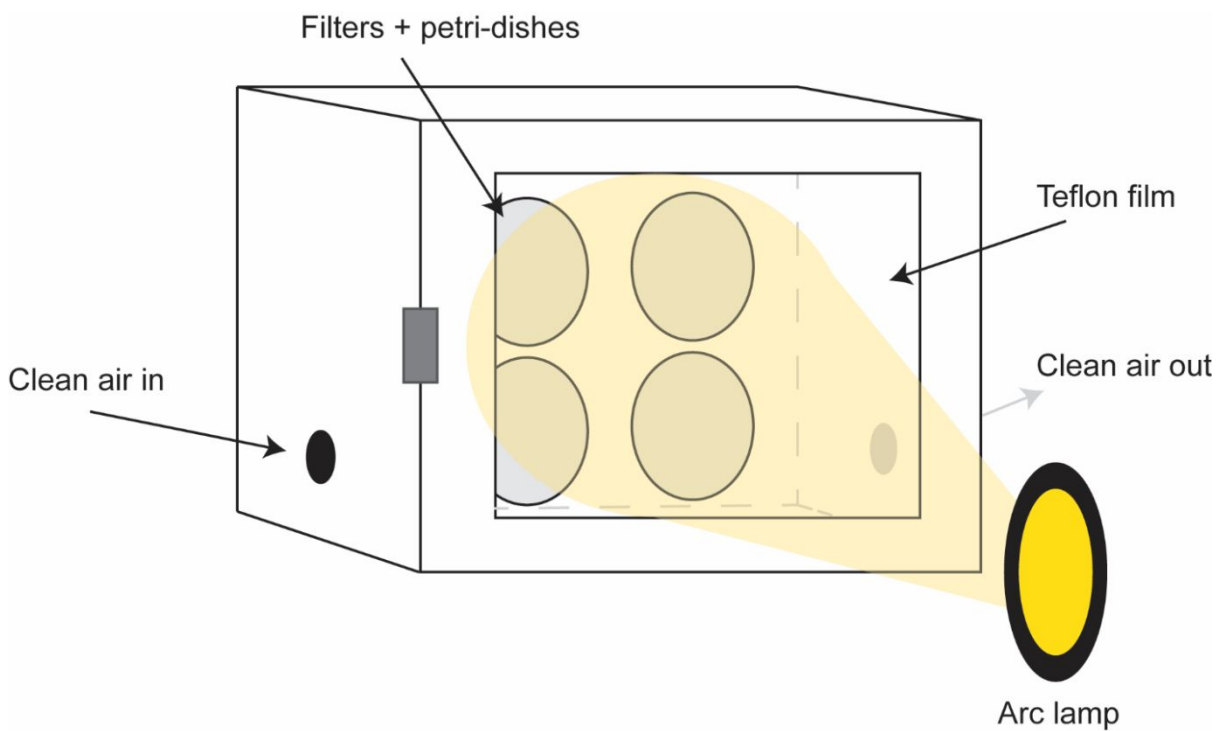Supplemental Information

Effects of Photolysis on the Chemical and Optical Properties of Secondary Organic Material Over Extended Timescales

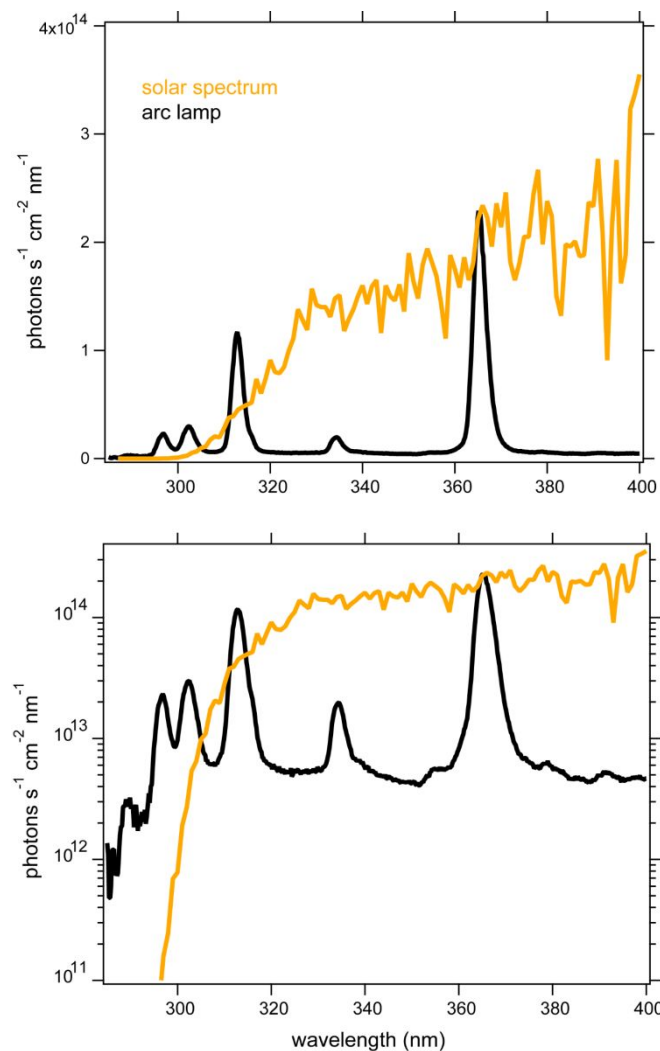*Emma Q. Walhout[1], Hongmin Yu[1], Corey Thrasher[1], Jacob Shusterman[1], Rachel E. O'Brien[1]**

[1] Department of Chemistry, College of William and Mary, Williamsburg, Virginia, 23185, USA

Figure S1. Diagram of photolysis box. The Teflon filters are mounted vertically, the box is sealed with a thin Teflon film and Swagelok ports provide in and out flow for clean air.

