Chemical and **Absorption Properties** of Organic Aerosols in N. California and Insights into the **Photooxidant Production Potentials** of **BrC Components**

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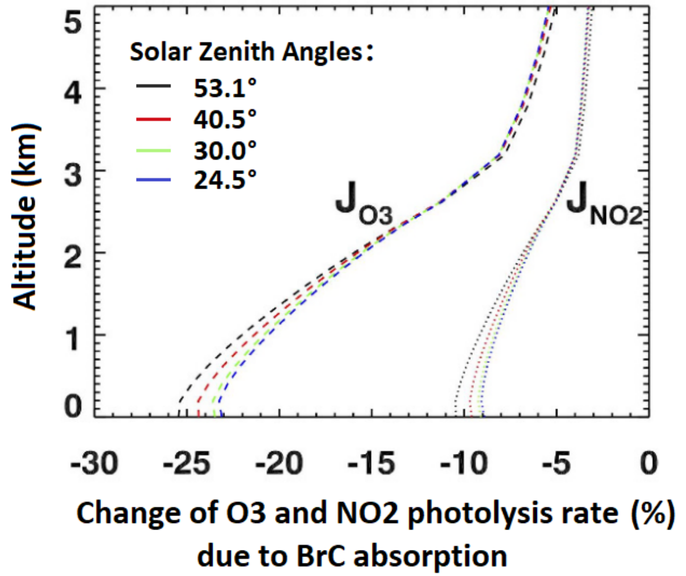
Photochemical Importance of Atmospheric BrC

❑ BrC species influences photochemical reactions and **oxidant concentrations** in the atmosphere.

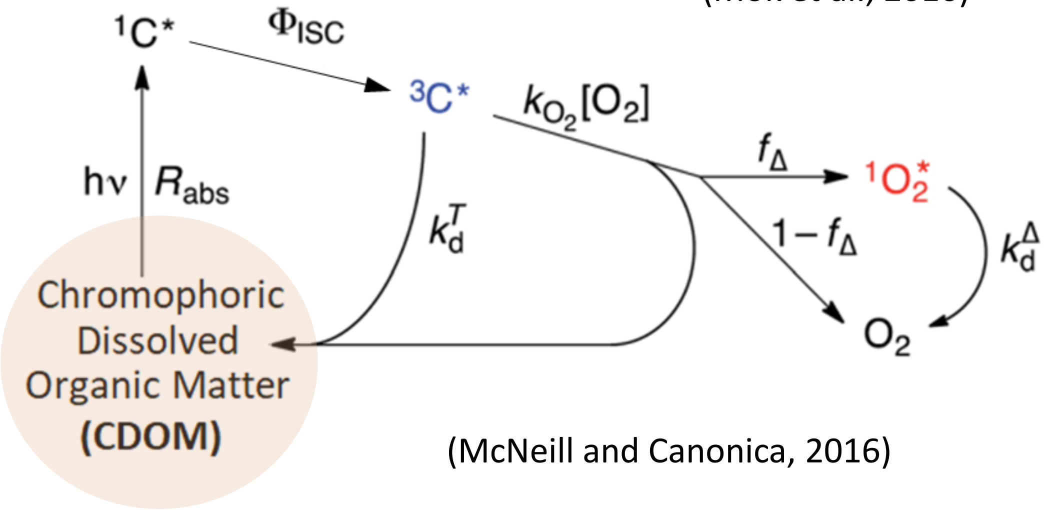
- BrC absorption can lead to lower production rates of ozone and radicals such as •OH, HO2•, and RO2• *(Mok et al., 2016)*.
- BrC species (such as aromatic carbonyls and imidazoles) can also act as **a source of condensed-phase photochemically generated oxidants** such as triplet excited states of organic carbon ($^3C^*$), singlet molecular oxygen ($^1O_2^*$) and •OH *(McNeill and Canonica, 2016)*.



