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Supplement of

A roadmap to estimating agricultural ammonia volatilization over Europe using satellite observations and simulation data

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1. NH_3 lifetime from this study and from Evangeliou et al., 2021

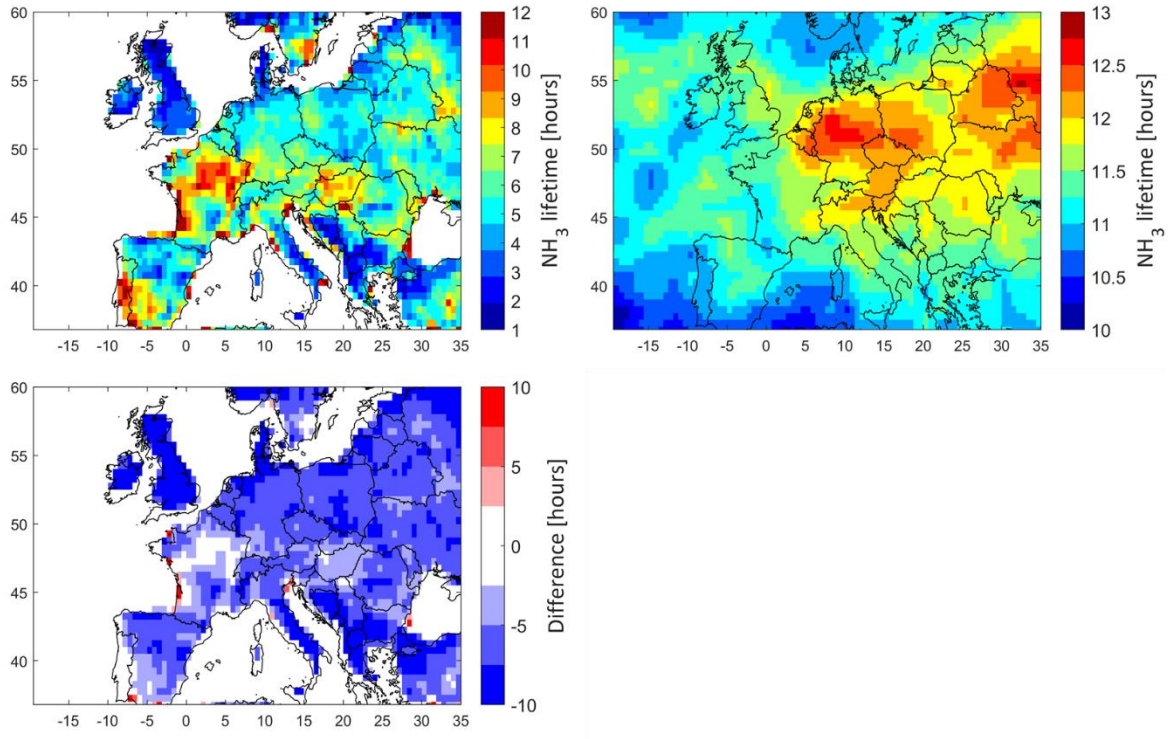

Figure S1. Monthly mean of NH_3 lifetime during March 2011 from GEOS-Chem (top left panel, as shown in Figure 2 in the main paper), and the one adapted from Evangeliou et al. (2021) (top right panel). Notice the difference in the colorbar axis limits between the two top panels. The difference in hours between the two datasets is shown in the bottom panel ($\tau_{GEOS\text{-}Chem} - \tau_{Evangeliou\ at\ al.}$).

