High-resolution inversion of fossil fuel emissions and biogenic fluxes over the Paris region

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Inversion methodology

Observations + uncertainty $y_o + R$

Optimized Fluxes and Uncertainties

$$x = x_b + BT^T\left(TBT^T + R\right)^{-1}\left((y_o - y_{bkg}) - Tx_b\right)$$

$$C_s = \left(T^T R^{-1} T + B^{-1}\right)^{-1}$$

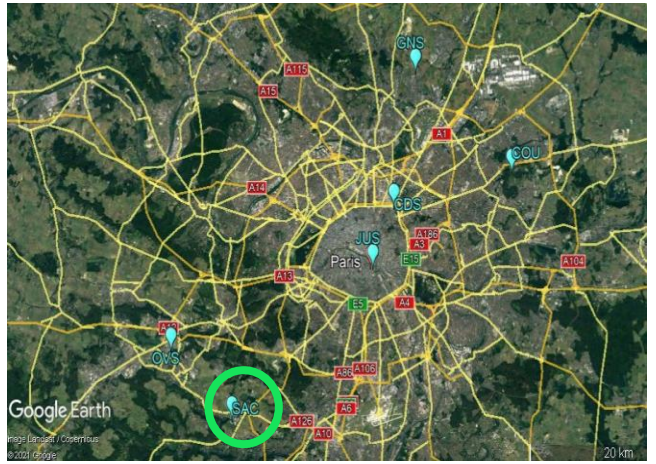
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Atmospheric Model (LPDM) ← **WRF (1kmx1km)**

$y_{bkg} = obs\ from\ SAC$

Prior flux + uncertainty (Origins, VPRM) $x_b + B$

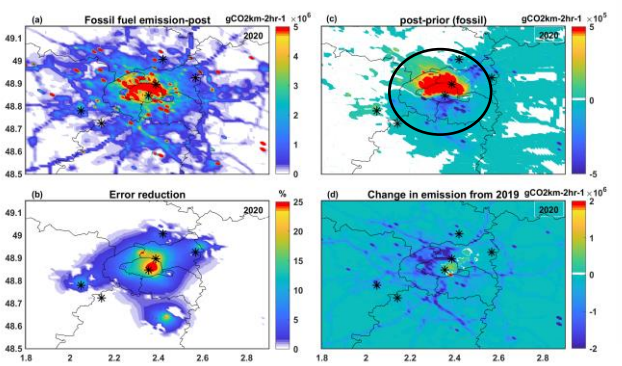
Dense population and emission intensity demands accurate flux estimation over the Paris region. Bayesian inverse modelling provides a top-down technique for verifying emissions and uptake of carbon dioxide (CO_2) from both natural and anthropogenic sources. It relies on accurate measurements of CO_2 concentrations at suitably located sites that can collect information about these sources at different spatial and temporal scales.

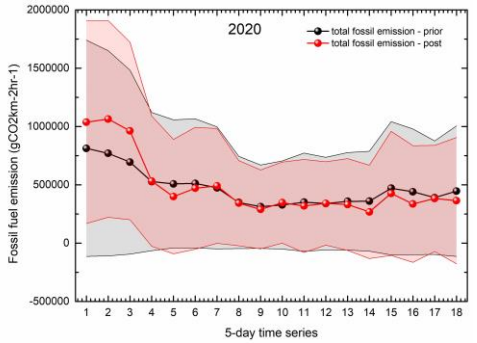


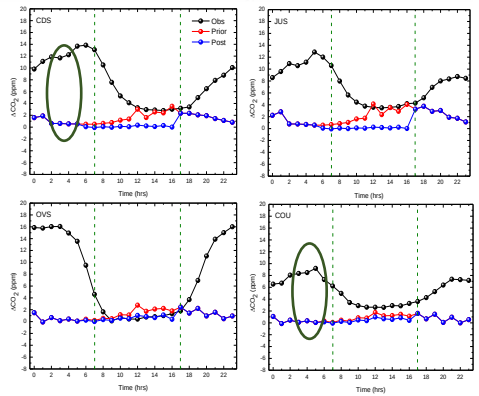
Ile de France Observation network

Results

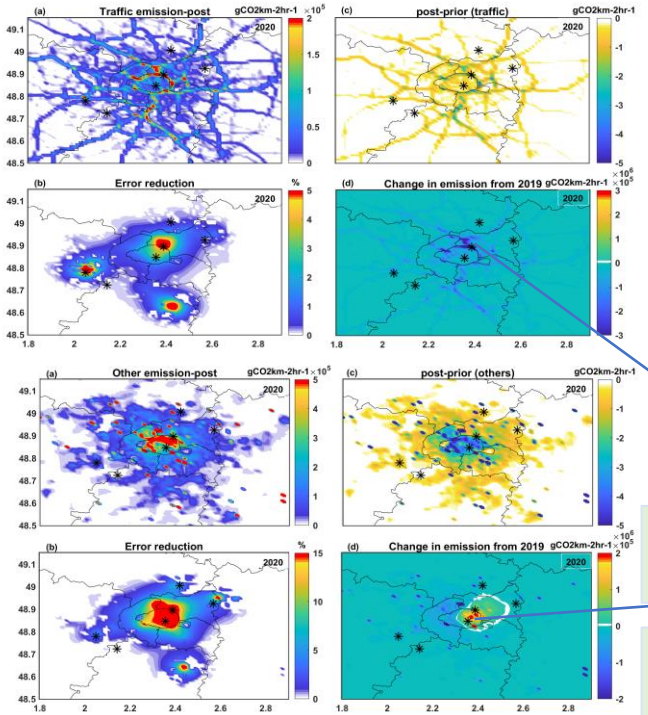
CO_2 only inversion

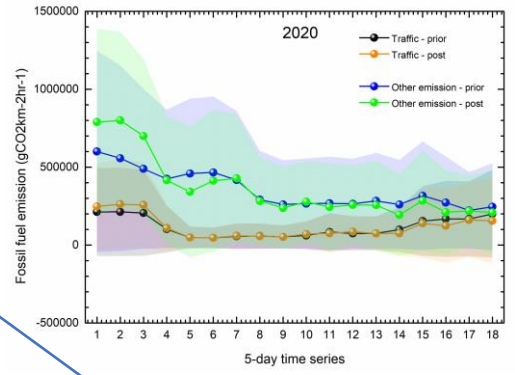






$COCO_2$ inversion





Traffic emissions reduced during confinement but other emissions increased in the paris centre

There is no noticeable change in the biosphere flux after inversion