Air Quality

And the Role of Aerosol Products

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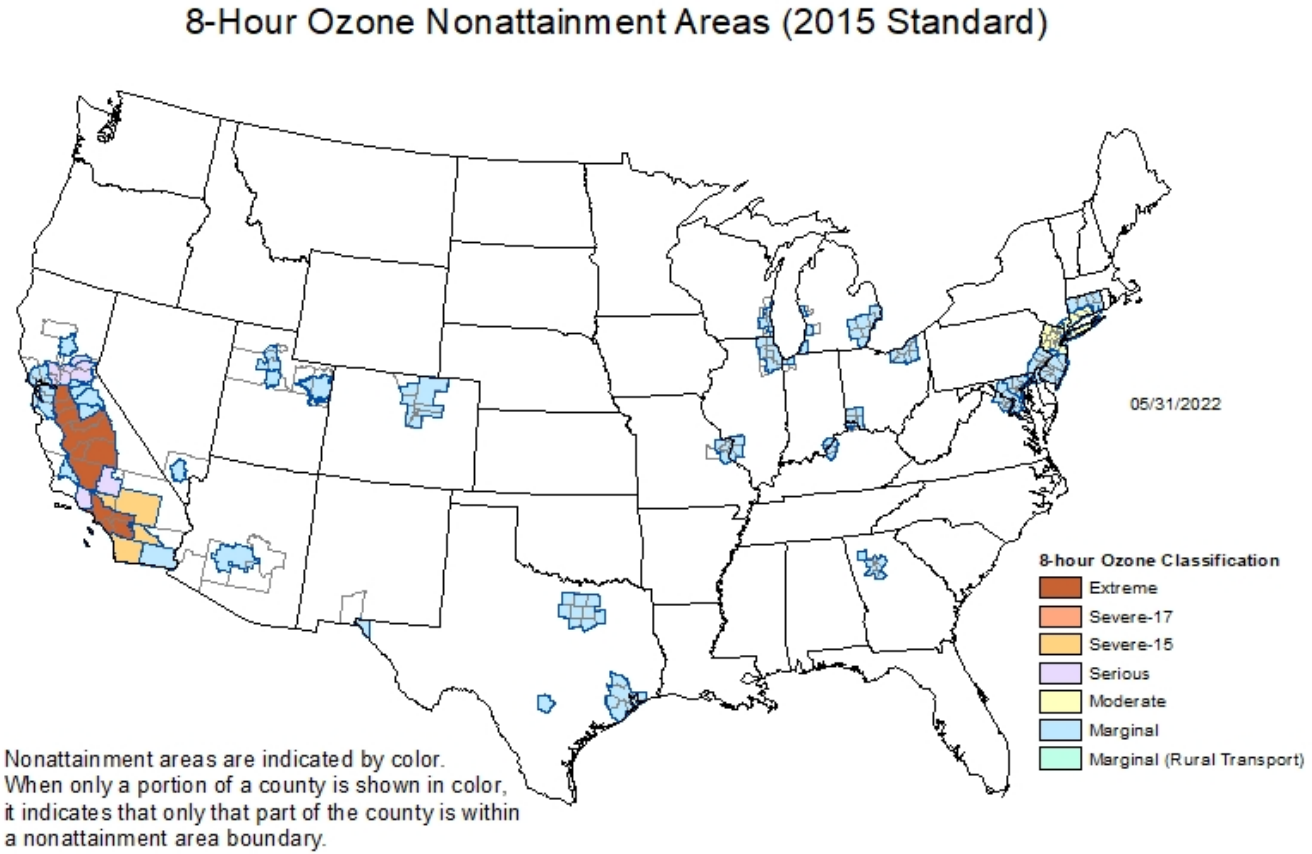
Air Quality in the United States

- The Clean Air Act Requires EPA to set National Ambient Air Quality Standards (NAAQS) for Common Pollutants in Outdoor Air
  - Carbon Monoxide
  - Lead
  - Nitrogen Dioxide
  - **Particulate Matter**
    - Particulate Matter (PM2.5 and PM10) Standards
  - **Ozone**
    - 8-Hour Ozone Standards (1997, 2008 & 2015)
  - Sulfur Dioxide
- The NAAQS for PM and Ozone are Both Currently under Re-Review by EPA