Figure S2. Measured photon flux in the photo-box compared to actinic flux for 40°N, 45° solar zenith angle. The actinic flux was obtained from the Quick TUV Calculator available at http://cprm.acom.ucar.edu/Models/TUV/Interactive_TUV/. Overhead ozone was 300 Dobson, surface albedo was 0.1, altitude was 0 km, cloud and aerosol optical depths were 0. Top: linear scale on y-axis, bottom: log scale on y-axis.
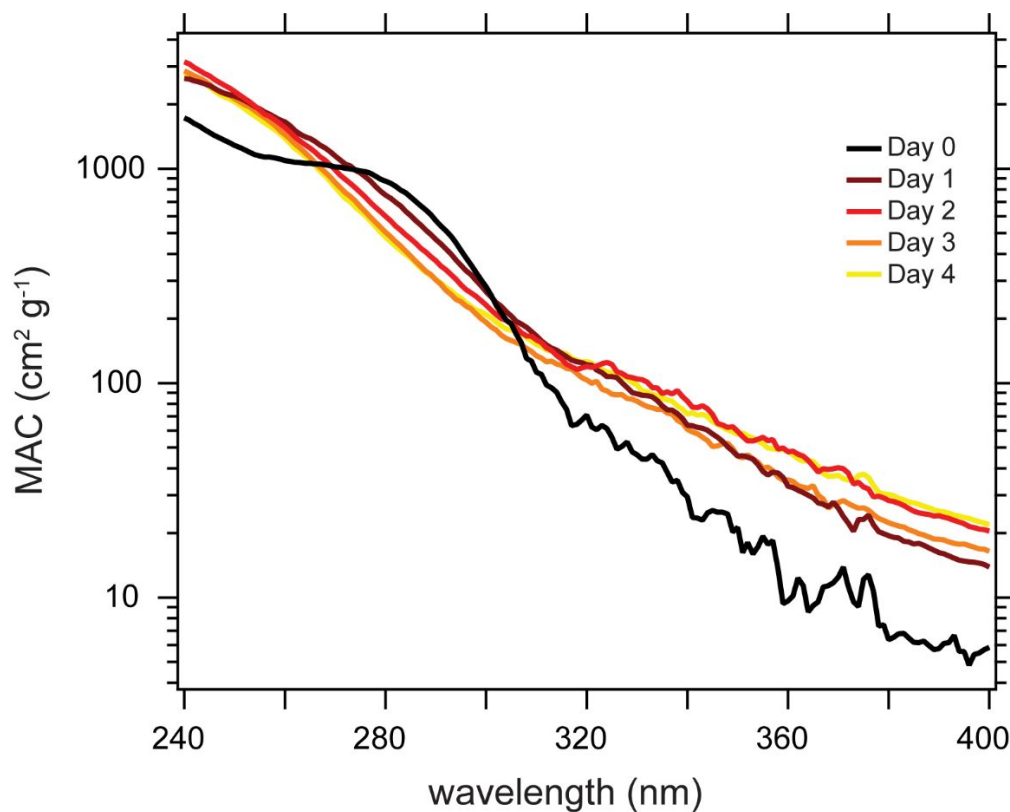
Figure S3. Mass absorption coefficients (cm^2 g^{-1}) for irradiated α-pinene SOM for days 0-4. Here, the same RIE value (1.8) is used to calculate the initial organic concentration in the extract for both the irradiated and the dark (day 0) samples. This leads to a lower concentration and a higher MAC value. The MAC values are plotted on a logarithmic scale and a 3 point boxcar smooth was applied to all lines.
