

## Estimation of SOA formation rate

The change in OA concentration ( $C_{OA}$ ) of the suspended fresh aerosol (prior to photo-oxidation) is due only to wall-deposition. The wall-loss rate usually exhibits a first-order decay:

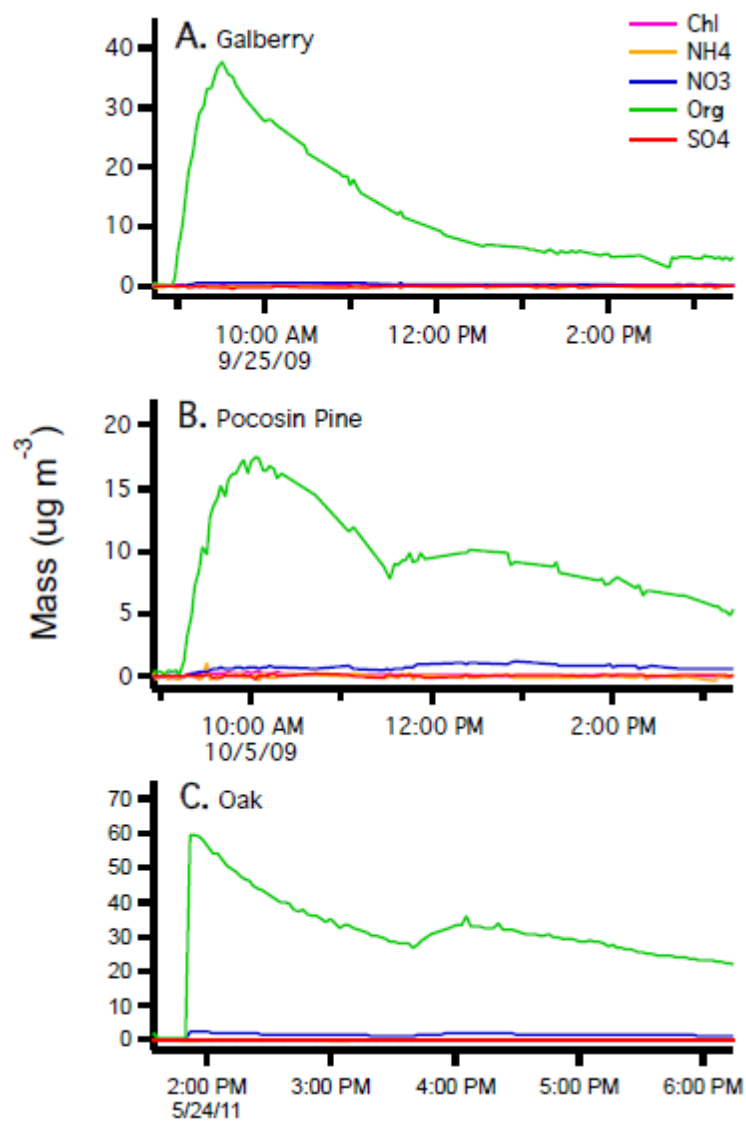
$$C_{OA}(t) = C_{OA}(t_{reference}) \exp\left(\frac{-\Delta t}{\tau}\right) \quad (S1)$$

Where  $\tau$  is the wall-loss time constant, and can be determined by fitting equation (S1) to the decay of the fresh emissions, as shown in Figure S4.

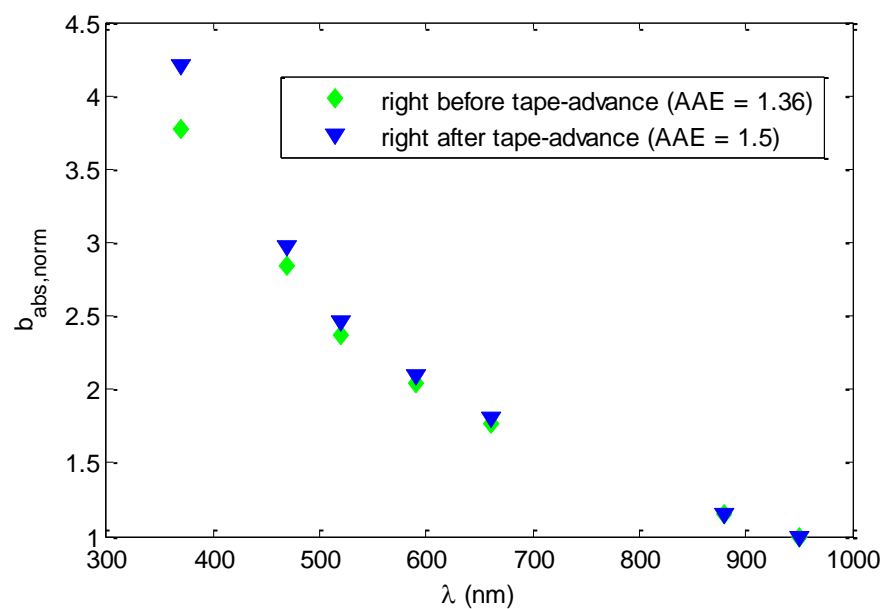
When photo-oxidation is initiated, SOA formation adds mass to the suspended  $C_{OA}$ , while it continues to decay by wall-deposition. Assuming that  $\tau$  does not change much upon SOA formation, SOA concentration in the suspended aerosol can be calculated as the difference between measured  $C_{OA}$  and  $C_{OA}$  predicted by equation (S1):

$$C_{SOA}(t) = C_{OA}(t) - C_{OA}(t_{reference}) \exp\left(\frac{-\Delta t}{\tau}\right) \quad (S2)$$

