

Supplementary Material: Defining aggregated local regions

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For computation efficiency, individual pixels within the local emissions regions used in the inversion were aggregated into a smaller number of regions. This aggregation was carried out as follows:

1. Within each local region, the average footprint is multiplied by the prior emissions field to estimate the average contribution that emissions from each grid cell make to the measured mole fraction
2. The grid cell with the maximum signal is chosen to be the center of an aggregated region
3. The region grows in a square, with the length of one side increasing by two grid cells at a time. National boundaries are not crossed, and regions previously allocated are not incorporated.
4. The region grows until some threshold is reached, until there are no grid cells remaining in the country, or until the length of one side of the region is greater than the distance to the monitoring site. A threshold of $0.005 \text{ pmol mol}^{-1}$ was chosen in the SF_6 inversion (approximately 10% of the measurement uncertainty).
5. The grid cell with the highest signal that has not already been allocated is chosen as the center of another region, and steps 3 - 4 are repeated until all of the grid cells are allocated to some region
6. Since national boundaries are not crossed and there is a limit on the size of the regions, many regions contribute very little to the measurements. Therefore, as a final step, each of the regions that contributes less than 10% of the threshold signal is aggregated to their closest regions

The derived aggregated regions are shown in Figure S1.

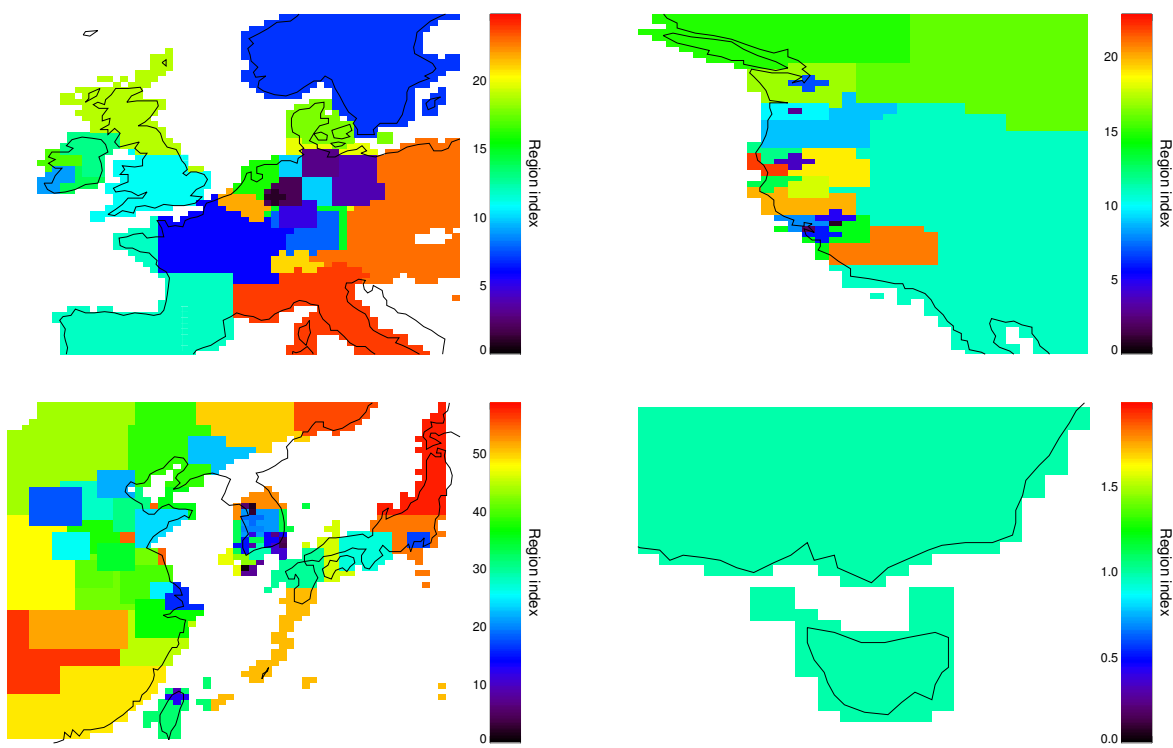


Figure S 1: Aggregated local emissions regions. The color corresponds to an index identifying each region.