Supplementary material

Since only a selection of figures could be presented in the main manuscript, additional figures are presented in this supplement for 1) prior and posterior time series, 2) prior emission fields, 3) prior uncertainty fields, 4) uncertainty reductions, and 5) country aggregated emissions.

5   **S1 Time series**

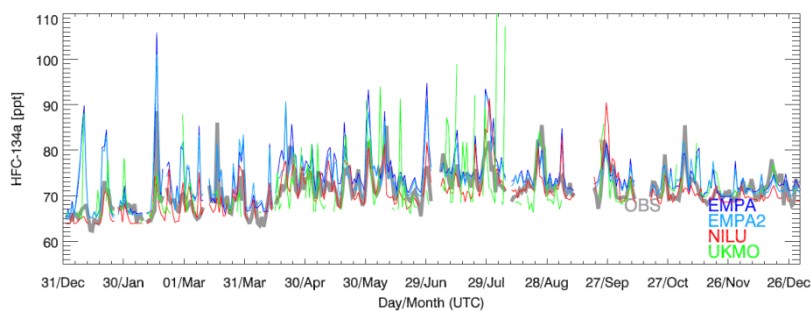
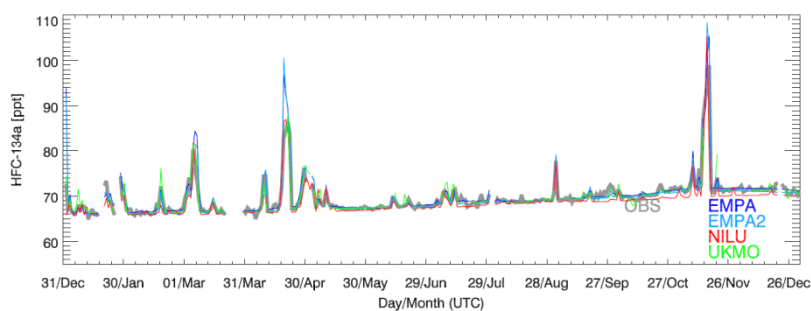
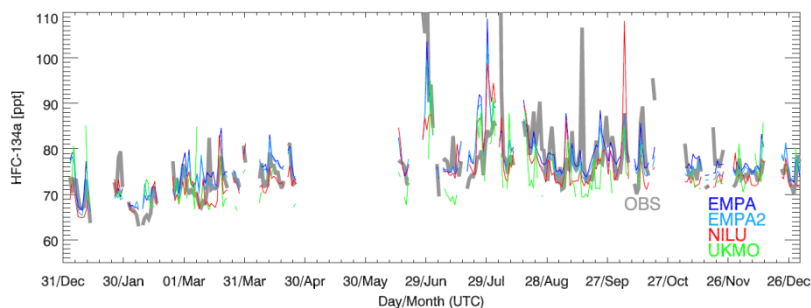



Figure S1: Prior simulated HFC-134a mole fractions (color lines) overlaid over observations (thick grey line) at the three sites Jungfraujoch, Mace Head and Monte Cimone.

