



*Supplement of*

**Implementation of a satellite-based tool for the quantification of CH<sub>4</sub> emissions over Europe (AUMIA v1.0) – Part 1: forward modelling evaluation against near-surface and satellite data**

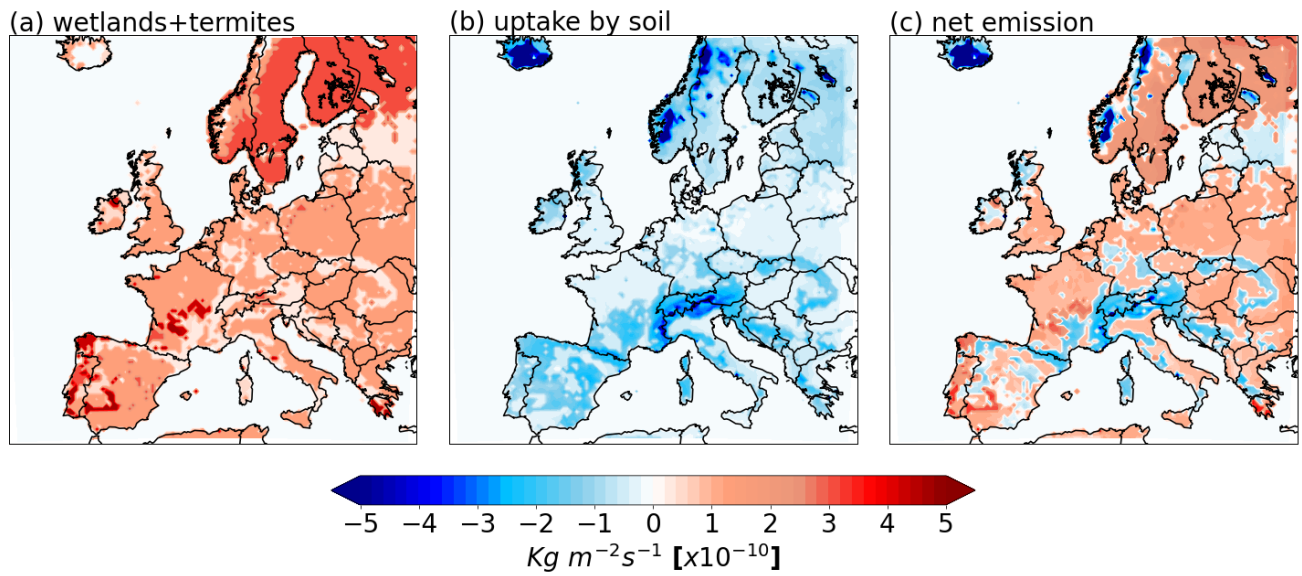
**Angel Liduvino Vara-Vela et al.**

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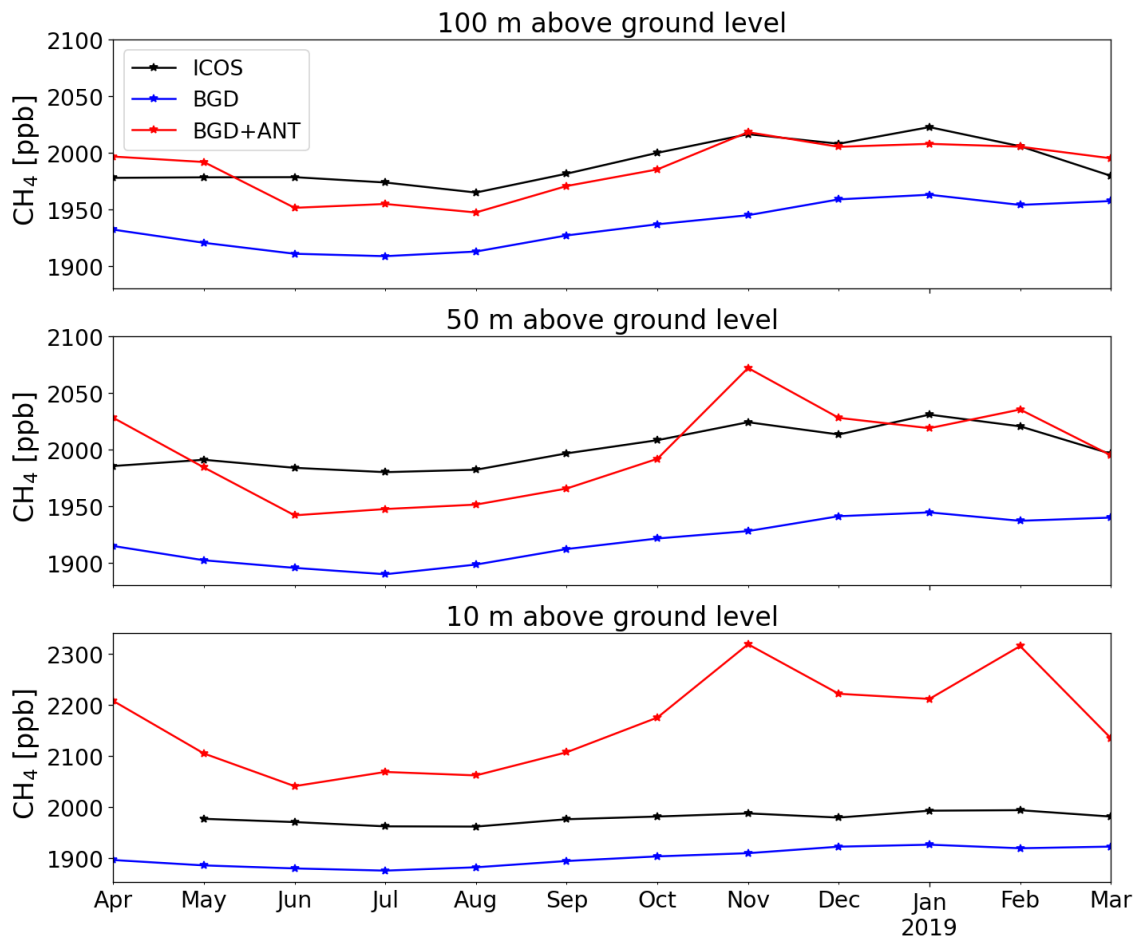