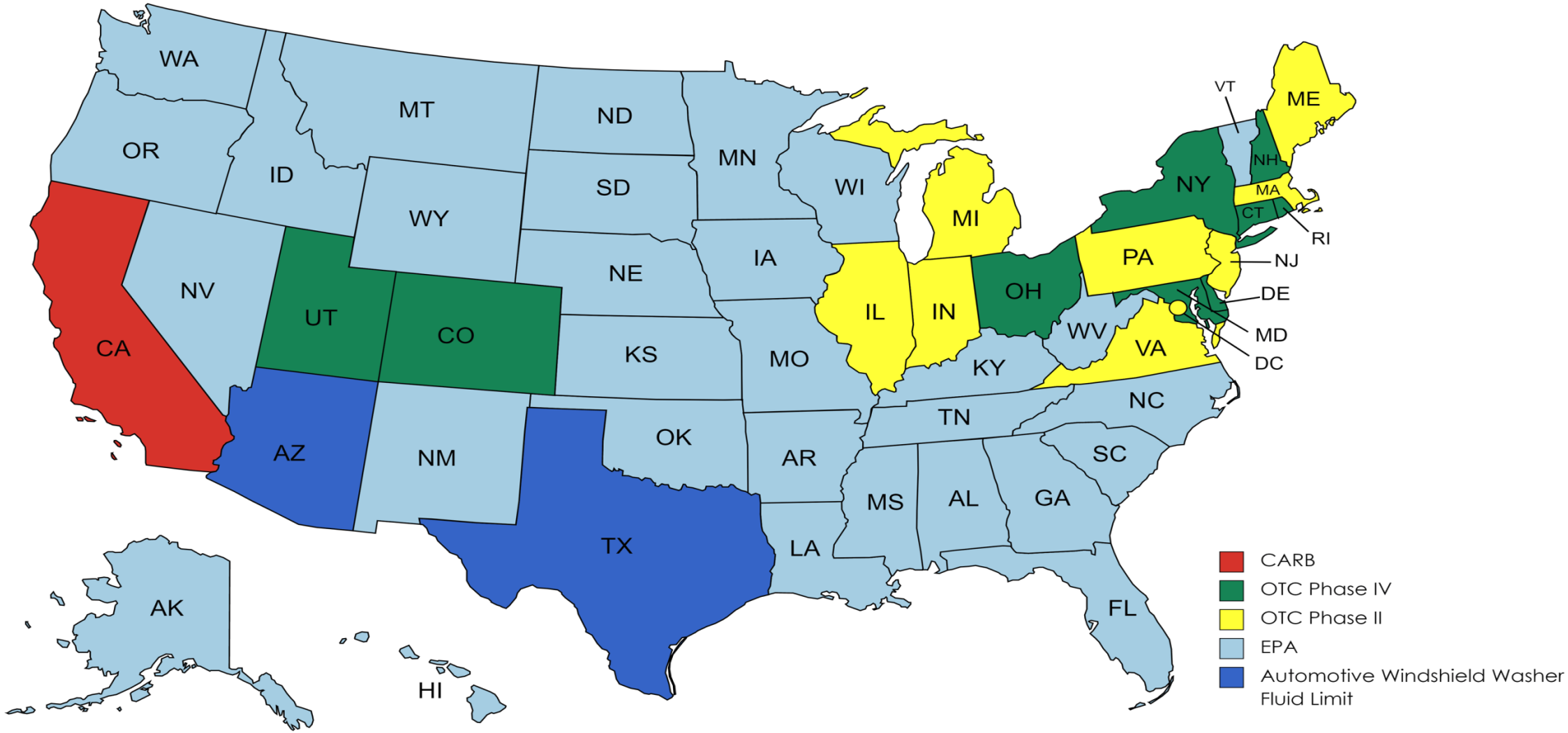
Why Do EPA & States Regulate VOCs?