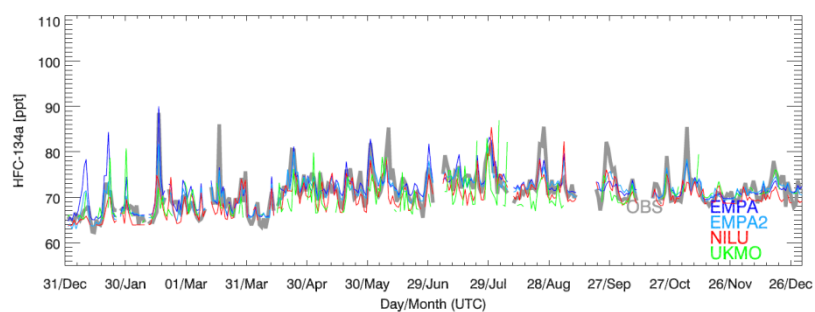
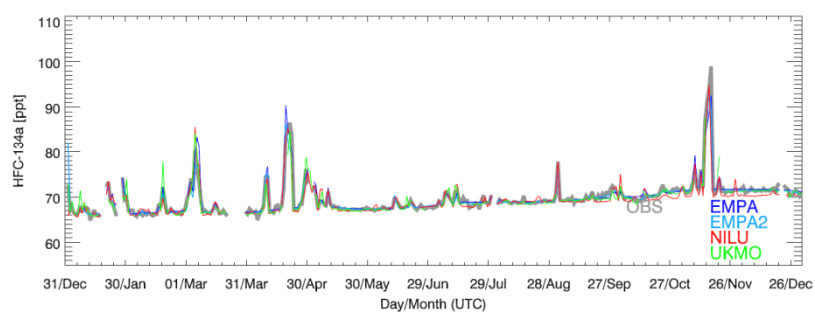
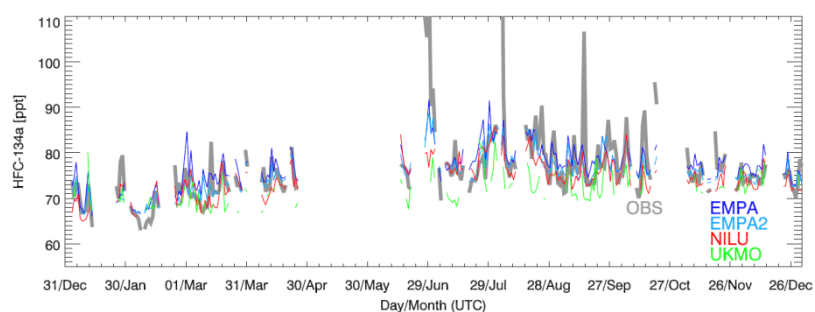



Figure S2: Posterior simulated HFC-134a mole fractions (color lines) overlaid over observations (thick grey line) at the three sites Jungfraujoch, Mace Head and Monte Cimone.

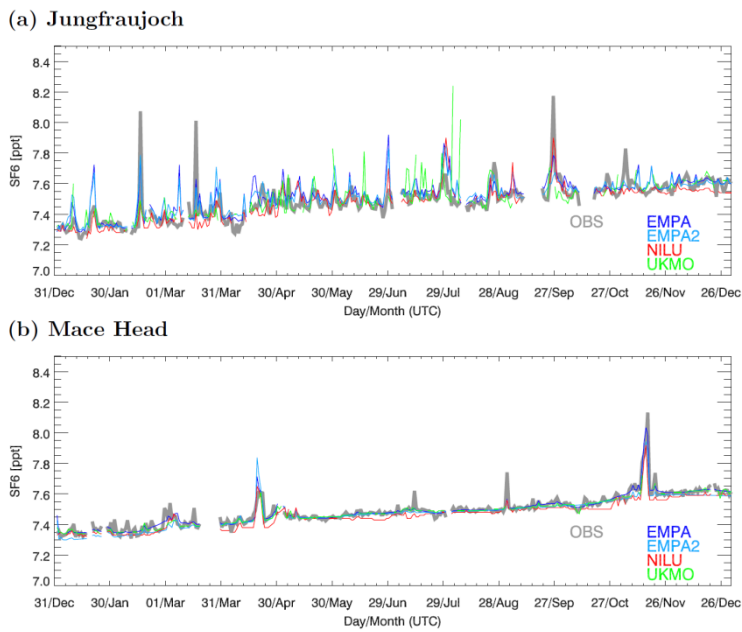
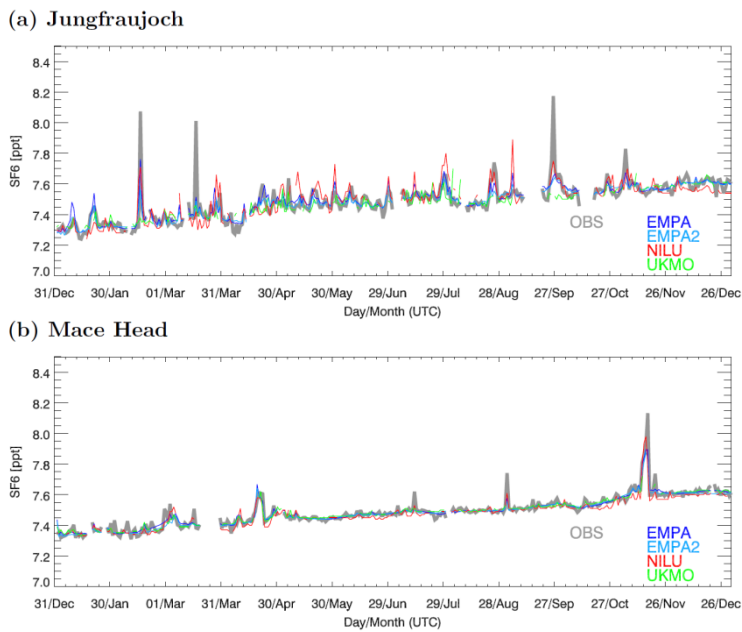



