Supplementary

Figure 1: Posterior air basin emissions for an error in the magnitude of emission. Filled markers show posterior results using SD prior uncertainty and clear markers represent 70% prior uncertainty. The prior bias in each air basin is given by the dashed lines with SD prior uncertainty (dark grey) and 70% prior uncertainty (light grey). Prior and posterior uncertainties are expressed as 2-σ.
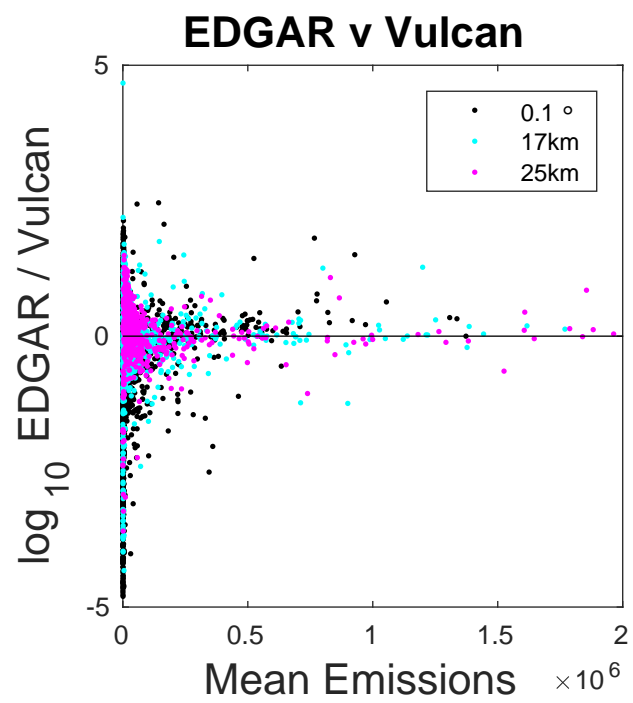
Figure 2: EDGAR grid cells compared to Vulcan (regridded to EDGAR native 0.1° resolution). Mean emissions are in units of gCO_2 m^2 yr^{-1}.
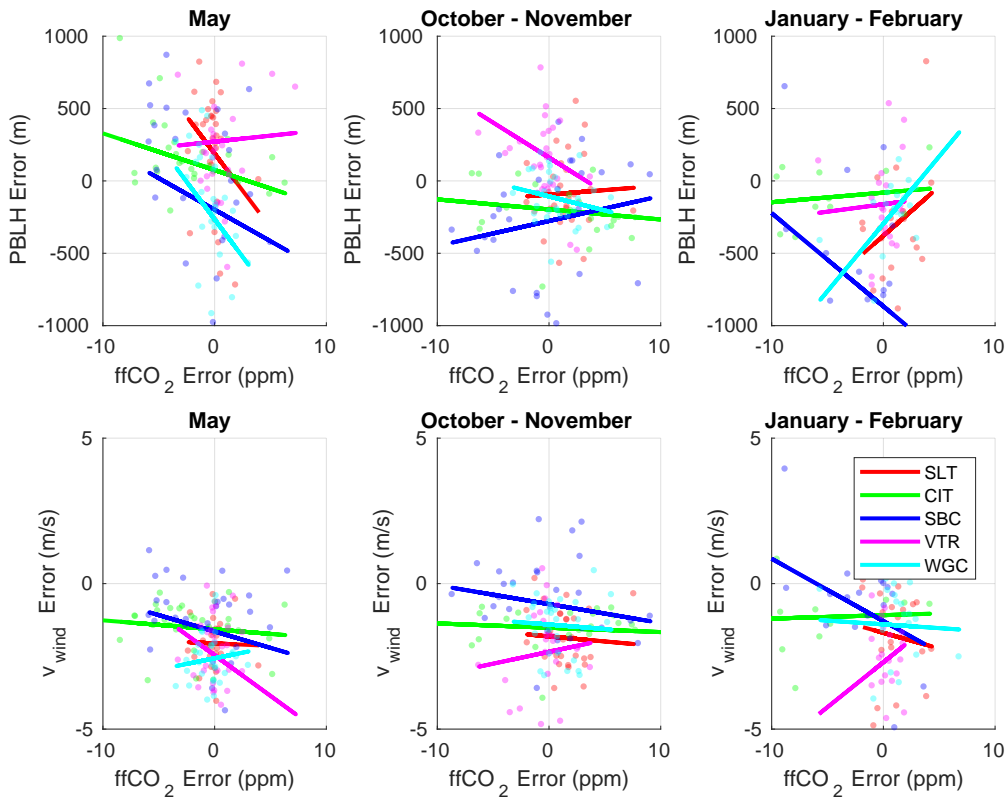
Figure 3: PBLH error versus ffCO$_2$ error (top) and wind speed versus ffCO$_2$ error (bottom). Error in PBLH/wind speed was calculated by subtracting UM from WRF estimates. ffCO$_2$ signal error was calculated by subtracting UM-NAME from WS-LBL signals.