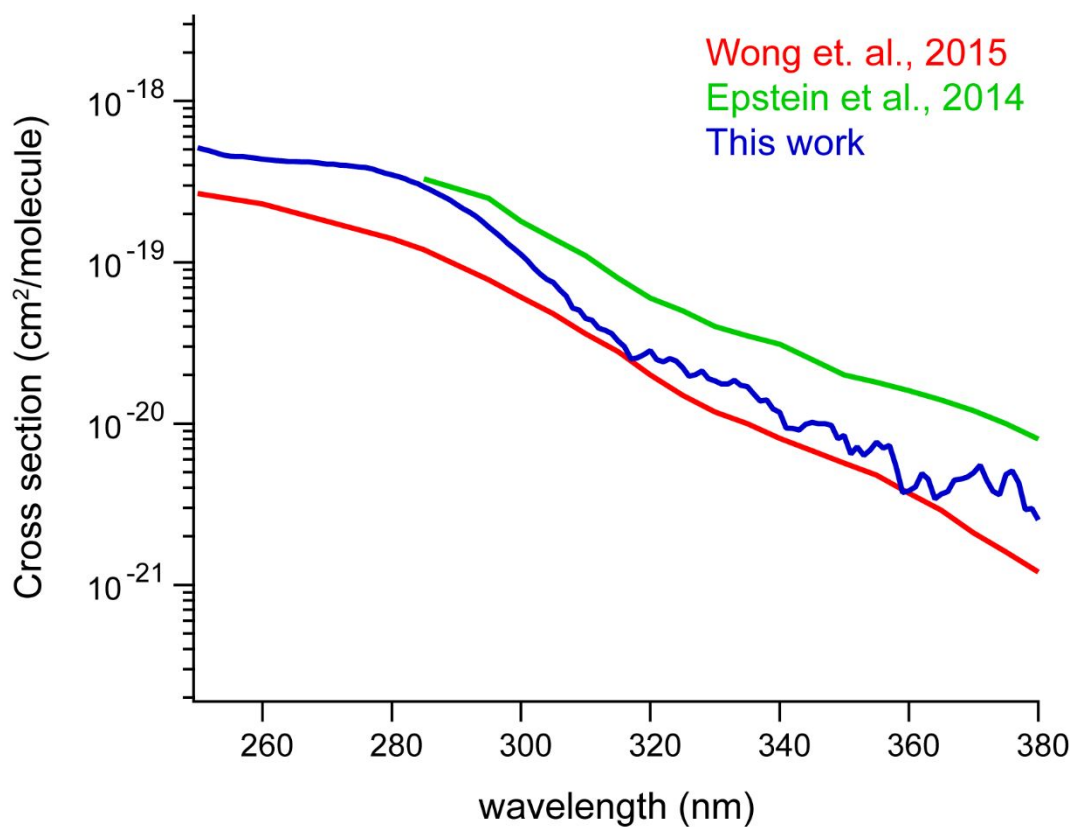
Figure S4. Cross sections for fresh α-pinene SOA from the literature and this work. The Epstein data set is reported to 280 nm. Here the blue line is calculated from the MAC value for the t = 0 and the average molecular weight (240 amu).