Figure S3: Prior simulated SF$_6$ mole fractions (color lines) overlaid over observations (thick grey line) at the two sites Jungfraujoch and Mace Head.

5 **Figure S4:** Posterior simulated SF$_6$ mole fractions (color lines) overlaid over observations (thick grey line) at the two sites Jungfraujoch and Mace Head.

S2 Prior emission fields

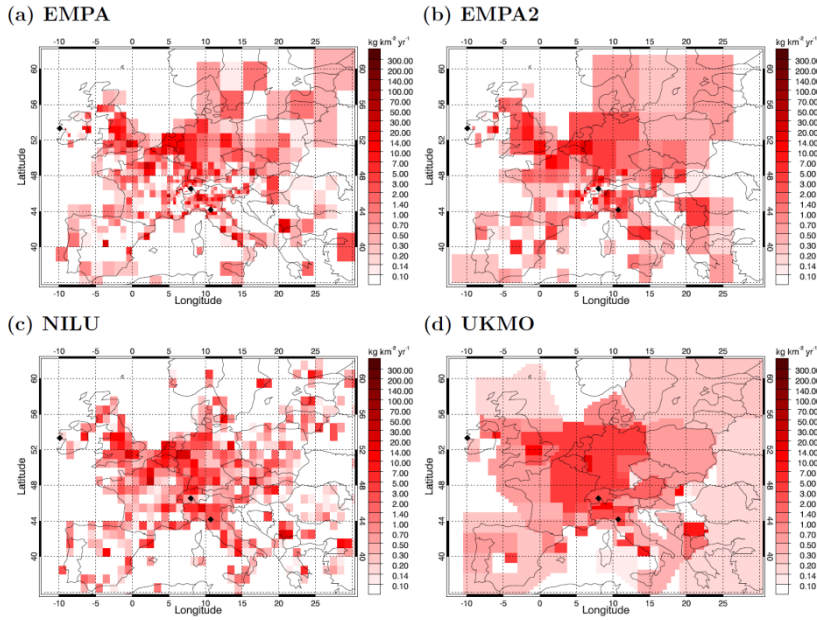
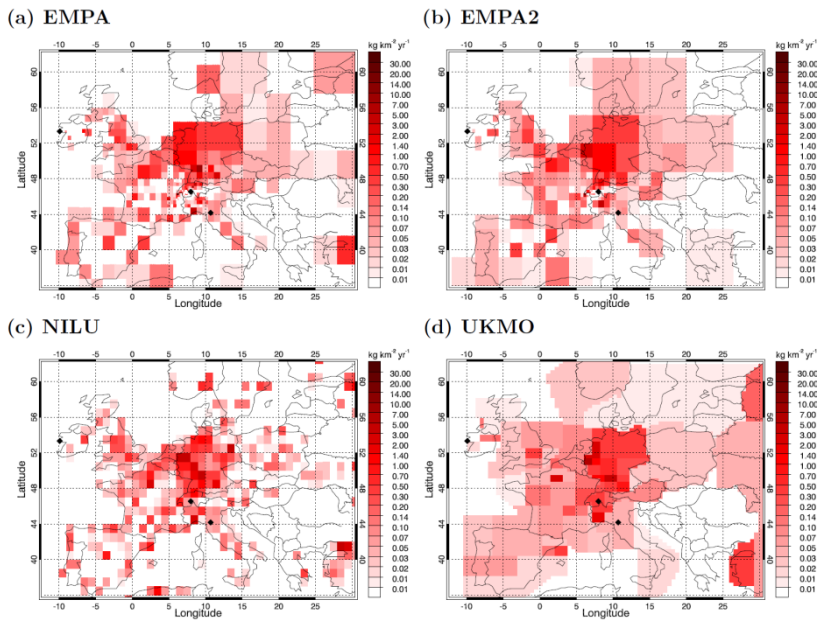



Figure S5: Prior emissions of HFC-125 as represented in the four inversion systems.

