

THE IMPACT OF COVID-19 ON CO₂ EMISSIONS IN THE LOS ANGELES AND WASHINGTON DC/BALTIMORE METROPOLITAN AREAS*

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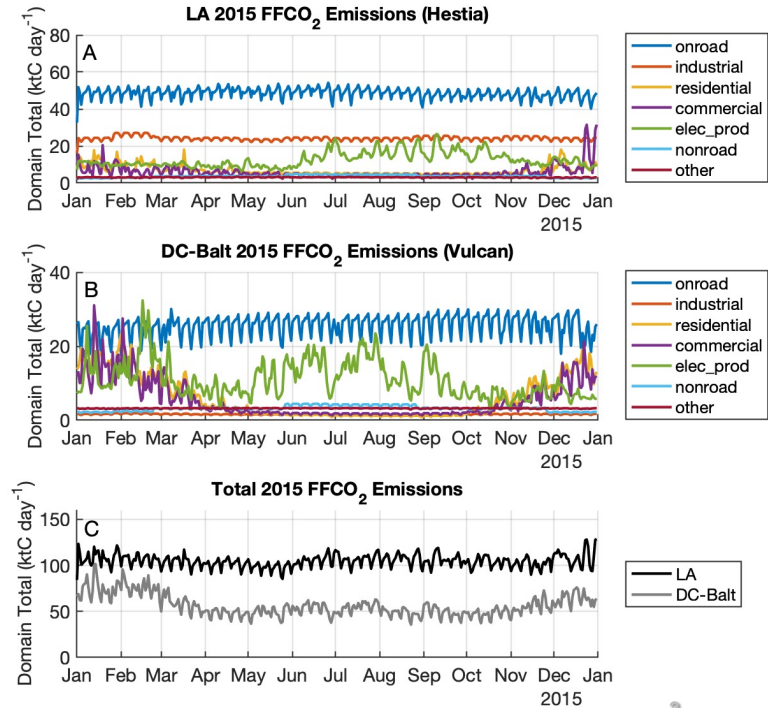
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**Yadav et al., GRL, in press.*

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LOS ANGELES VS. WASHINGTON DC/BALTIMORE CO₂ EMISSIONS PROFILES

- LOS ANGELES HAS HIGH EMISSIONS, A CLEANER BACKGROUND, LESS VARIABILITY IN JAN-MAY, AND SMALLER BIOSPHERIC SIGNAL.
- WASHINGTON DC AND BALTIMORE (DC-BALT) HAVE VERY SEASONAL EMISSIONS THAT ALSO VARY INTER-ANNUALLY, DUE TO THE LARGE AND VARIABLE EMISSIONS FROM POWER PLANTS AND NATURAL GAS USE FOR HEATING.
- IN BOTH CITIES, BETWEEN JANUARY AND MAY, ON-ROAD VEHICULAR EMISSIONS ACCOUNT FOR ~45% OF TOTALS.