1 Supplement

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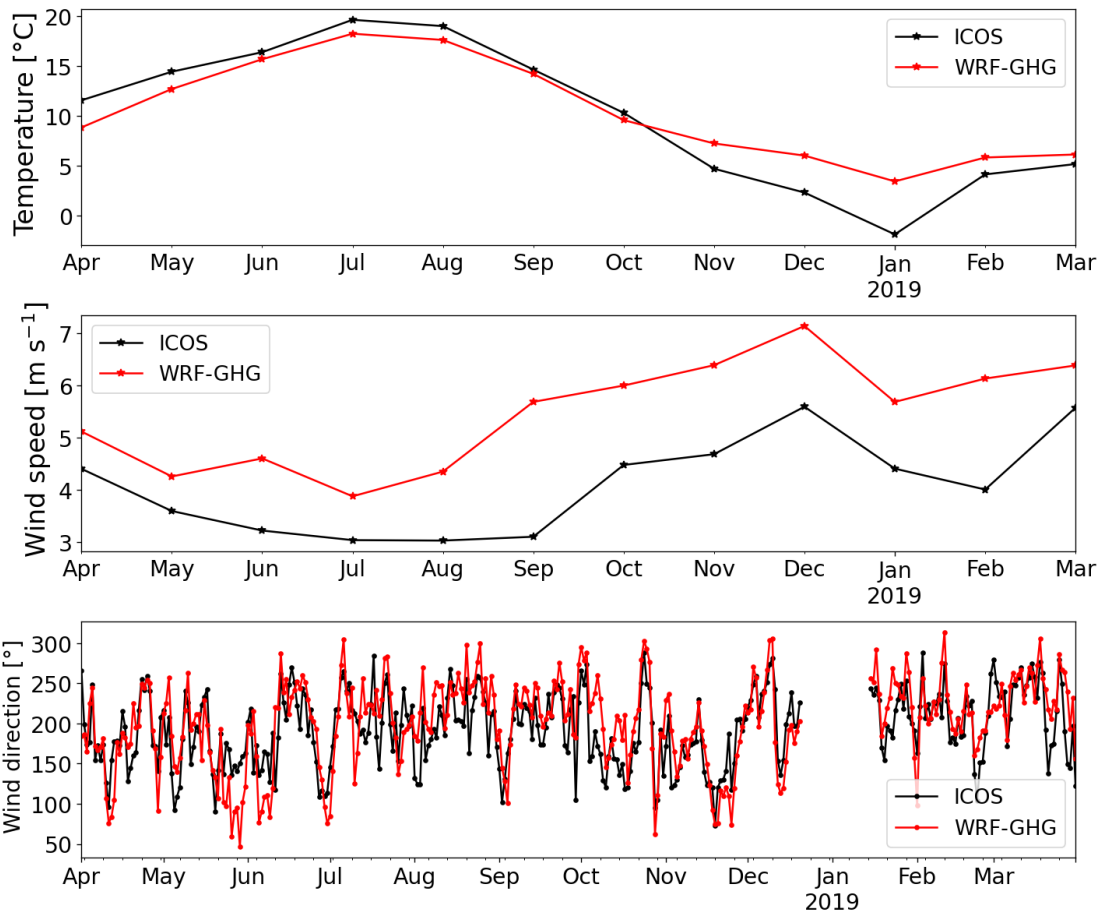
**Figure S1.** Temporal mean spatial distribution of  $\text{CH}_4$  emission rate for natural sources (wetlands and termites) and sinks (soil uptake) in the 30 km modeling domain, averaged over the period from May 1 to 31, 2018..