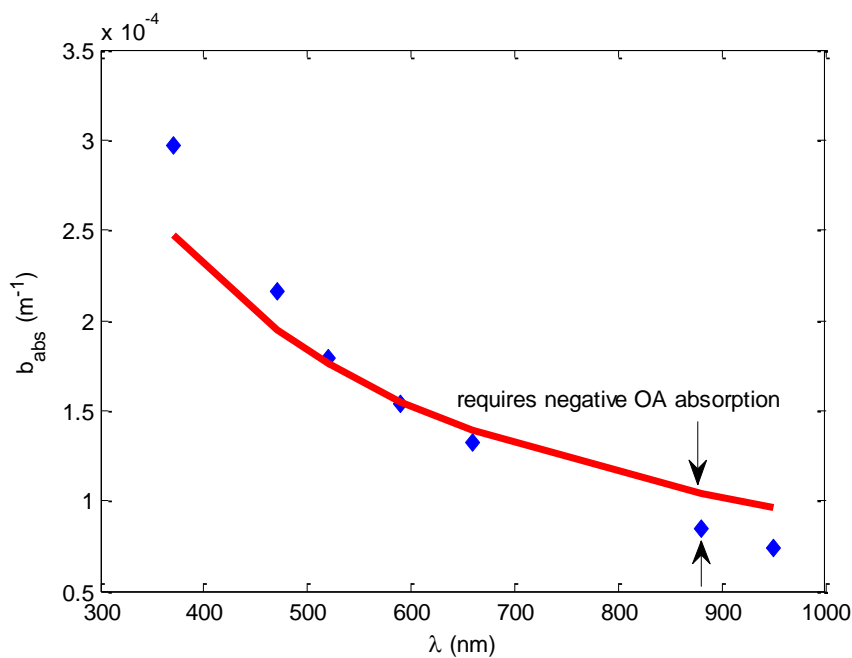
## Figures



**Figure S1** Time series of non-refractory aerosol concentration in biomass-burning emissions measured using an AMS.

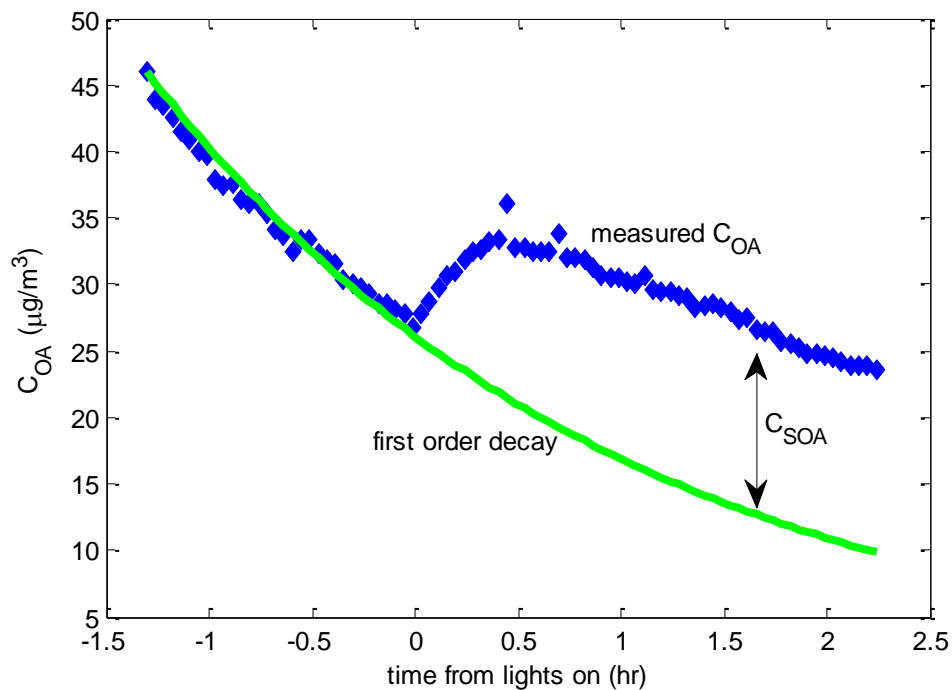


**Figure S2** Normalized absorption coefficients obtained from Aethalometer measurements right before and right after tape-advance for oak-burning experiment.



**Figure S3** Absorption coefficients obtained from Aethalometer measurements and assuming that OA absorbs negligibly at 550 nm for oak POA experiment. The red curve is the absorption

coefficient of BC. Evidently, the shape of the absorption curve does not allow the assumption of negligible OA absorption at 550 nm, as it would require (unphysical) negative OA absorption at  $\lambda < 550$  nm.



**Figure S4** Time series of suspended  $C_{OA}$  in oak-aging experiment. The green curve is a fit given by equation (1). The difference between measured  $C_{OA}$  and the first order decay fit is the suspended SOA mass concentration ( $C_{SOA}$ ).