

Correction to “Characterizing the Particle Composition and Cloud Condensation Nuclei from Shipping Emission in Western Europe”

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We have revised our data products recently and found that there is an issue related to the standard temperature and pressure (STP) calibrations of our cloud condensation nuclei counter (CCNc) instrument; this issue led to an increase by a factor of ~ 7 in the absolute CCN concentrations in the original

work (with $R^2 = 0.99$). We confirm that all of the trends, scientific conclusions, and statements in the original publication remain the same. The corrected absolute CCN concentrations are presented in corrected versions of Table 1 and Figures 3f, 4e, and 5a.

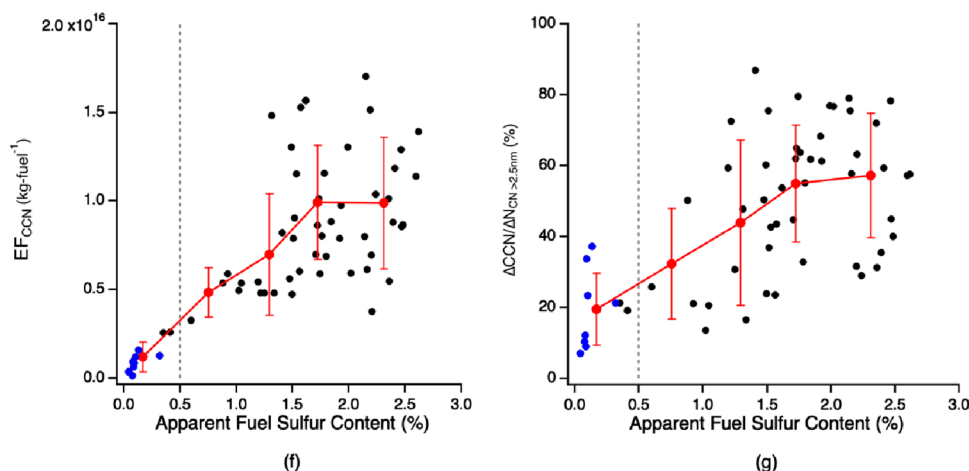
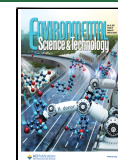


Figure 3. Emission factors as a function of apparent fuel sulfur content (FSC) for (f) cloud condensation nuclei (CCN) and (g) the ratio between the number concentrations of CCN and $\text{CN} > 2.5 \text{ nm}$ ($\Delta\text{CCN}/\Delta\text{N}_{\text{CN} > 2.5 \text{ nm}}$).

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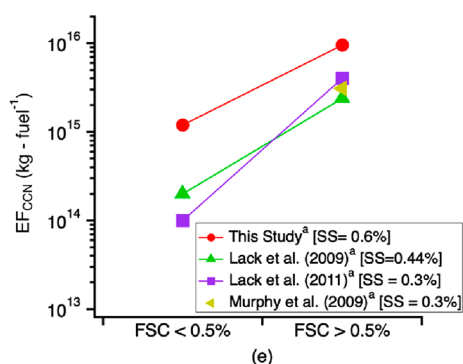


Figure 4. Comparison of EF with previous studies for (e) cloud condensation nuclei (CCN).

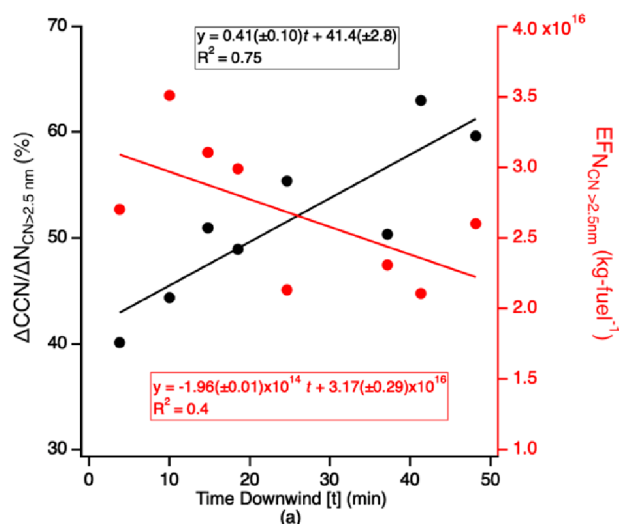


Figure 5. (a) $\Delta\text{CCN}/\Delta N_{\text{CN}>2.5 \text{ nm}}$ and $\text{EF}_{\text{CN}>2.5 \text{ nm}}$ as a function of time downwind for a single ship plume.

Table 1. Summary of Measured EFs and Aerosol Characteristics (mean of different vessels \pm the standard deviation)^a

	apparent FSC > 0.5% [28]	apparent FSC < 0.5% [6]	change (%)
SO ₄ [g (kg of fuel) ⁻¹]	2.58 (±1.3)	0.16 (±0.2)	-94
rBC [g (kg of fuel) ⁻¹]	0.14 (±0.09)	0.08 (±0.03)	-43
Org [g (kg of fuel) ⁻¹]	0.99 (±0.49)	0.66 (±0.4)	-33
PM ₁ [g (kg of fuel) ⁻¹]	3.87 (±1.57)	1.1 (±0.5)	-72
CN > 2.5 nm [no. (kg of fuel) ⁻¹]	1.62 × 10 ¹⁶ (±0.7 × 10 ¹⁶)	0.51 × 10 ¹⁶ (±0.38 × 10 ¹⁶)	-69
CN > 0.1 μm [no. (kg of fuel) ⁻¹]	5.4 × 10 ¹⁴ (±2.9 × 10 ¹⁴)	2.36 × 10 ¹⁴ (±1.2 × 10 ¹⁴)	-56
CCN [no. (kg of fuel) ⁻¹]	9.6 × 10 ¹⁵ (±3.7 × 10 ¹⁵)	1.2 × 10 ¹⁵ (±0.79 × 10 ¹⁵)	-88
ΔCCN/ΔN _{CN>2.5 nm} (%)	55.8 (±18.9)	21.4 (±11.6)	-62
S(VI)/total sulfur (%)	4.7 (±2.1)	2.6 (±0.9)	-45
κ	0.63 (±0.12)	0.18 (±0.08)	-71

^aMeasured vessel numbers are grouped by apparent FSC over and under 0.5%. Measured vessel numbers are provided in parentheses. For the plumes from single vessels sampled multiple times, the average of multiple measurements is used. The apparent FSC of 0.5% is the IMO 2020 sulfur regulation limit for shipping in international waters.

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