2. NH_3 emission potential using a fixed k for all landtypes.

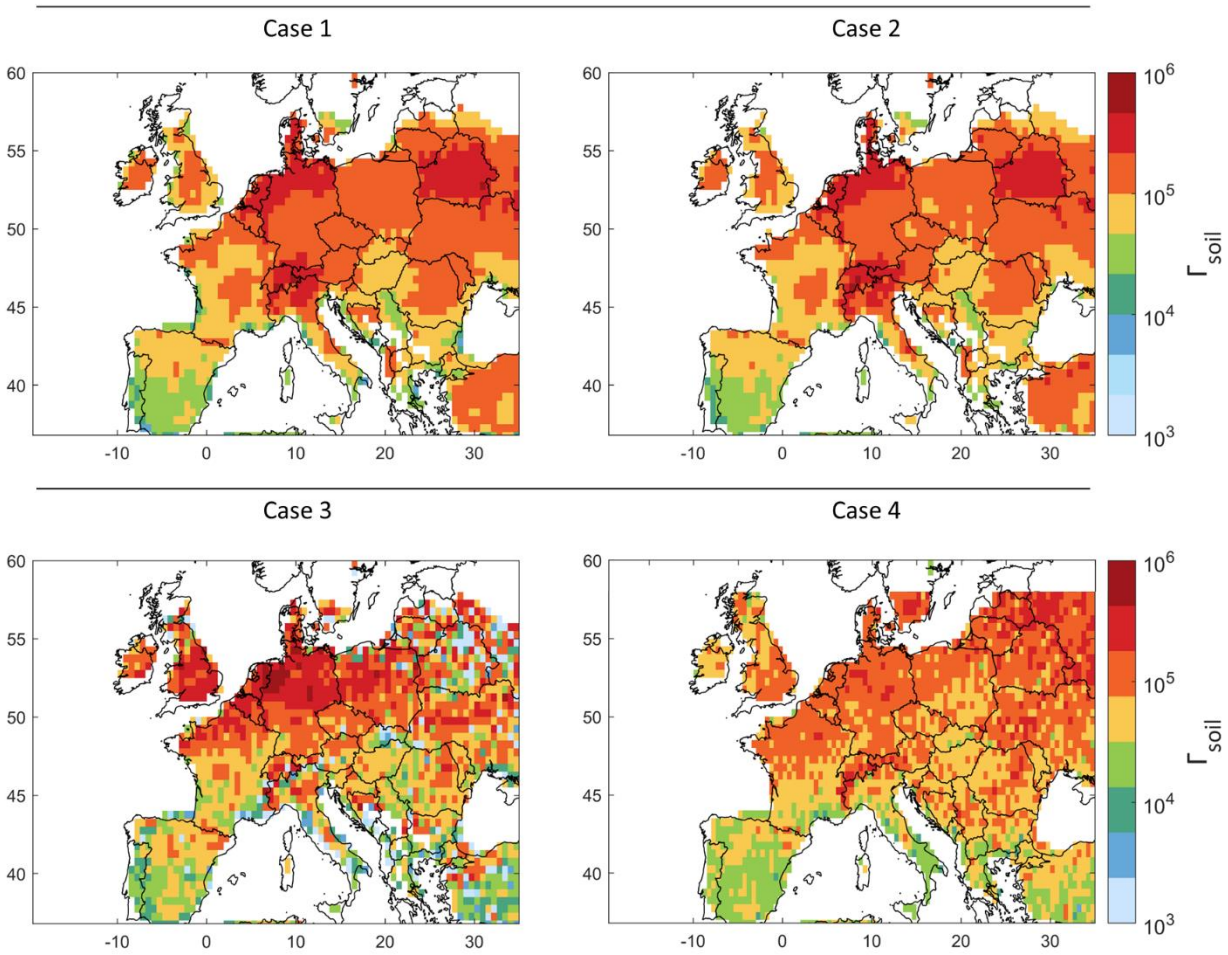

Figure S2. Same as Figure 5 in the manuscript, but using fixed k for all land types ($k = 4.5 \times 10^{-4}$ m s^{-1}).