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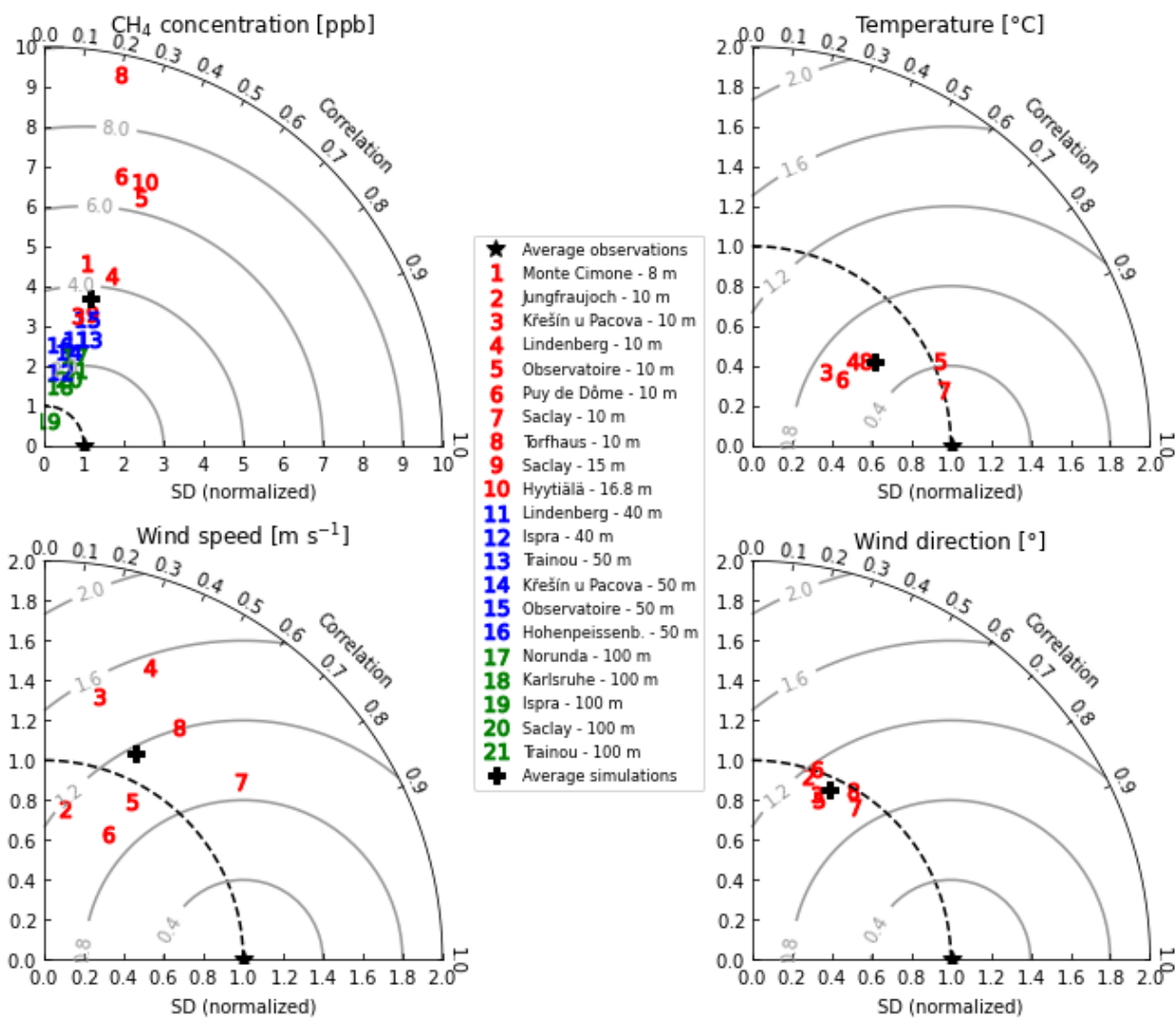
**Figure S2.** Monthly mean concentrations of observed (ICOS) and simulated (BGD and BGD+ANT) CH<sub>4</sub> at 10, 50 and 100 m above ground level for all stations. BGD and ANT represent the simulated concentrations from background and anthropogenic sources, respectively. The mean concentrations were computed based on quality-controlled ICOS CH<sub>4</sub> data. Contributions from natural sources (wetlands and termites) and biomass burning were not relevant during the study period.

