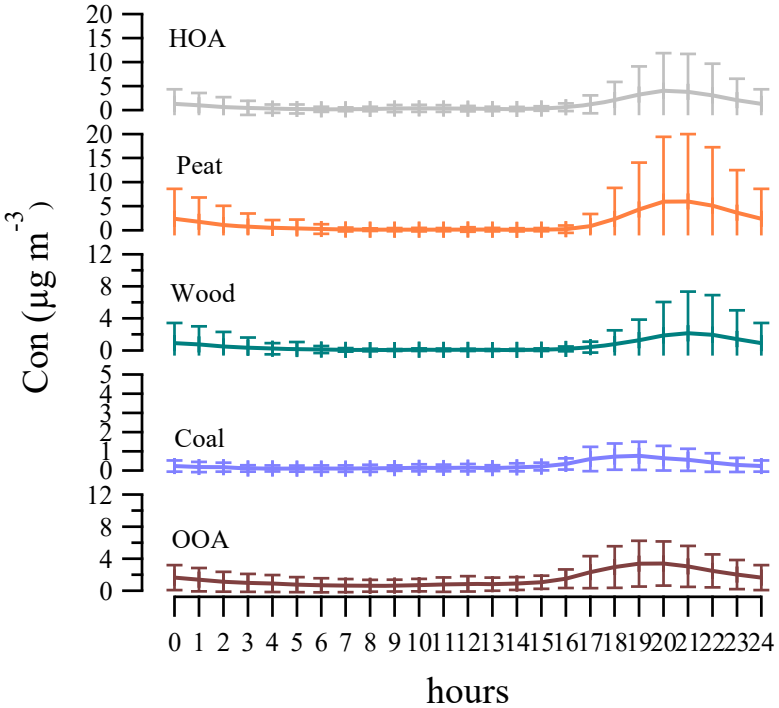

Figure S8. Averaged diurnal cycle of the ME-2 5-factor solution. Error bar represents one standard deviation.

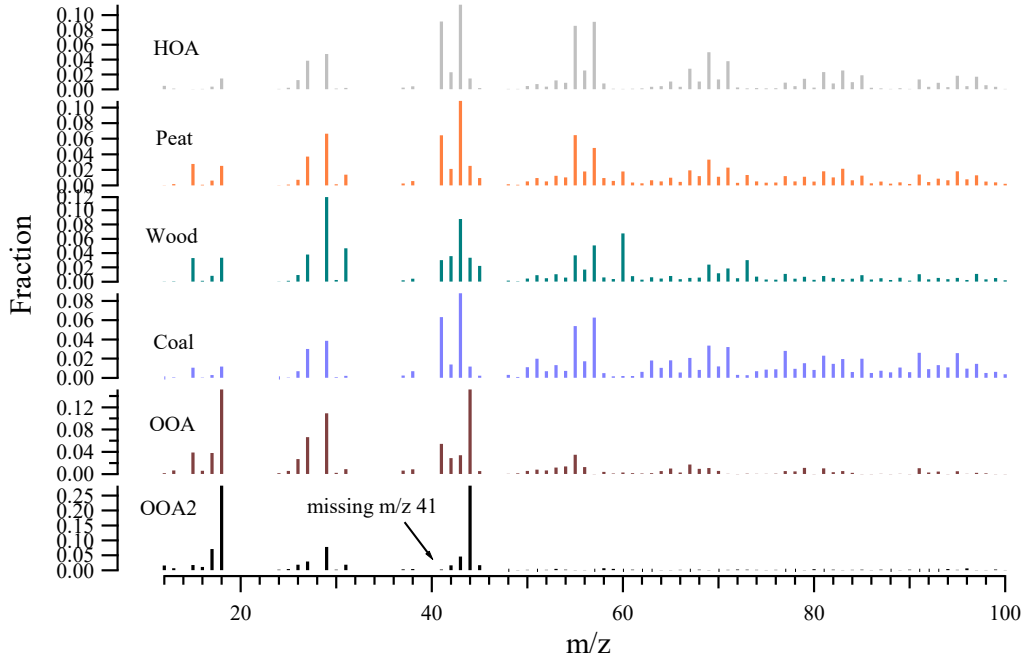

Figure S9. Mass spectral profile of the 6-factor solution. OOA2 featured a negligible contribution from m/z 41 likely due to the splitting from the already identified OOA.

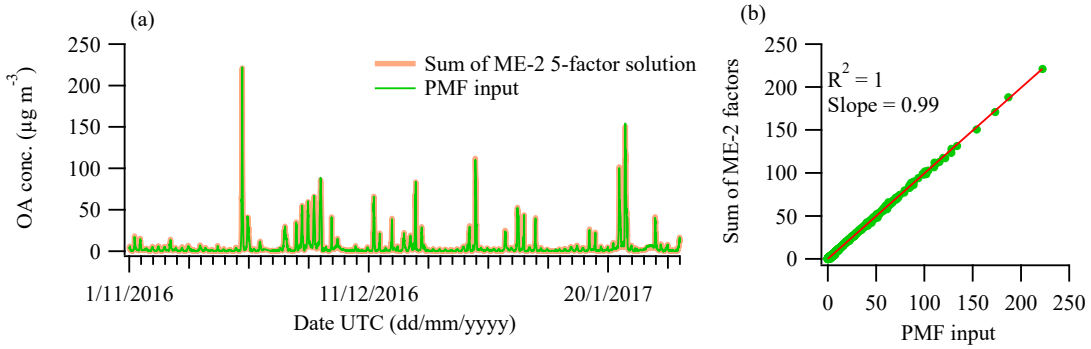

Figure S10. (a) Time series of the PMF input and the sum of the ME-2 5-factor solution; and (b) Scatter plot between the MF input and the sum of the ME-2 5-factor solution. Also shown in (b) are the linear correlation (R^2) and slope.

Reference:

Crippa, M., Canonaco, F., Slowik, J. G., El Haddad, I., Decarlo, P. F., Mohr, C., Heringa, M. F., Chirico, R., Marchand, N., Temime-Roussel, B., Abidi, E., Poulain, L., Wiedensohler, A., Baltensperger, U., and Prévôt, A. S. H.: Primary and secondary organic aerosol origin by combined gas-particle phase source apportionment, Atmos. Chem. Phys., 13, 8411-8426, 10.5194/acp-13-8411-2013, 2013.

Trubetskaya, A., Lin, C., Ovadnevaite, J., Ceburnis, D., O'Dowd, C., Leahy, J. J., Monaghan, R. F. D., Johnson, R., Layden, P., and Smith, W.: Study of Emissions from Domestic Solid-Fuel Stove Combustion in Ireland, Energy & Fuels, 10.1021/acs.energyfuels.0c04148, 2021.