Posting type	Advisory
Subject	Bias between masked and unmasked light absorption measurements
Module/Species	A/ f_{abs}
Sites	Entire network
Period	Before 2008
Recommendation	Recognize the effect of mask removal on reported absorption.
Submitter	W.H. White, white@crocker.ucdavis.edu

Supporting information

Masks were historically used at many sites to reduce the nominal collection area of A-module filters from 3.53 cm^2 to 2.20 cm^2. As recently as 2003, masks were employed at approximately half of all sites; by the end of 2007, all masks had been removed.

IMPROVE's Hybrid Integrating Plate/Sphere (HIPS) is designed to measure the absorption thickness of a Teflon filter sample. Absorption thickness can be thought of as the absorption cross-section (m^2/g) of the absorbing material times the material's areal mass loading (g/m^2) on the filter. Well-recognized artifacts of the method cause measured absorption to increase less than proportionately with the mass loading, as can be seen from the log-log slope less than unity in Figure 1. Because masking generates higher areal loadings at the same atmospheric concentrations, some bias toward lower absorption readings for masked samples can be expected to result from this loading dependence. Figure 1 also shows another, less recognized, artifact of masking: even when they yield *equal* areal loadings (from lower atmospheric concentrations), masked samples give slightly lower absorption readings. Figure 2 illustrates the overall impact of mask removal on measured absorption cross-sections.

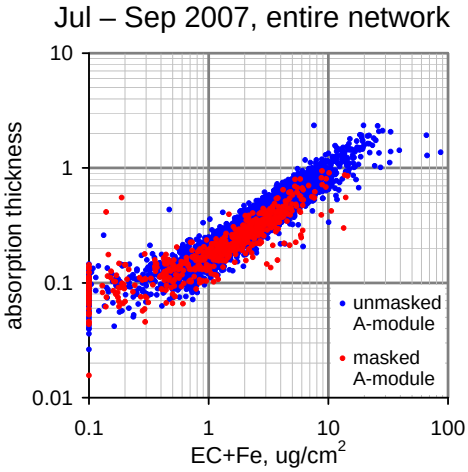

Figure 1 (left).
Measured absorption thickness as a function of areal mass loading.

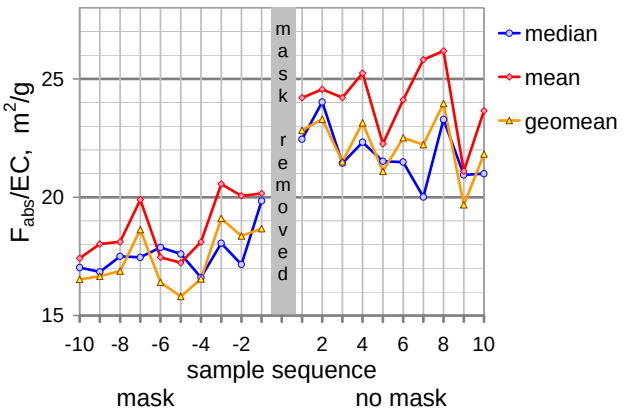

Figure 2 (right).
Measured absorption cross-sections at 55 sites converted from masked to unmasked operation around the beginning of 2004. The 55-site medians, arithmetic means, and geometric means are shown for each of the 10 sampling days immediately preceding and following conversion at each site.