- When States – or Parts of States – Meet NAAQS, this is Called an "Attainment Area"
- If a State – or Parts of the State – Fail to Meet NAAQS for any of the Six Criteria Pollutants, this is Called a "Non-Attainment Area"
- Volatile Organic Compounds (VOCs) are Considered Precursors to both Ozone and Particulate Matter.
- States with Non-Attainment Areas must Develop and Submit State Implementation Plans (SIPs)
  - Blueprint for Actions that will Achieve Compliance with NAAQS

Current Non-Attainment States for Federal 8-Hour Ozone Standard



Federal & State Consumer Product VOC Regulations



California Air Resources Board (CARB)

- First Consumer Products Rule to Regulate VOC Content Adopted in 1989
- Most Recent Amendment Heard at March 2021 Board Hearing
  - Formal Documents - https://ww2.arb.ca.gov/rulemaking/2021/consumerproducts2021
  - Significant Reductions Came from Aerosol Products

Air Fresheners	Aerosol Crawling Bug Insecticide	Dry Shampoo
Hair Finishing Spray	Hair Shine	Personal Fragrance Products (Includes Body Spray)
Plastic Pipe Adhesive (Aerosol)	Temporary Hair Color (Aerosol)	

  - Preliminary Data Summaries for 2018 Survey on Aerosol Adhesives and Aerosol Coatings Under Review for Public Comment

McDonald (2018)

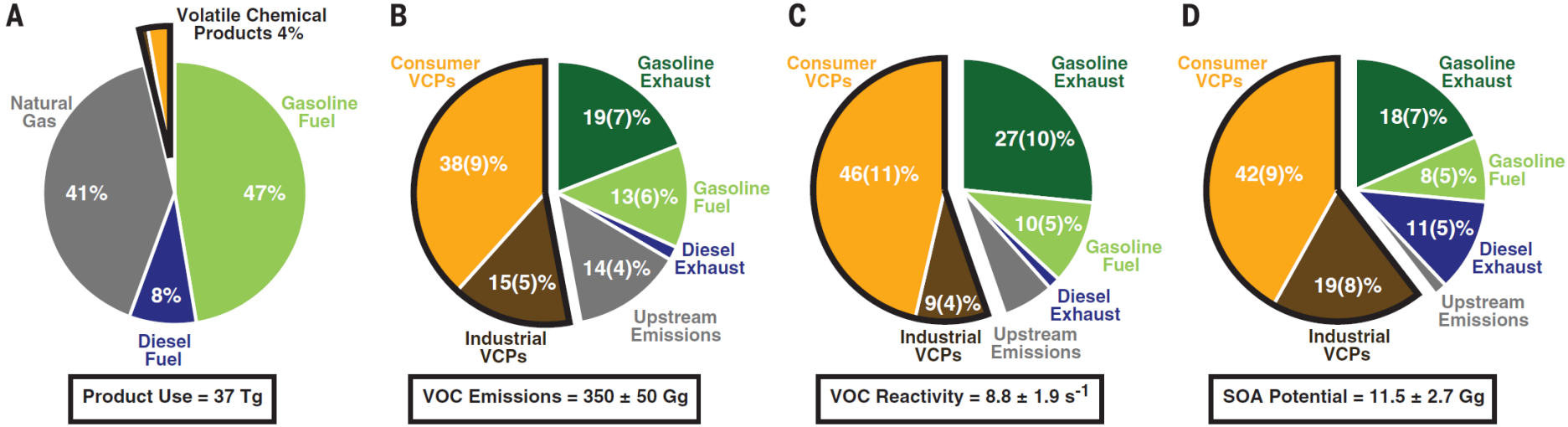
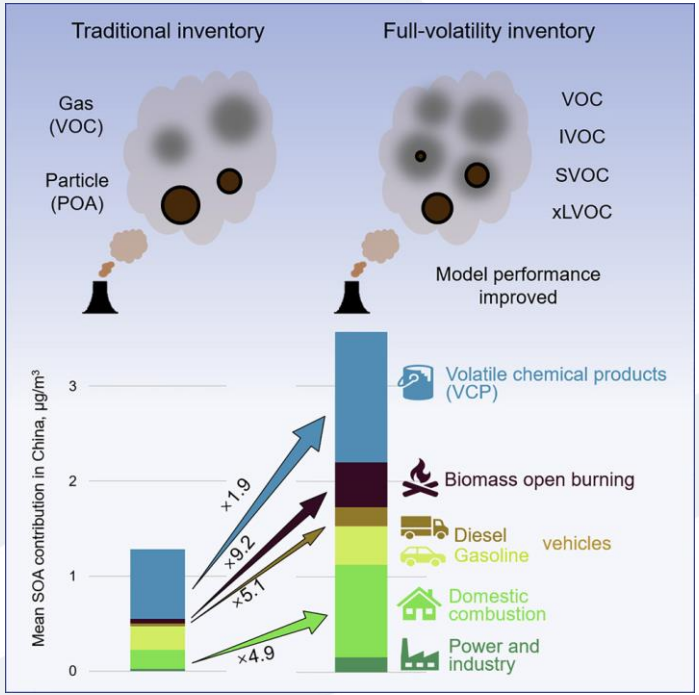