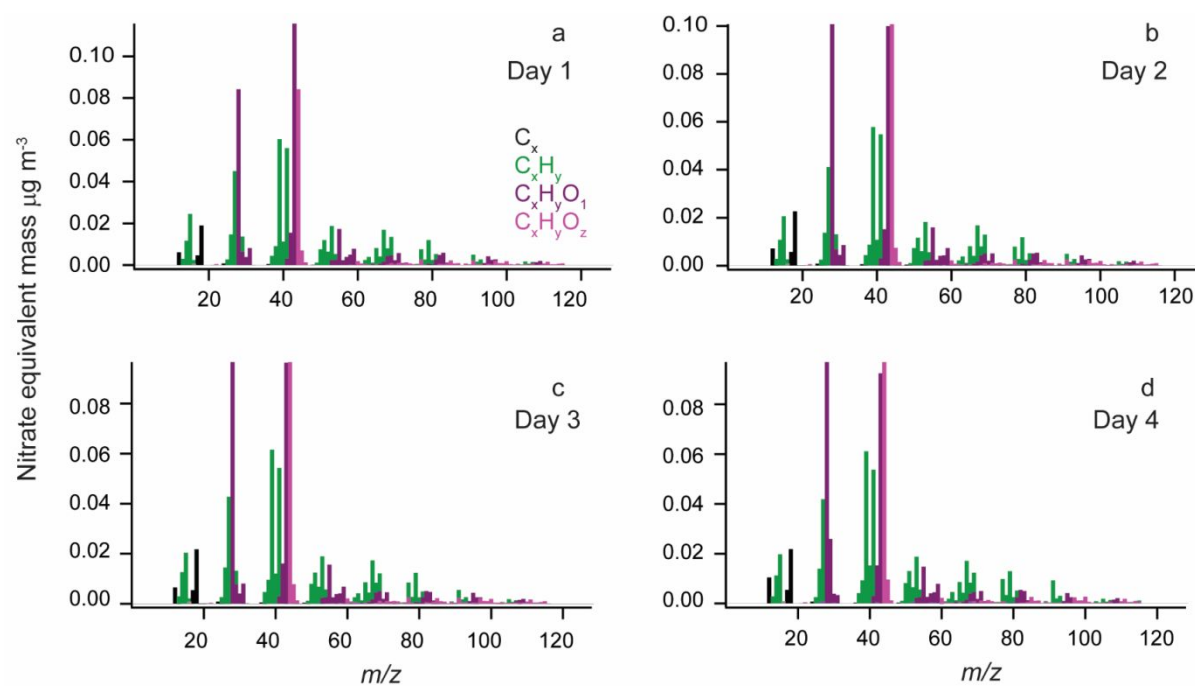
Figure S5. Offline-AMS mass spectra for irradiated samples days 1-4 (a-d, respectively). Ions are colored by fragmentation families.
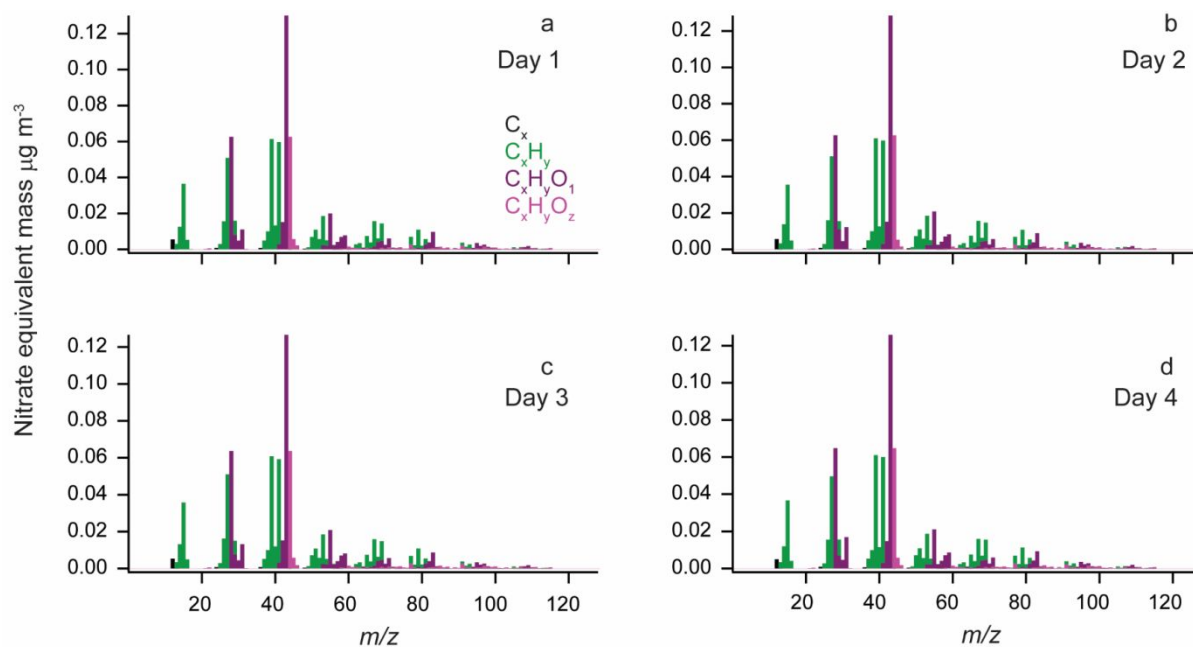
Figure S6. Offline-AMS mass spectra for dark samples days 1-4 (a-d, respectively). Ions are colored by fragmentation families.