Supplement of

Estimates of black carbon emissions in the western United States using the GEOS-Chem adjoint model

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Fig. S1. Sensitivities of surface BC mass to the scaling factors of BC emissions as computed using GEOS-Chem adjoint and the finite difference approximation (Eq. 1, unit: kg / grid box). Results are from 1-week simulations for biomass burning (top panel) and anthropogenic emissions (bottom panel) for August 2006. Solid lines are regression lines.

Fig. S2. (top) Normalized a posteriori cost function $J(X_i)/J(X_0)$ as a function of the regularization parameter $\gamma_r$ (Eq. 3) for August 2006. (bottom) Reduction in the normalized cost function $J(X)/J(X_0)$ at 2°×2.5° and 0.5°×0.667° for August 2006.
Fig. S1

Finite Difference Sensitivities (kg/grid box) vs. Adjoint Sensitivities (kg/grid box)

For the upper graph:
- $r = 1.00$
- $m = 1.01$

For the lower graph:
- $r = 1.00$
- $m = 1.00$
Fig. S2