(Mok et al., 2016)

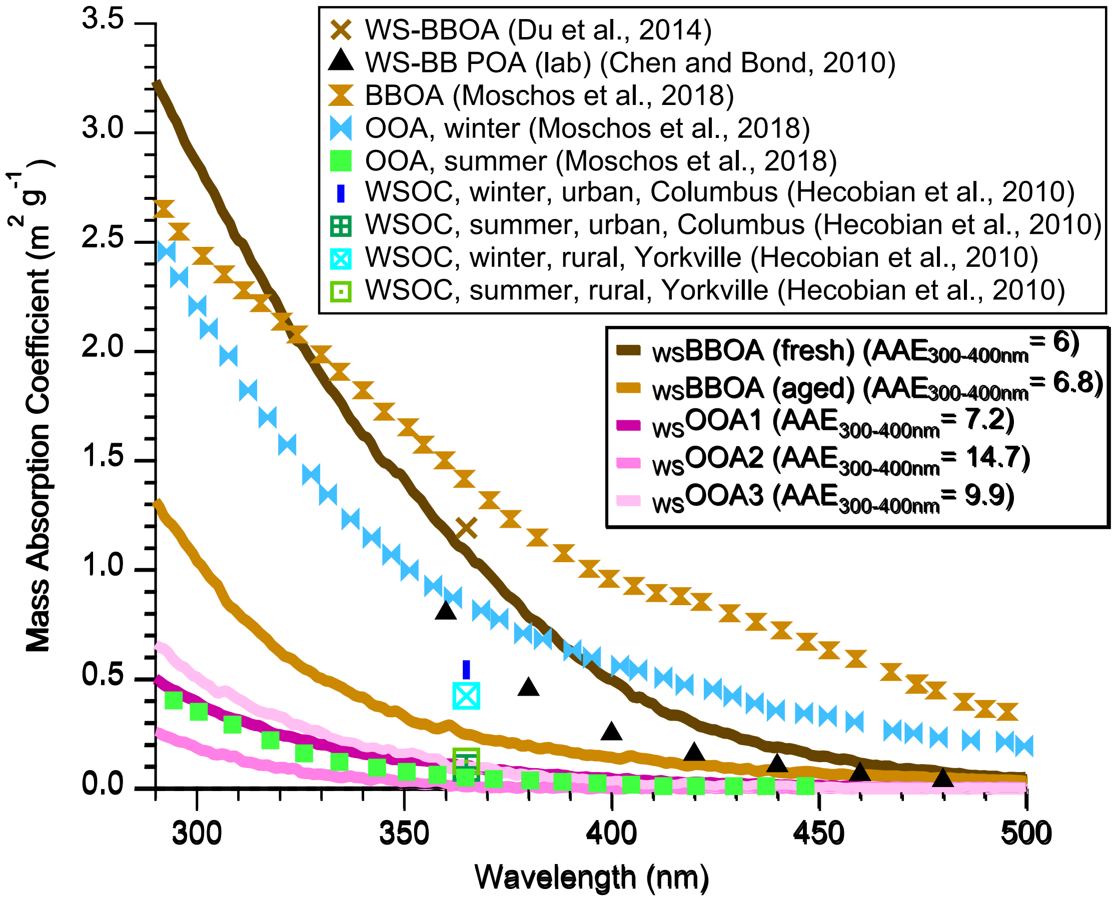
❑ Objectives:

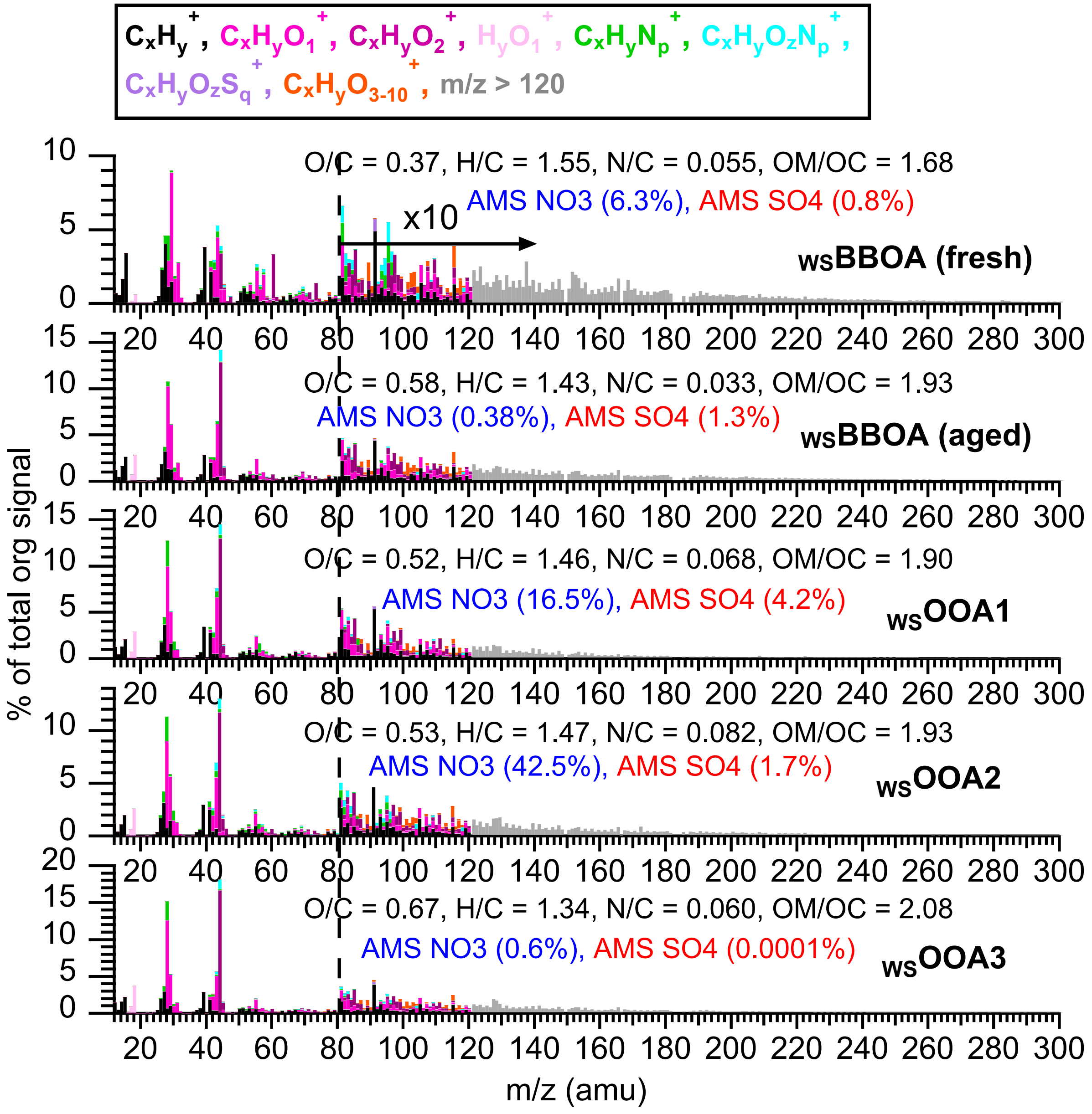
- ✓ **Understanding the sources, compositions, and optical properties of water-soluble BrC ($_{WS}$BrC) in $PM_{2.5}$ (Davis, CA)**
- ✓ **Estimating the photochemical formation of major aqueous-phase oxidants (OH, $^1O_2^*$ and $^3C^*$)**



(McNeill and Canonica, 2016)