5   **Figure S6:** Prior emissions of SF$_6$ as represented in the four inversion systems.

S3 Absolute prior uncertainties

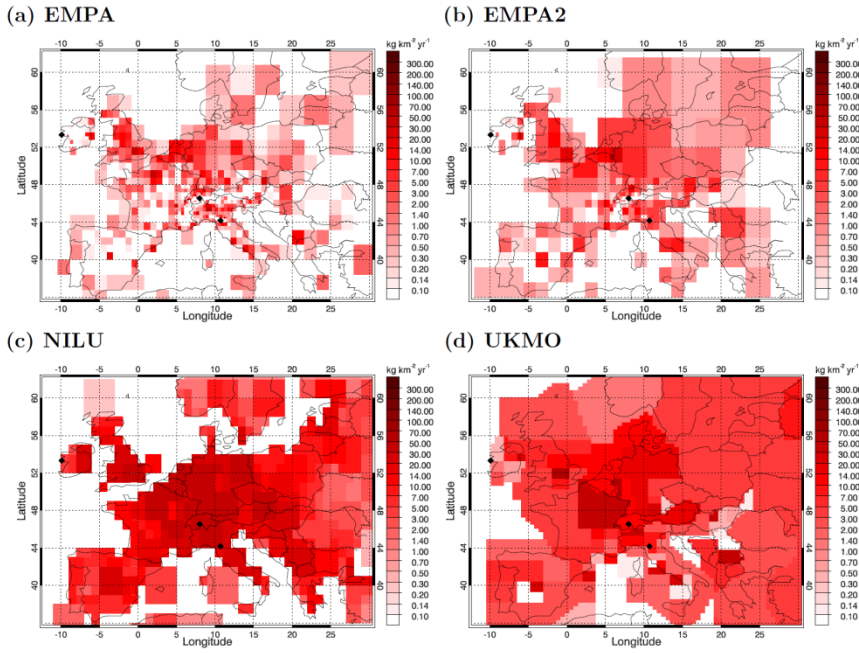
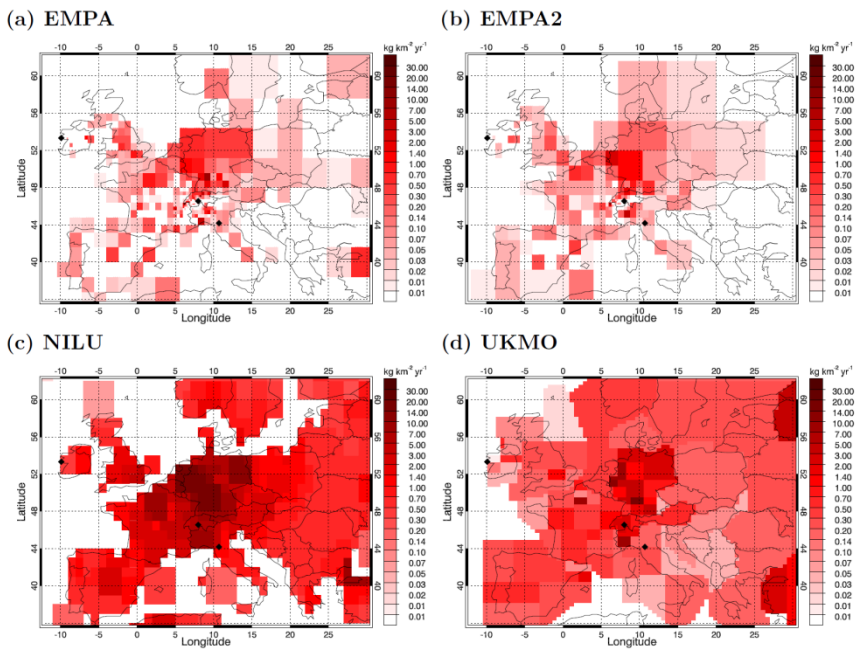



Figure S7: Uncertainties of prior HFC-125 emissions (experiment M1).