3. Comparison of emission potential calculated with a variable and fixed k

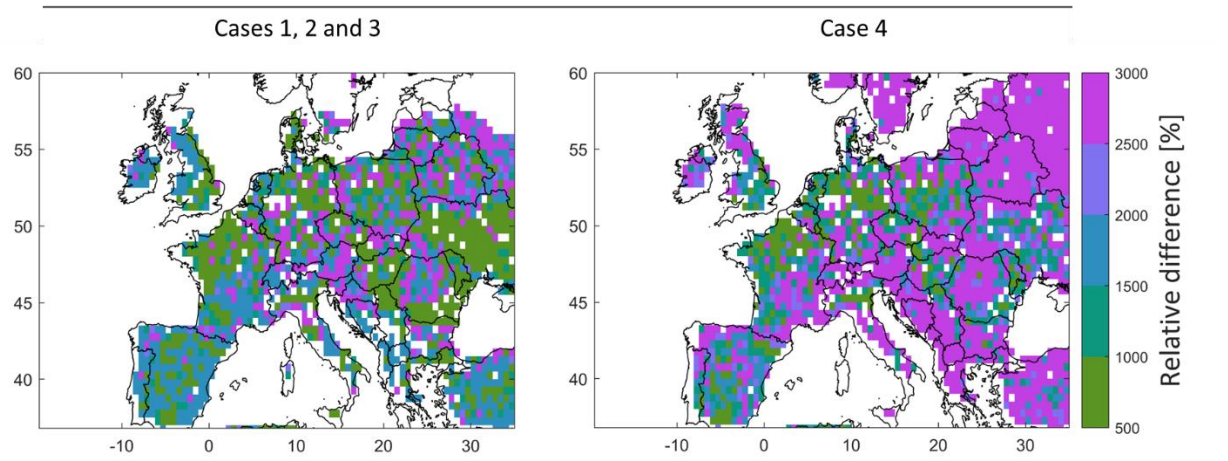

Figure S3. Relative difference (%) of Γ_{soil} between a fixed and a variable k value: $\frac{\Gamma_{fixed\,k} - \Gamma_{variable\,k}}{\Gamma_{variable\,k}} \times 100$. Cases 1, 2 and 3 are identical (NH_3 lifetime from GEOS-Chem); case 4 is different due to the use of NH_3 lifetime from Evangeliou et al. (2021).

4. Comparison of T skin from ERA5 and MERRA-2 (GEOS-Chem)

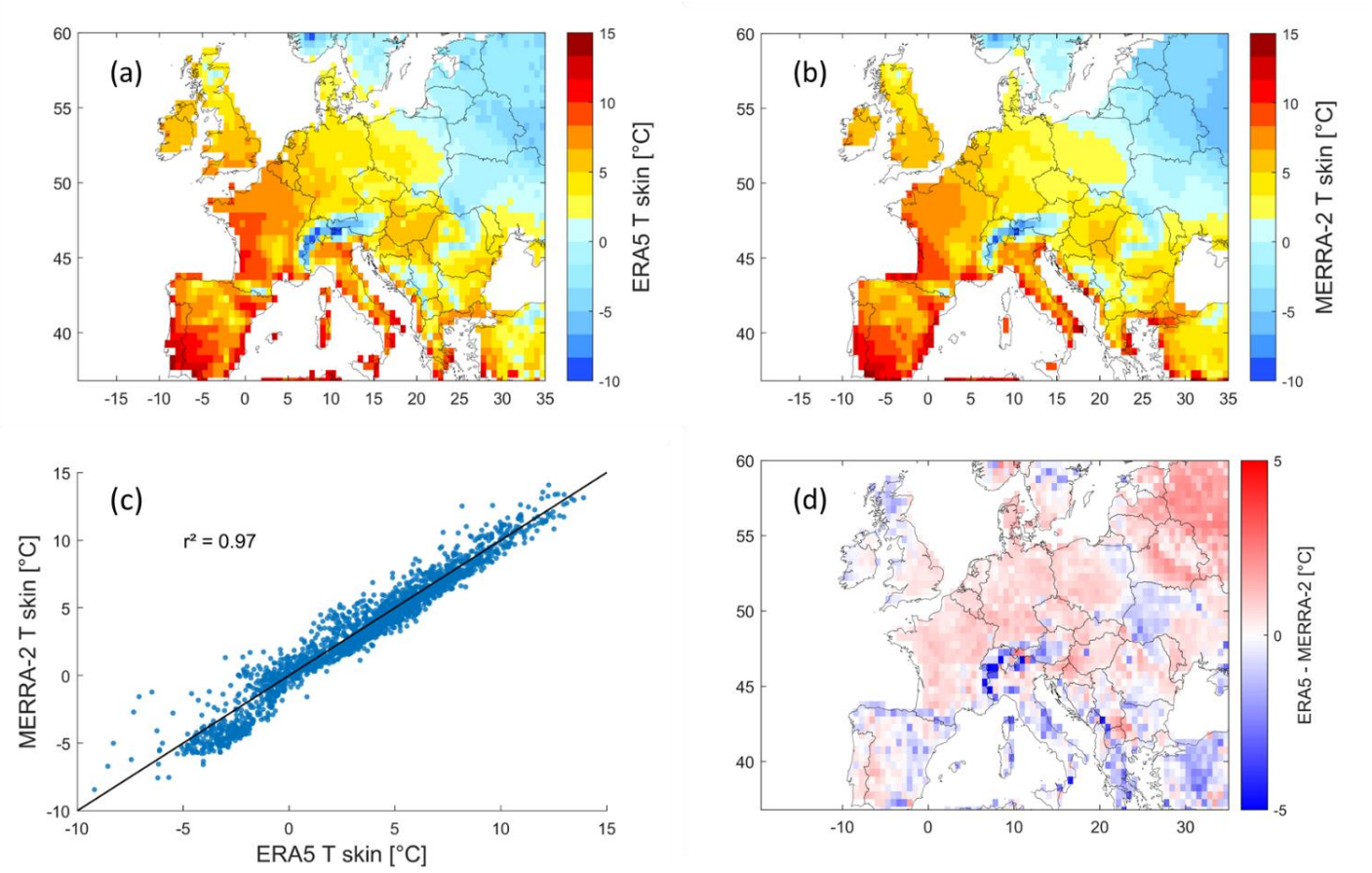

Figure S4: A comparison between T skin from ERA5 and MERRA-2: (a) T skin monthly average from ERA5, and (b) MERRA-2; (c) scatter plot of T skin from MERRA-2 (y axis) and ERA5 (x axis); and (d) the difference between the two datasets [°C].