Fig. 4. Contributors to ambient air pollution in Los Angeles. (**A** to **D**) Distribution of (A) petrochemical product use, (B) VOC emissions, (C) VOC reactivity with OH, and (D) SOA formation potential across petrochemical sources only. Contributions from nonfossil sources are not shown. Uncertainties in source apportionment were determined by Monte Carlo analysis.

McDonald, B.C., et al. (2018). Volatile Chemical Products Emerging as Largest Petrochemical Source of Urban Organic Emissions. Science, 359, doi: 10.1126/science.aaq0524.

Xing Chang (2022)

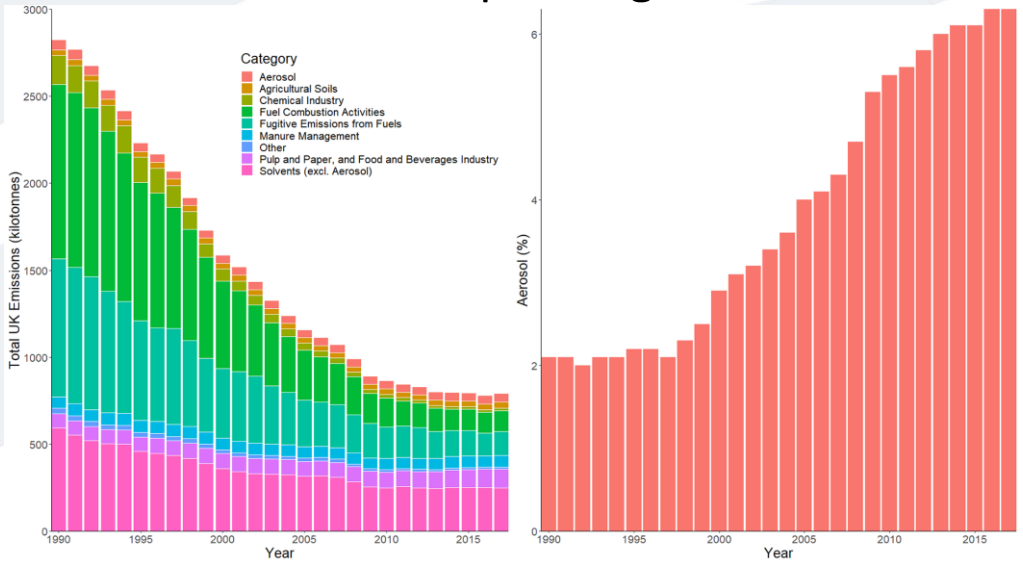


Chang, X. et al. Full-volatility emission framework corrects missing and underestimated secondary organic aerosol sources. One Earth, Volume 5, Issue 4, 2022, Pages 403-412.

Yeoman and Lewis (2021)

- Reports UK VOC emissions from aerosols have risen from 2.0% (1990) to 6.1% (2017)
  - Estimated UK emissions of VOCs from aerosol use in 2017 were greater than the total VOC emissions from all passenger cars

Yeoman, AM and Lewis, AC. 2021. Global emissions of VOCs from compressed aerosol products. Elem Sci Anth, 9: 1. DOI: https://doi.org/10.1525/elementa.2020.20.00177



HOMEChem (Research in 2018)

- House Observations of Microbial and Environmental Chemistry (HOMEChem)
- 20 Research Groups from 13 Universities Studied and Measured Emissions from Everyday Activities, such as Cooking, Cleaning, and the use of Personal Care Products
  - Targeted Species: Oxidants, VOCs, and Particulate Matter
- Has resulted in 21 publications thus far
  - Can be found at - https://indoorchem.org/projects/homechem/

CASA Experiment (Research in 2022)

- Chemical Assessment of Surface and Air (CASA)
  - Conducted in Collaboration with NIST (National Institute of Standards and Technology)
- Follows Up Discoveries of HOMEChem
- Experiments Concluded in April 2022

https://indoorchem.org/projects/casa/

Thank You

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