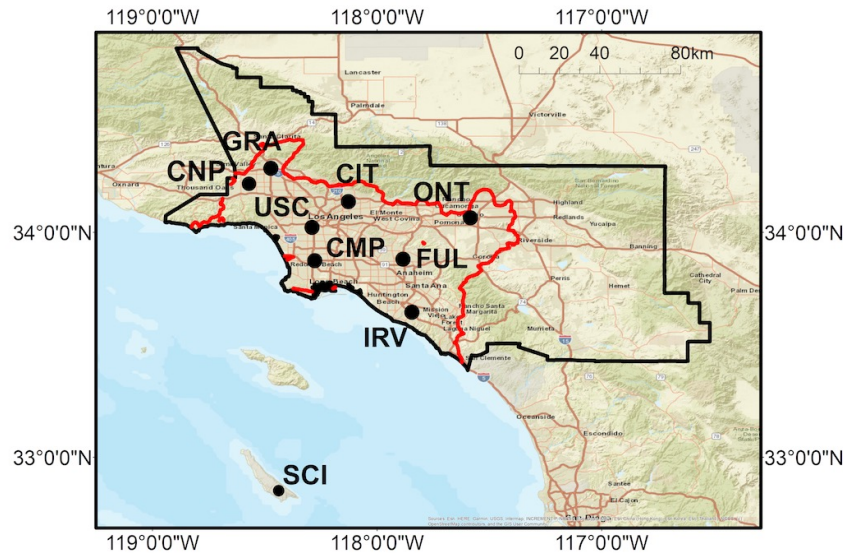


CO₂ OBSERVATIONS IN EACH URBAN AREA

TOWER-BASED IN-SITU OBSERVATIONS FROM DENSE NETWORKS

Our study focuses on Jan-May 2018, 2019 & 2020

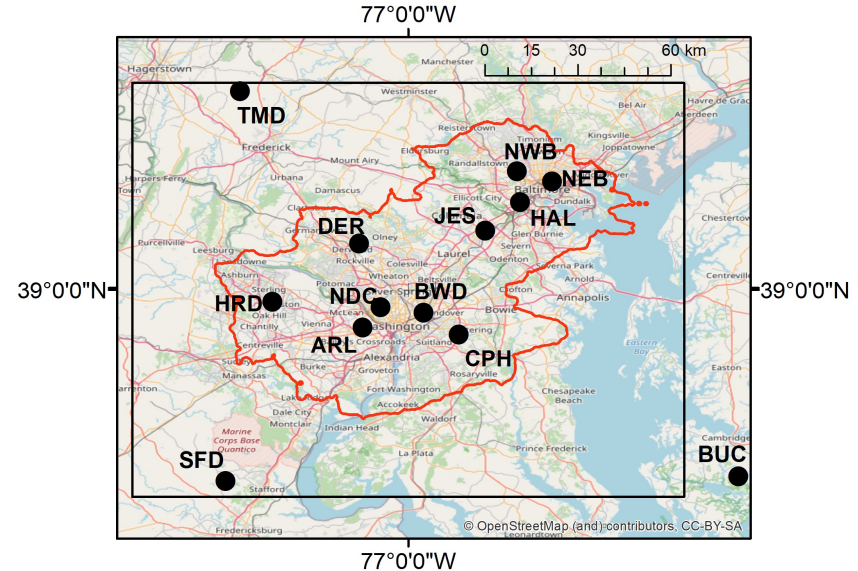
Los Angeles



www.megacities.jpl.nasa.gov
Verhulst et al., ACP, 2017

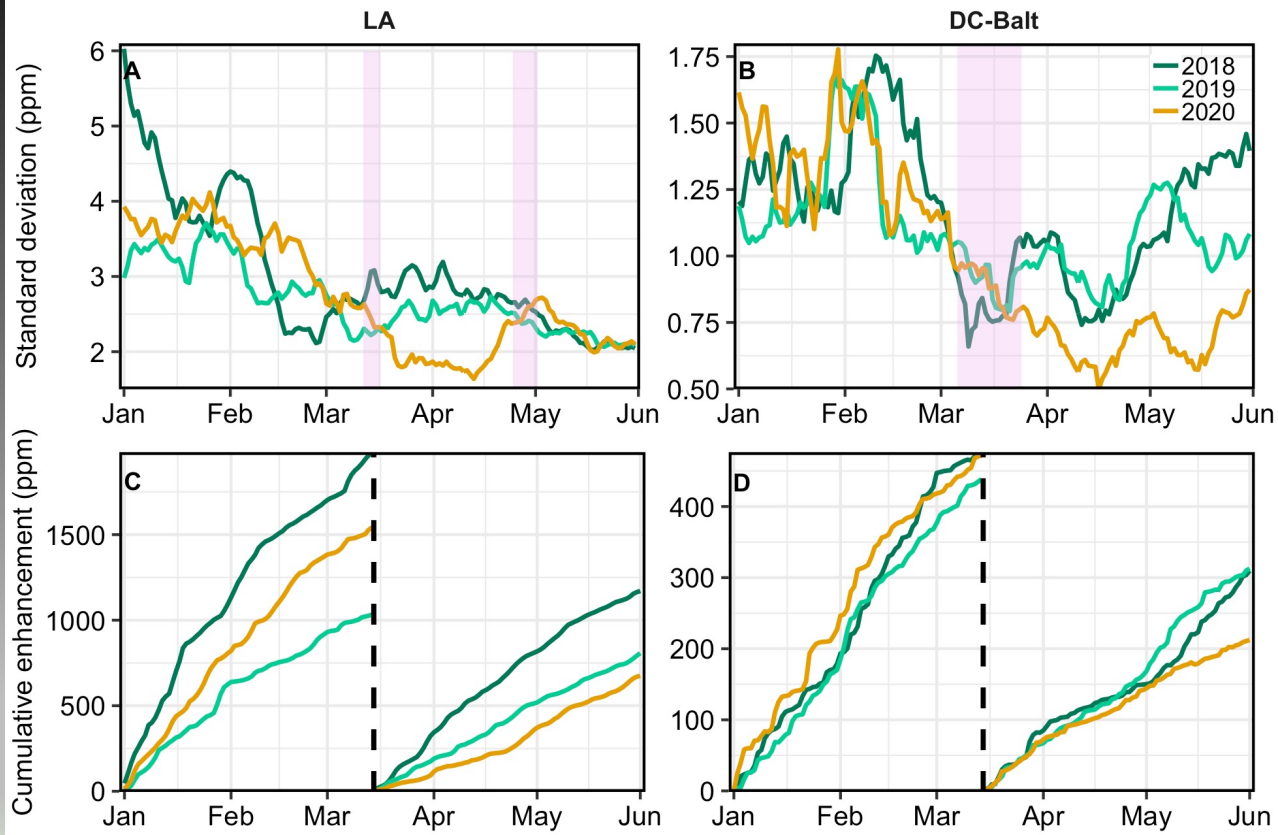
Red outline shows 75% footprint sensitivity

