

1 Temperature dependence of the gas-particle 2 partitioning of selected VOCs

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9 **Propagation of error.** For the 1,2-DCB and TCE, the error (σ) was propagated using the following
10 equations:

11
$$\sigma_{\Delta H_{des} (kJ mol^{-1})} = \pm \sigma_{slope} R \times 10^{-3} \quad (\text{Equation S1}) \text{ and}$$

12
$$\sigma_{\Delta S_{des} (kJ mol^{-1})} = \pm \sigma_{intercept} R \times 10^{-3} \quad (\text{Equation S2}).$$

13 For *n*-BuOH, the error was propagated as

14
$$\sigma_{\Delta H_{des} (kJ mol^{-1})} = \pm \left(\sigma_b^2 \left| \frac{\partial \Delta H_{des}}{\partial b} \right|^2 + \sigma_c^2 \left| \frac{\partial \Delta H_{des}}{\partial c} \right|^2 \right)^{1/2} \quad (\text{Equation S3})$$

15 resulting to

16
$$\sigma_{\Delta H_{des} (kJ mol^{-1})} = \pm \left[\left(\sigma_b^2 R^2 + \sigma_c^2 \left| \frac{2R}{T} \right|^2 \right) \cdot 10^{-3} \right]^{1/2} \quad (\text{Equation S4}).$$

17 Whereas the propagated errors for *n*-BuOH were determined using

18
$$\sigma_{\Delta S_{des} (kJ mol^{-1})} = \pm \left(\sigma_a^2 \left| \frac{\partial \Delta S_{des}}{\partial a} \right|^2 + \sigma_c^2 \left| \frac{\partial \Delta S_{des}}{\partial c} \right|^2 \right)^{1/2} \quad (\text{Equation S5})$$

19 resulting to

$$20 \quad \sigma_{\Delta S_{des}} = \pm \left[\left(\sigma_a^2 R^2 + \sigma_c^2 \left| \frac{R}{T^2} \right|^2 \right) \cdot 10^{-3} \right]^{1/2} \quad (\text{Equation S6}).$$

21 R and T are the ideal gas constant (8.314 J mol⁻¹ K⁻¹) and absolute temperature (K), respectively. The
22 factor 10⁻³ in the equations results from converting J to kJ as we reported in the main texts that the
23 thermodynamic properties have units of kJ mol⁻¹. The uncertainties in the parameters, a , b , c , *slope*, and
24 *intercept* are summarized in **Tables 2** and **3**, which were obtained from the fit. Uncertainties were taken as
25 one standard deviation from the mean. Fitting was performed using *Igor Pro*TM. We assume that the
26 uncertainty in temperature was negligible ($\sigma_T \sim 0.01$ K) as we precisely controlled it. The uncertainty in
27 ΔH_{des} and ΔS_{des} increased with an increase in temperature. The increase in uncertainty was due to the smaller
28 mass fraction of the VOCs partitioning into the aerosols at higher temperatures. The propagated
29 uncertainties for ΔH_{des} and ΔS_{des} were on average $\sim 6\times$ lower for *n*-BuOH partitioning of Am Sulf than on
30 SA.

31 **Expansion of $\ln D_p$ as a Taylor series.** Rewriting the equation,

$$32 \quad \ln D_p = \ln \left(1 + e^{-\Delta G_{2,1}^0/RT} \right) - \frac{\Delta G_1^0}{RT} \quad (\text{Equation 10})$$

33 to

$$34 \quad \ln D_p = \ln (1 + e^{-\alpha x}) - \beta x,$$

$$35 \quad \text{where } \alpha = \frac{\Delta G_{2,1}^0}{R}, \beta = \frac{\Delta G_1^0}{R}, \text{ and } x = \frac{1}{T}.$$

36 Expansion as a series at $x=0$ yields

$$37 \quad \ln D_p = \ln 2 + \left(-\frac{\alpha}{2} - \beta \right) x + \left(\frac{\alpha^2}{8} \right) x^2 - \left(\frac{\alpha^4}{192} \right) x^4 + \left(\frac{\alpha^6}{2880} \right) x^6 + O(x^8)$$

38 where $O(x^8)$ are the higher order terms $n>6$.

39 The general solution can be written as

40
$$\ln D_p = a + bx + cx^2 + dx^4 + ex^6 \dots, \text{ (Equation 11)}$$

41 where a, b, c, d, e, \dots are the coefficients.