5. Ammonia under future scenarios from GEOS-Chem

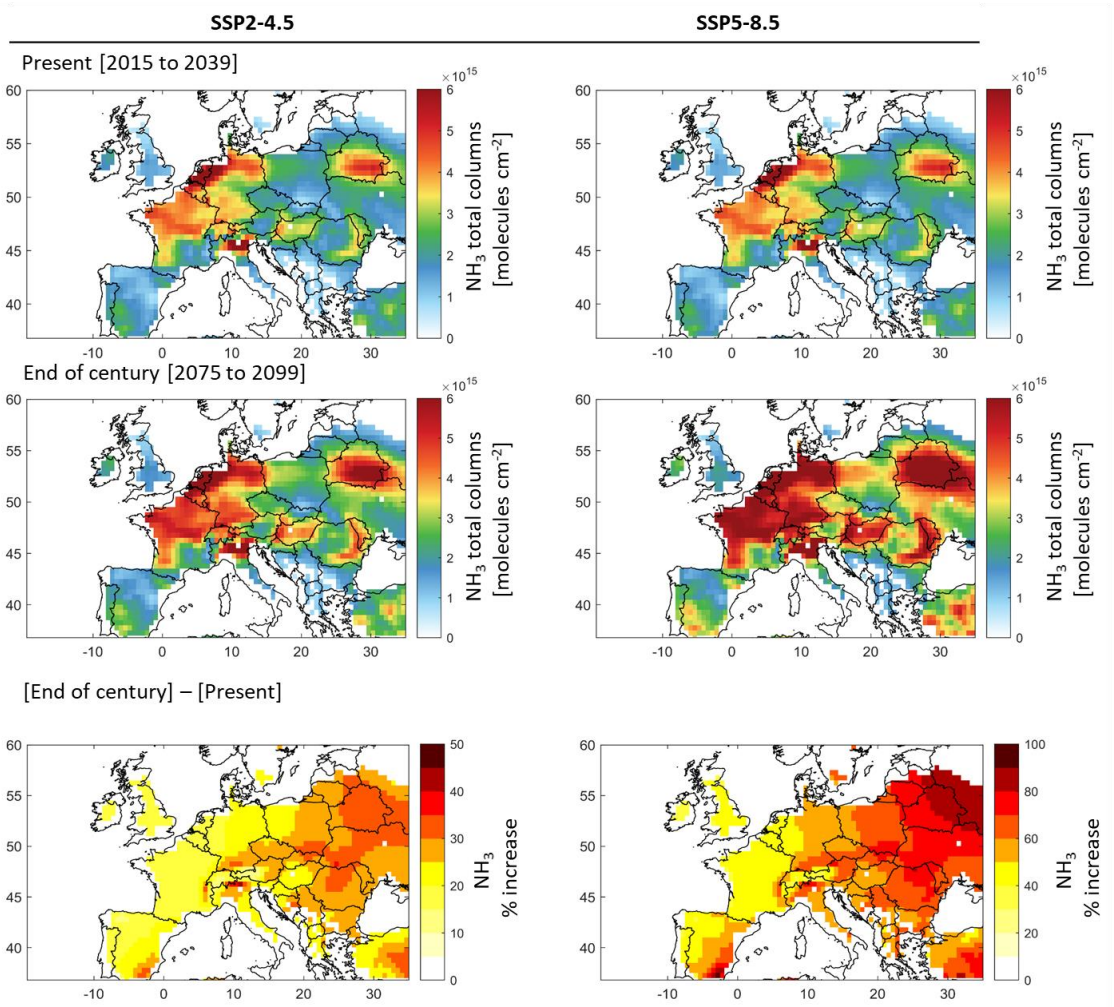

Figure S5: Same as Figure 7 in the manuscript, but using emission potential Γ_{soil} derived from GEOS-Chem and MERRA-2.

References

Evangeliou, N., Balkanski, Y., Eckhardt, S., Cozic, A., Van Damme, M., Coheur, P.-F., … Hauglustaine, D. (2021). 10-year satellite-constrained fluxes of ammonia improve performance of chemistry transport models. *Atmospheric Chemistry and Physics*, *21*, 4431–4451. https://doi.org/10.5194/acp-21-4431-2021