Washington DC & Baltimore



www.nist.gov/northeast-corridor-urban-test-bed

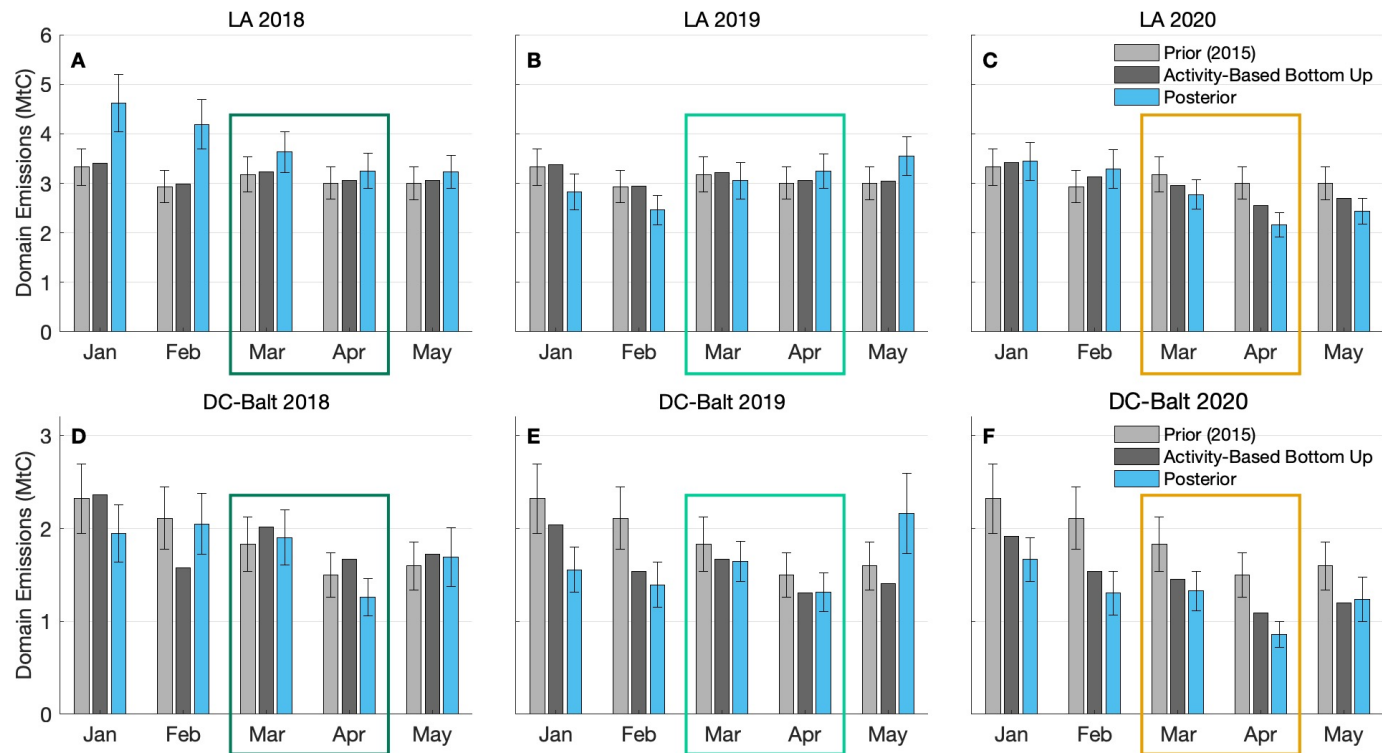
Karion et al.,
ESSD, 2020



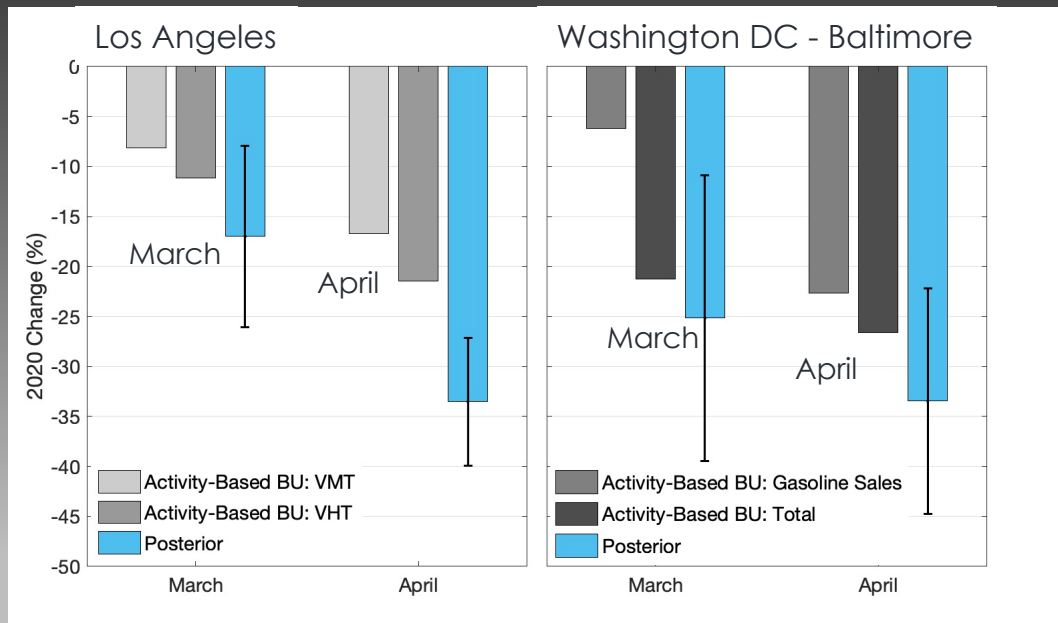
Variability (top) and cumulative enhancements (bottom) of atmospheric CO₂ in 2020 relative to previous years show lower values beginning in mid-March.

CO₂ INVERSION RESULTS

POSTERIORS (BLUE) SHOW DECREASE IN MARCH & APRIL 2020



CO₂ EMISSIONS CHANGE IN MARCH & APRIL 2020 RELATIVE TO MEAN OF 2018 & 2019



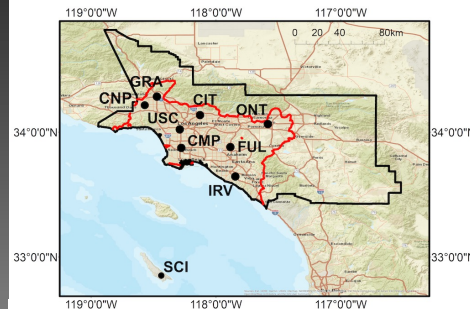
- 33-34% declines (April) in both cities (blue bars) largely explained by bottom-up analysis showing declines in on-road traffic emissions (gray bars).
- Remaining declines are unexplained in LA; in DC-Balt, additional decreases are attributable to the electricity sector and reduced gas usage due to a warmer spring.

The impact of COVID-19 on CO₂ emissions in the Los Angeles and Washington DC metropolitan areas