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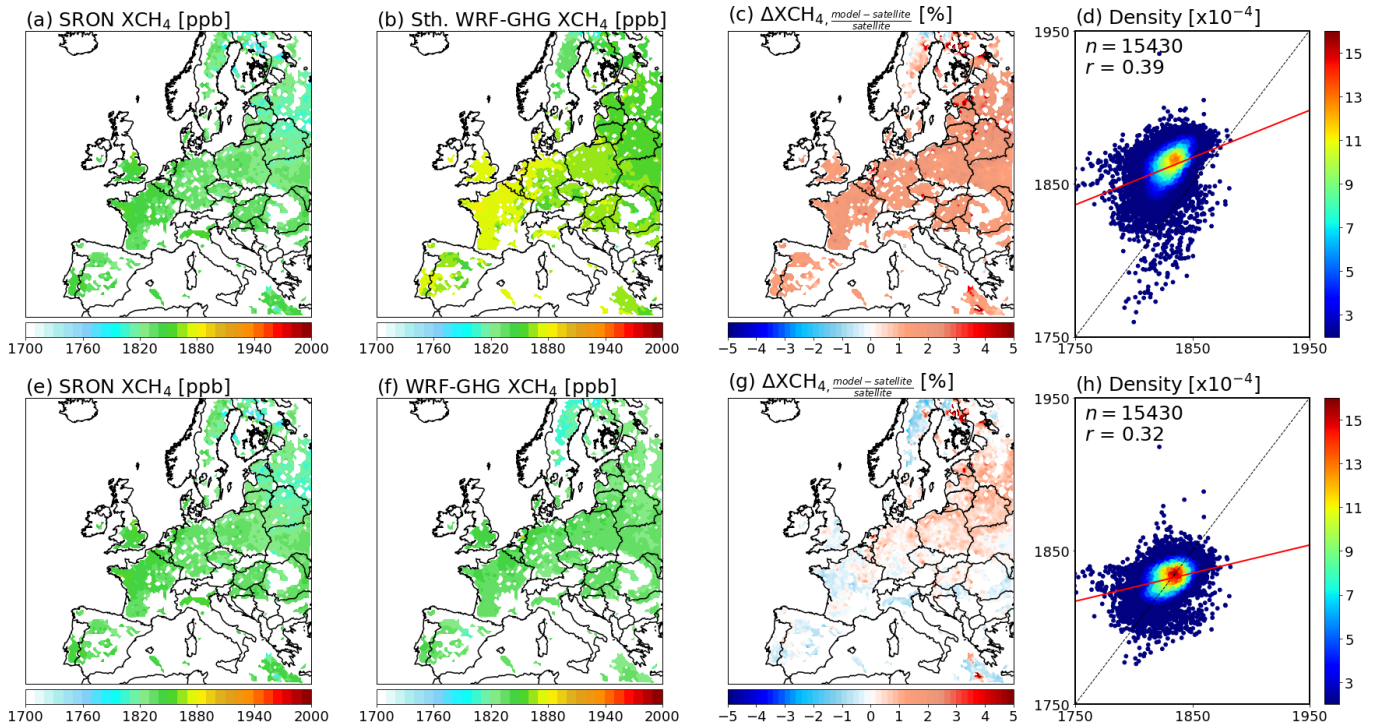
**Figure S3.** Monthly (and daily) mean values of observed and simulated temperature, wind speed (and wind direction) at 10 m above ground level. The mean concentrations were computed based on quality-controlled ICOS data.

