Figure S1. Comparison of wind direction (°), as measured from the research aircraft (black circles) with those simulated by the NAME model (red circles), for each flight on a minute by minute basis. The points in time at which samples were collected are indicated by vertical purple lines.
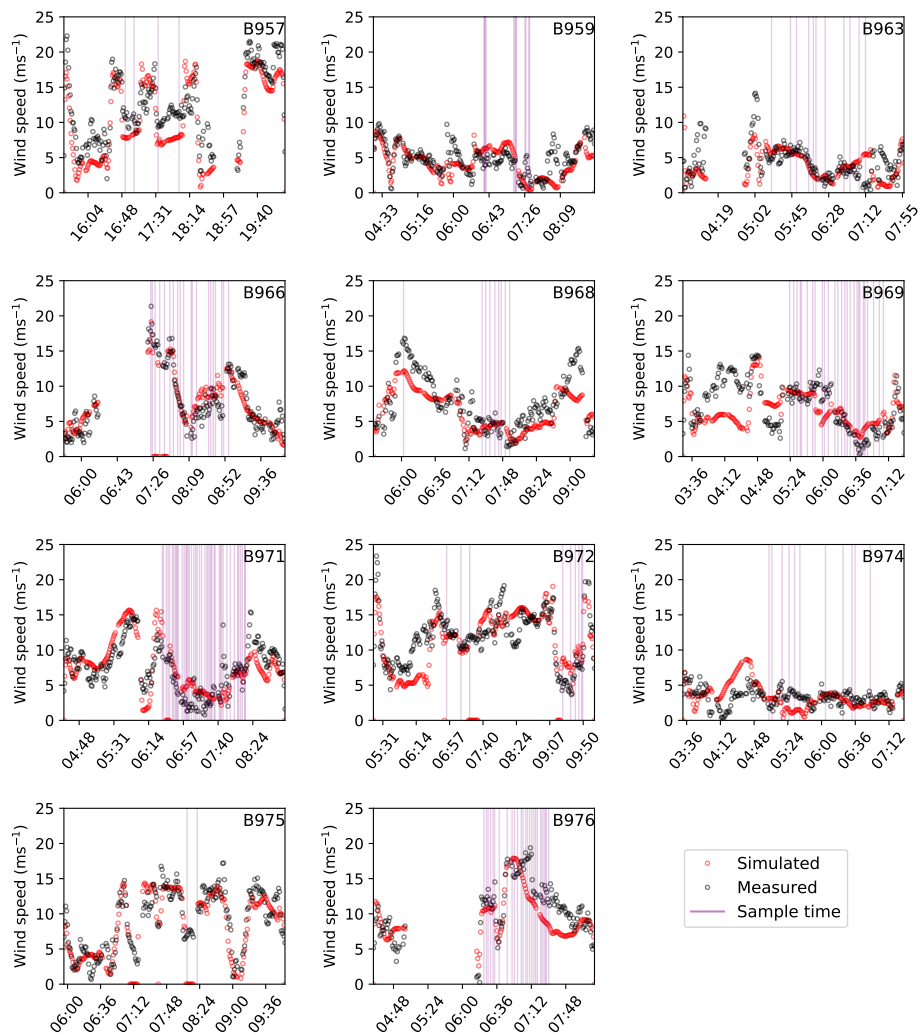
Figure S2. Comparison of wind speed (m s^{-1}), as measured from the research aircraft (black circles) with those simulated by the NAME model (red circles), for each flight on a minute by minute basis. The points in time at which samples were collected are indicated by vertical purple lines.
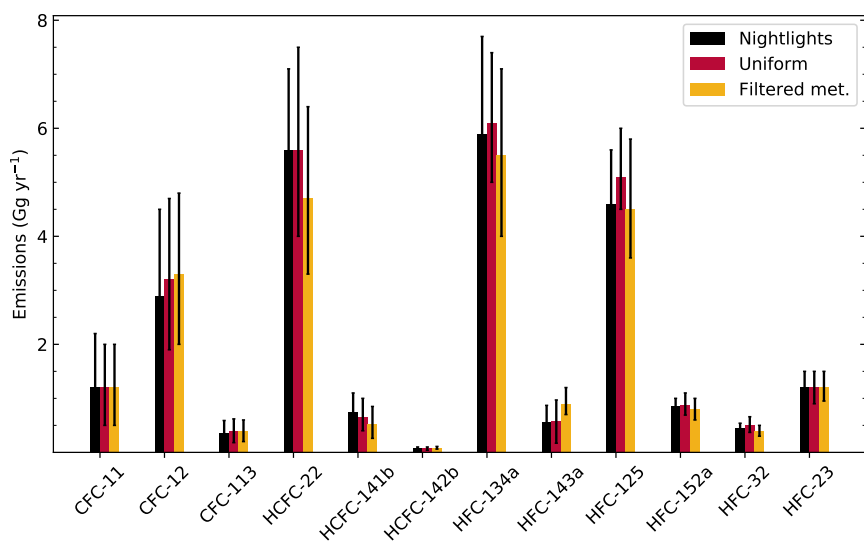
Figure S3. Comparison of posterior NCI ODS/HFC emissions estimates. Black bars) based on prior emissions distributed using the NOAA night lights distribution; red bars) based on prior emissions distributed using uniformly across the model domain; yellow bars) based on the NOAA night lights distribution, with observations for which the corresponding model simulated wind speed/direction differed from the observed value by $\geq 20\%$ removed. Error bars represent the $5^{th} - 95^{th}$ percentiles of the posterior PDF.