Water-Soluble BrC Components in $PM_{2.5}$

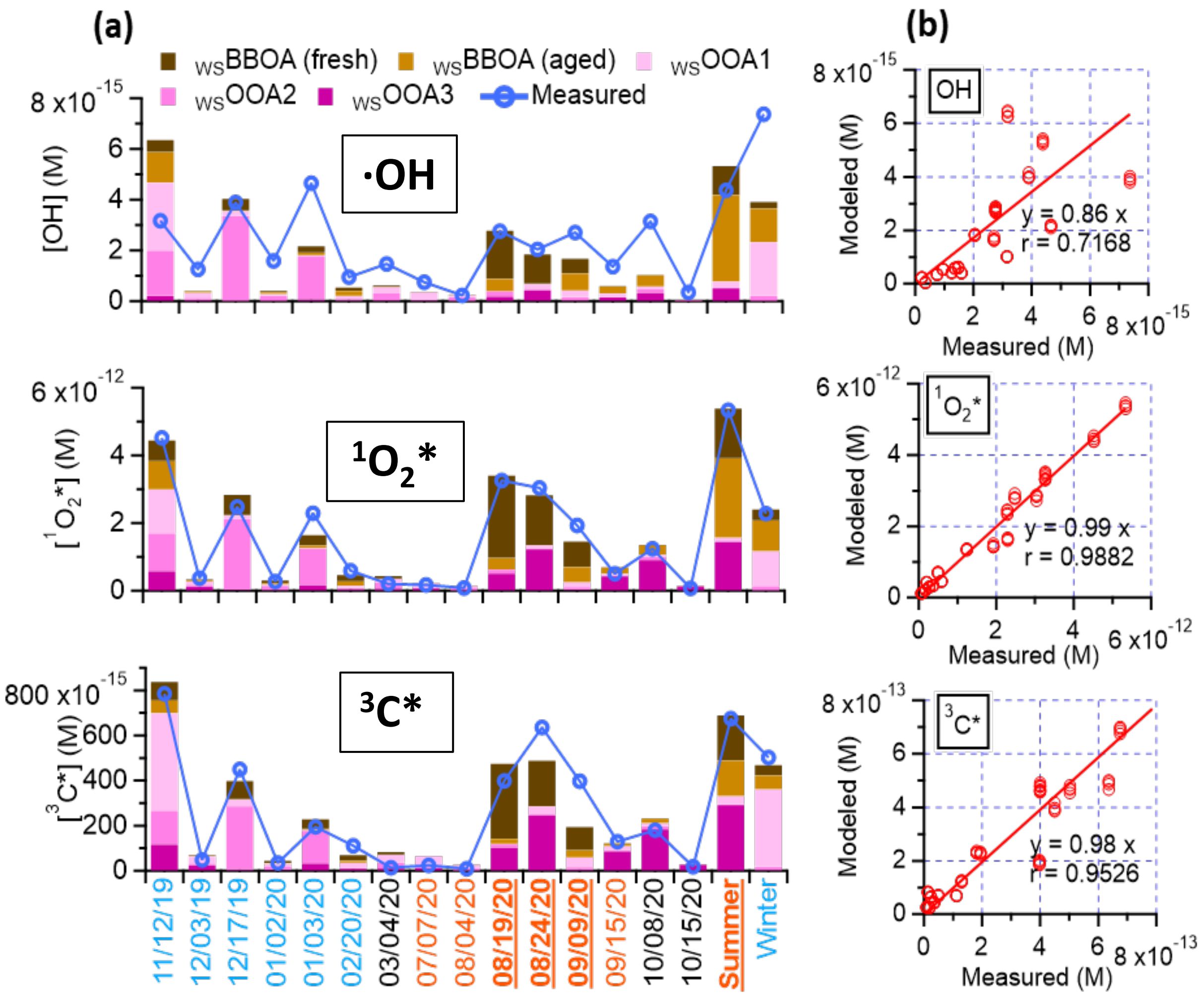


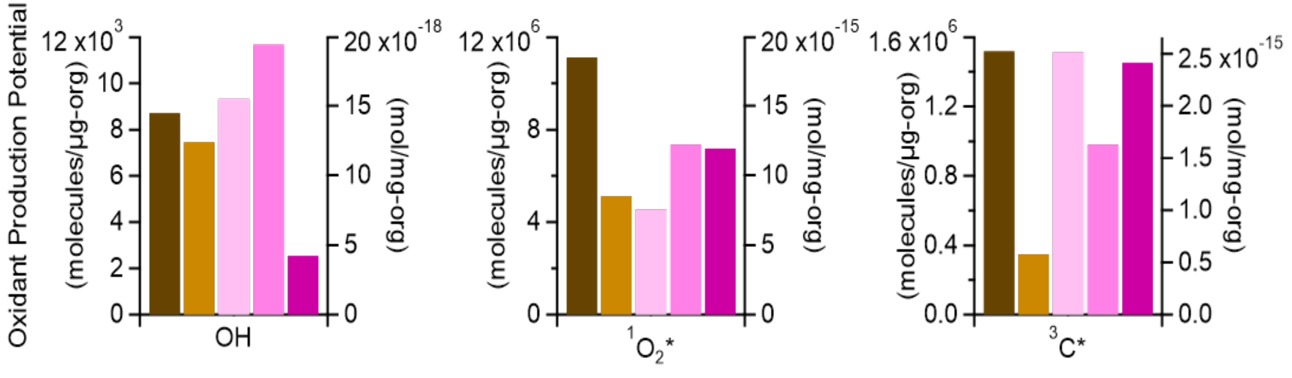


- $_{ws}BBOA_{fresh}$: fresh BBOA, enriched of sugars & HMW comp.
- $_{ws}BBOA_{aged:}$ aged BBOA, enriched phenolic SOA tracers
- $_{ws}OOA1$: wintertime aqSOA
- $_{ws}OOA2$: mainly in winter (associated with high nitrate)
- $_{ws}OOA3$: elevated in summer

Oxidant Formation Potentials of WS-BrC Components

$$C_{ox,\,mea} = a\cdot\ {}_{WS}\mathbf{BBOA}_{fresh} + b\cdot\ {}_{WS}\mathbf{BBOA}_{aged} + c\cdot\ {}_{WS}\mathbf{OOA}_{1} + d\cdot\ {}_{WS}\mathbf{OOA}_{2} + e\cdot\ {}_{WS}\mathbf{OOA}_{3} + \varepsilon_{ox}$$