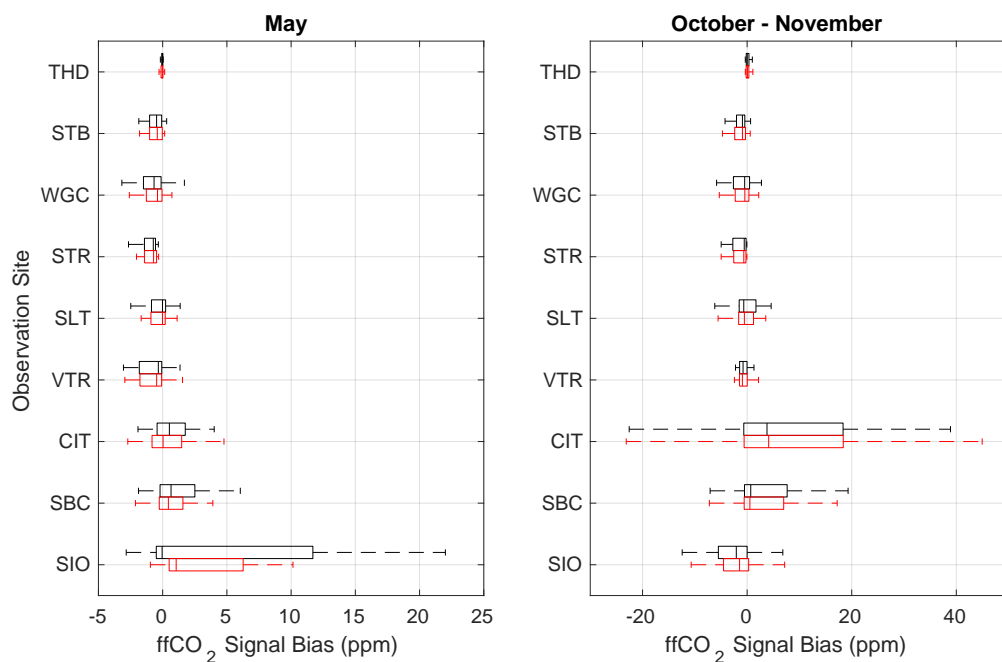
Figure 4: ffCO$_2$ signal bias for aggregation error (black) and no aggregation error (red) in modelled atmospheric transport. For each box the central mark indicates the median, and the left and right edges indicate the 25th and 75th percentiles, respectively. Dashed lines extend to the most extreme data points not considered outliers. Error was calculated by subtracting WS-CTL signals (generated using native 0.1° resolution and UM-NAME resolution footprints respectively) from UM-NAME signals.
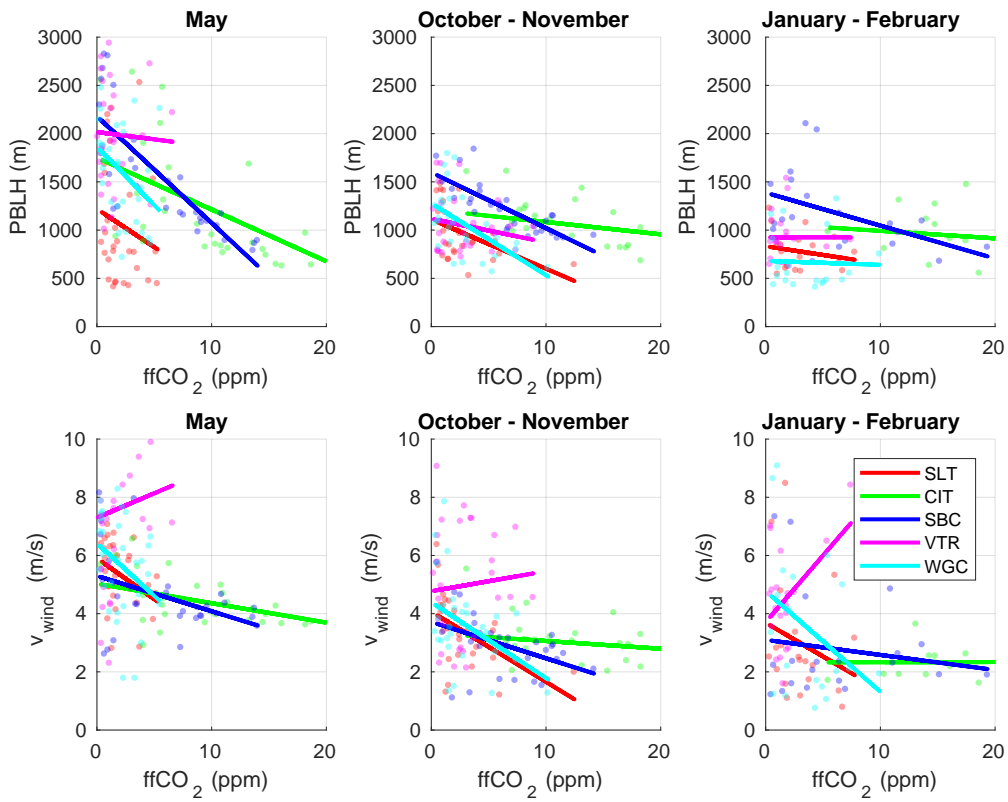
Figure 5: PBLH versus ffCO$_2$ (top) and wind speed versus ffCO$_2$ (bottom) using MYNN2 PBLH, Noah/LSU wind speed, and WS-LBL ffCO$_2$ signal estimates.