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**Figure S4.** Correlation coefficients and standard deviation (SD) model to observation ratios for CH<sub>4</sub> concentrations, temperature, wind speed and wind direction. The numbers in red, blue and green represent ICOS stations with data with sampling heights between 8.0–16.8 m, 40–50 m, and 100 m, respectively (see Table 3 for station details).

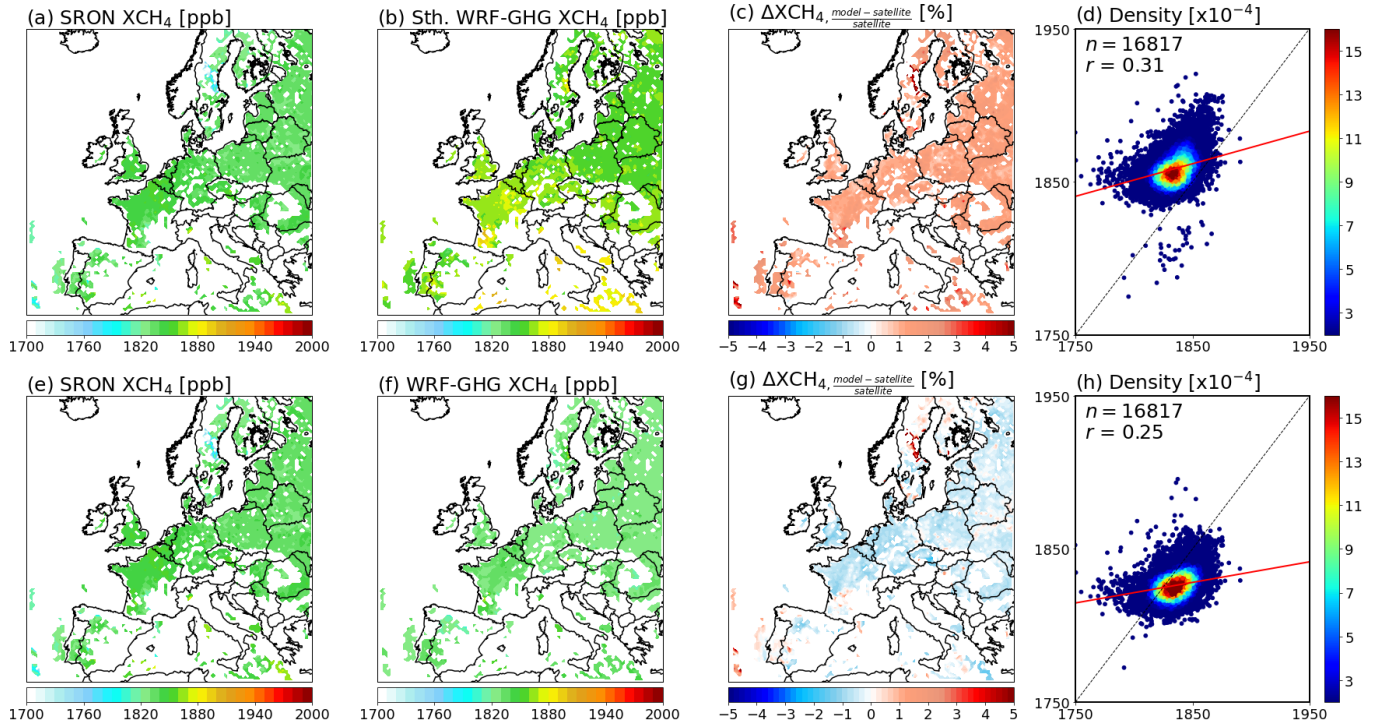
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172 **Figure S5.** Temporal mean spatial distributions of XCH<sub>4</sub> concentration from SRON RemoTeC-S5P (panels a and e) and WRF-  
173 GHG estimates with and without smoothing (panels b and f, respectively), along with their relative differences (panels c and g),  
174 averaged over the period from April 1 to April 30, 2018.