5   **Figure S8:** Uncertainties of prior SF$_6$ emissions (experiment M3).

S4 Uncertainty reductions

(a) EMPA (b) EMPA2 (c) NILU (d) UKMO

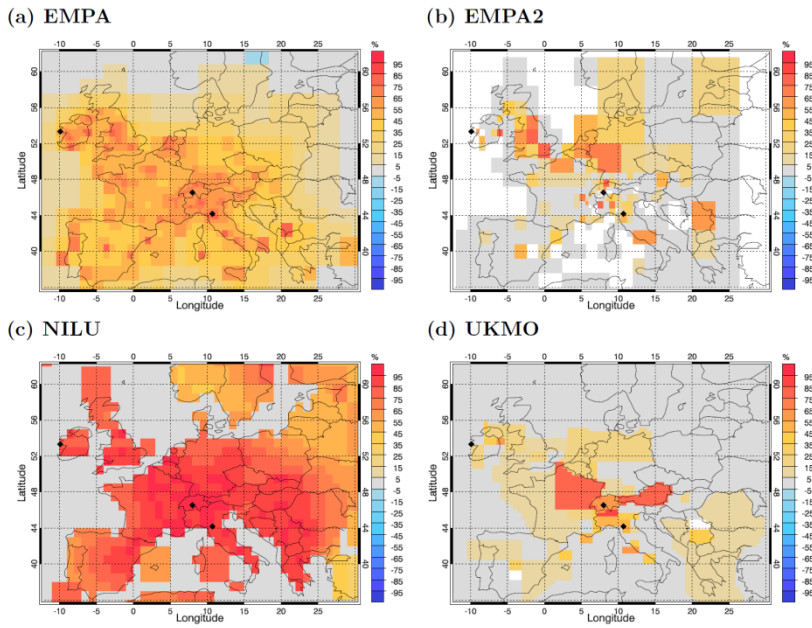



Figure S9: Uncertainty reduction (1-u_{post}/u_{prior}) in % for HFC-125 (experiment M1). For EMPA, the reduction is shown in terms of reduction of relative uncertainties [1-(u_{post}/x_{post})/(u_{prior}/x_{prior})].

(a) EMPA (b) EMPA2 (c) NILU (d) UKMO

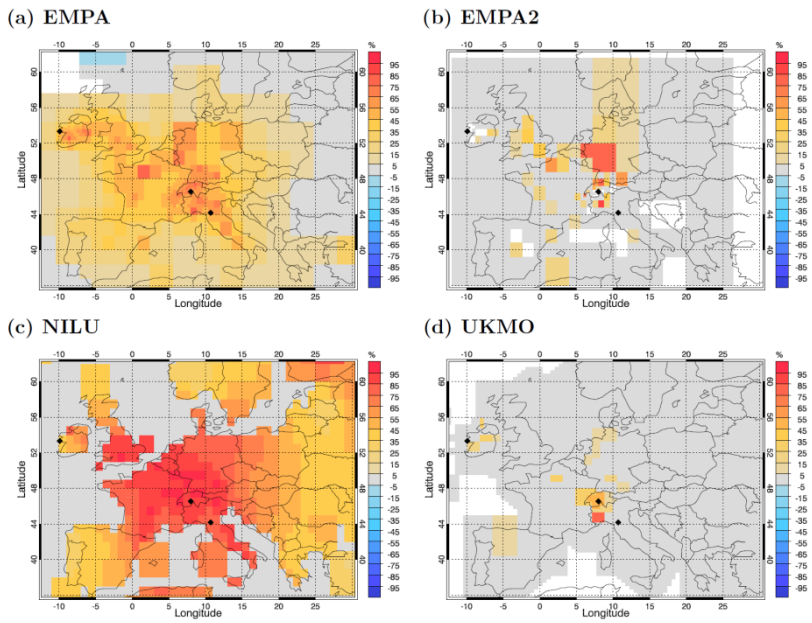



Figure S10: Uncertainty reduction (1-u_{post}/u_{prior}) in % for SF$_6$ (experiment M3). For EMPA, the reduction is shown in terms of reduction of relative uncertainties [1-(u_{post}/x_{post})/(u_{prior}/x_{prior})]. Strong negative values occur in EMPA where prior emissions are extremely small.