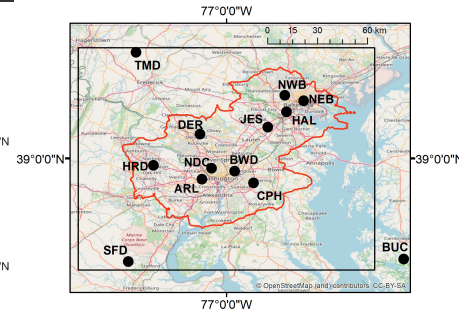
Yadav et al., GRL, in press (2021).

- Observational analysis showed decreasing atmospheric CO₂ beginning mid-March 2020 in both cities.
- Atmospheric inversions performed for both cities using tower network CO₂ observations.
- Monthly emissions estimated for Jan-May of 3 years: 2018, 2019, and 2020.
- Emissions decrease in March and April 2020 determined relative to means of 2018/2019.
- 33-34% declines (April) in both cities (blue bars) largely explained by bottom-up analysis showing declines in on-road traffic emissions (gray bars).
- Remaining declines are unexplained in LA; in DC-Balt, additional decreases are attributable to the electricity sector and reduced gas usage due to a warmer spring.

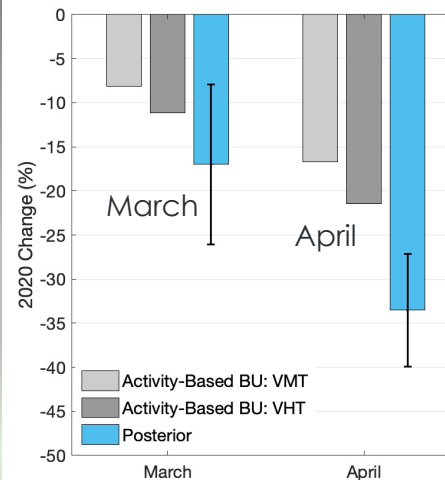
Los Angeles



Washington DC - Baltimore



Los Angeles



Washington DC - Baltimore