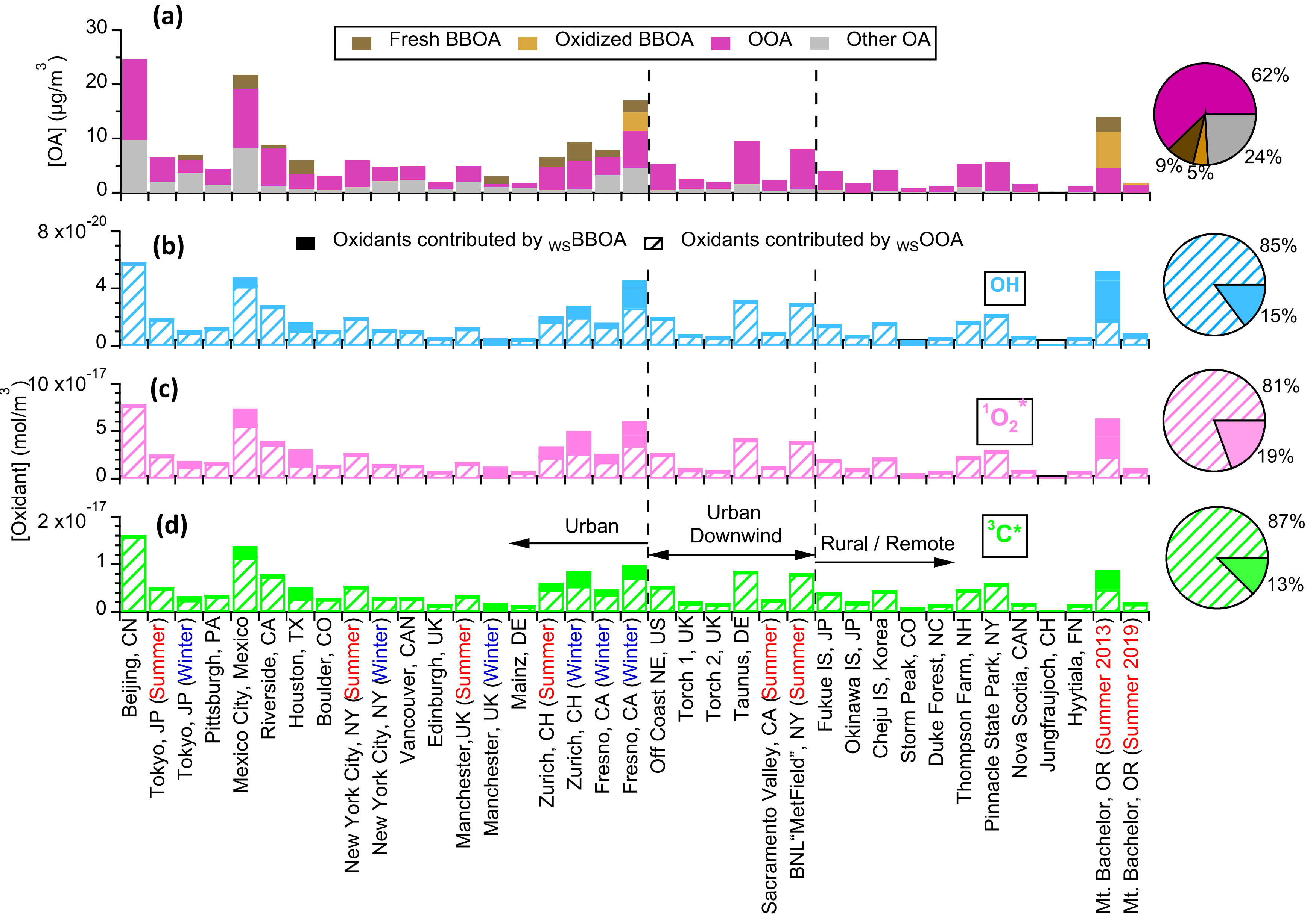


- BrC chromophores are main sources of $^1O_2^*$ and $^3C^*$ in clouds
- OH may have more complex sources.
- Fresh BBOA is most light absorbing, highest abundance of BrC chromophores

  → photostimulated to produce $^1O_2^*$ and $^3C^*$.
- Fresh-BBOA and highly oxidized SOA are potent photosensitizers for producing aq $^1O_2^*$ and $^3C^*$.

Aqueous-phase Oxidant Concentrations in Clouds

$$C_{ox,WSOA} = P_{ox,WSOA} \times C_{OA} \times F_{WS}$$



- Oxygenated species are dominant source of aqueous-phase oxidants in clouds