S5 Country-aggregated emissions

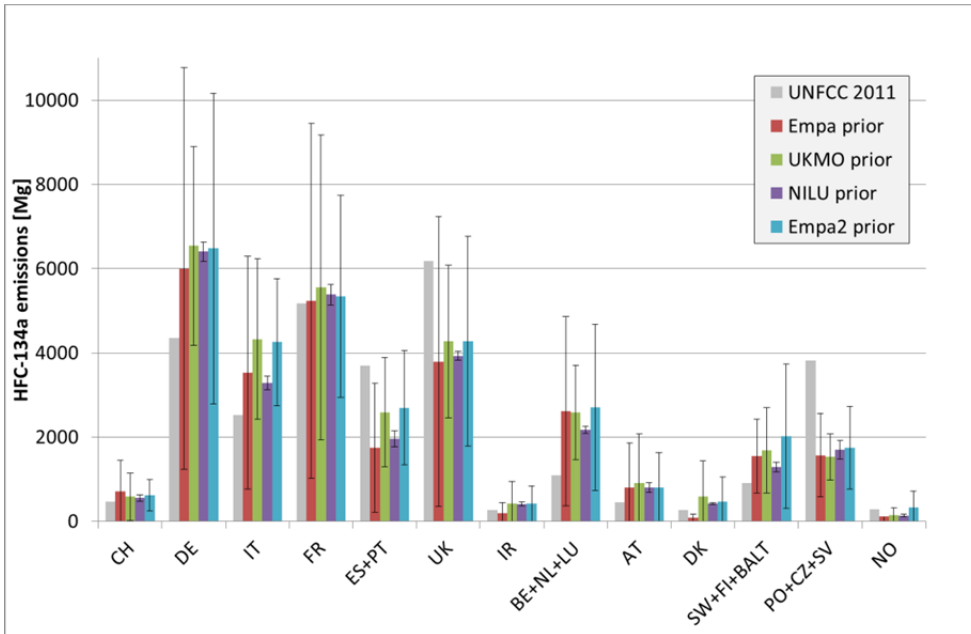
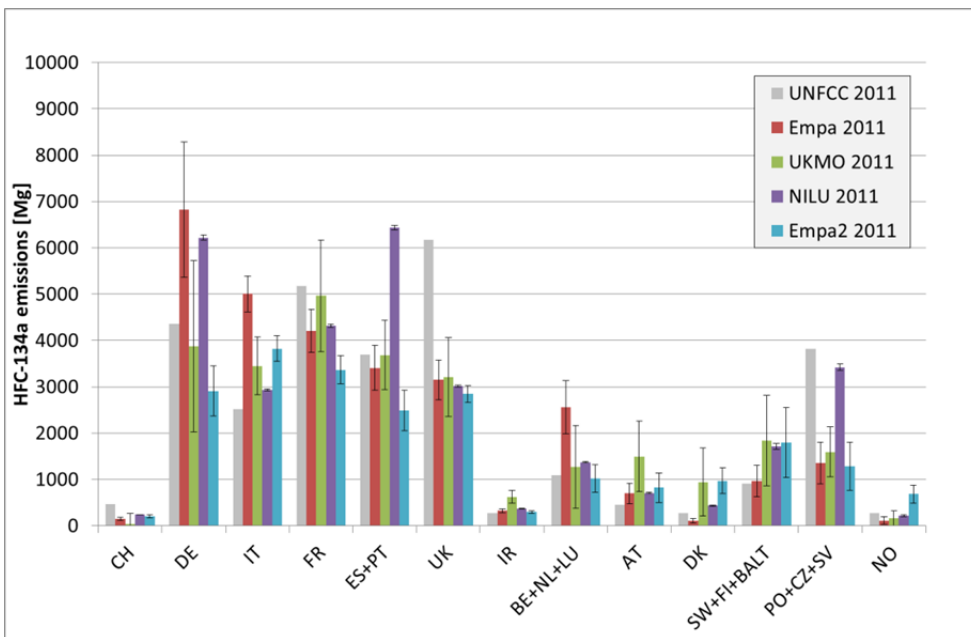



Figure S11: Country-aggregated prior emissions of HFC-134a (experiment M2).

5   **Figure S12:** Country-aggregated posterior emissions of HFC-134a (experiment M2).

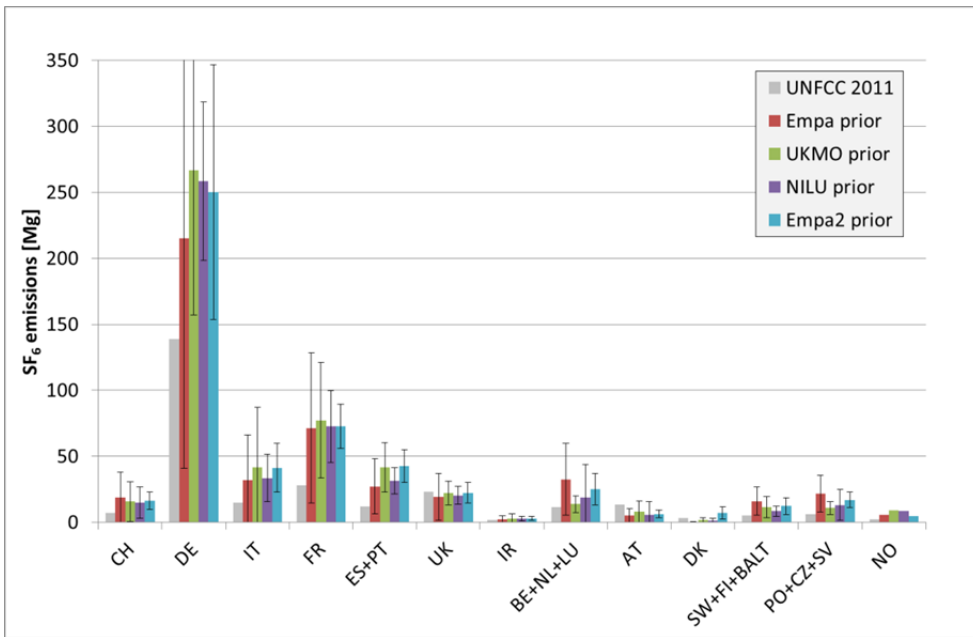



Figure S13: Country-aggregated prior emissions of SF$_6$ (experiment M3).

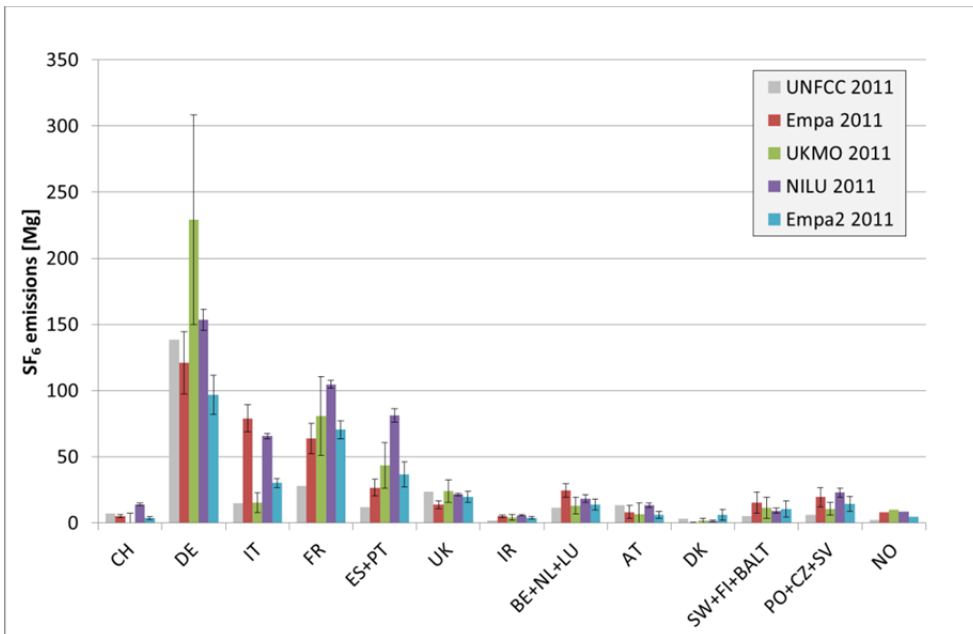



Figure S14: Country-aggregated posterior emissions of SF$_6$ (experiment M3).