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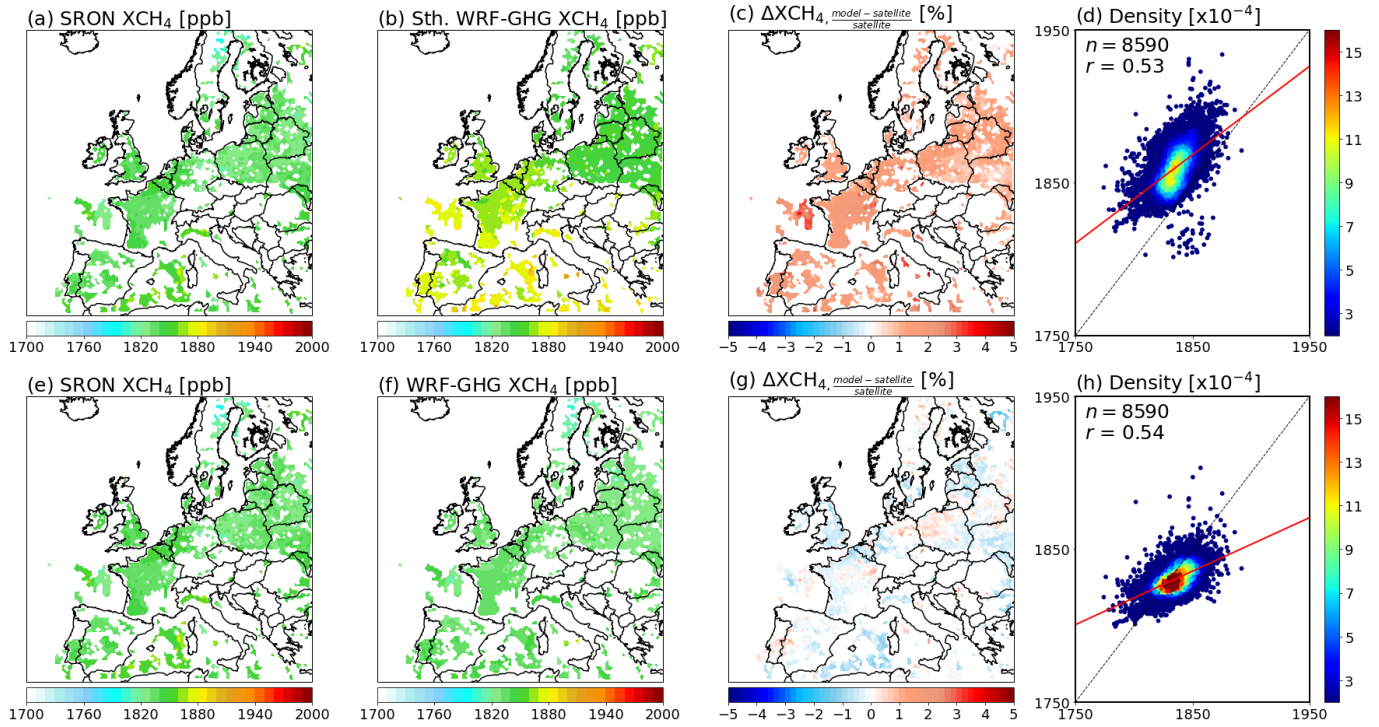
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194 **Figure S6.** Temporal mean spatial distributions of XCH<sub>4</sub> concentration from SRON RemoTeC-S5P (panels a and e) and WRF-  
195 GHG estimates with and without smoothing (panels b and f, respectively), along with their relative differences (panels c and g),  
196 averaged over the period from May 1 to May 31, 2018.

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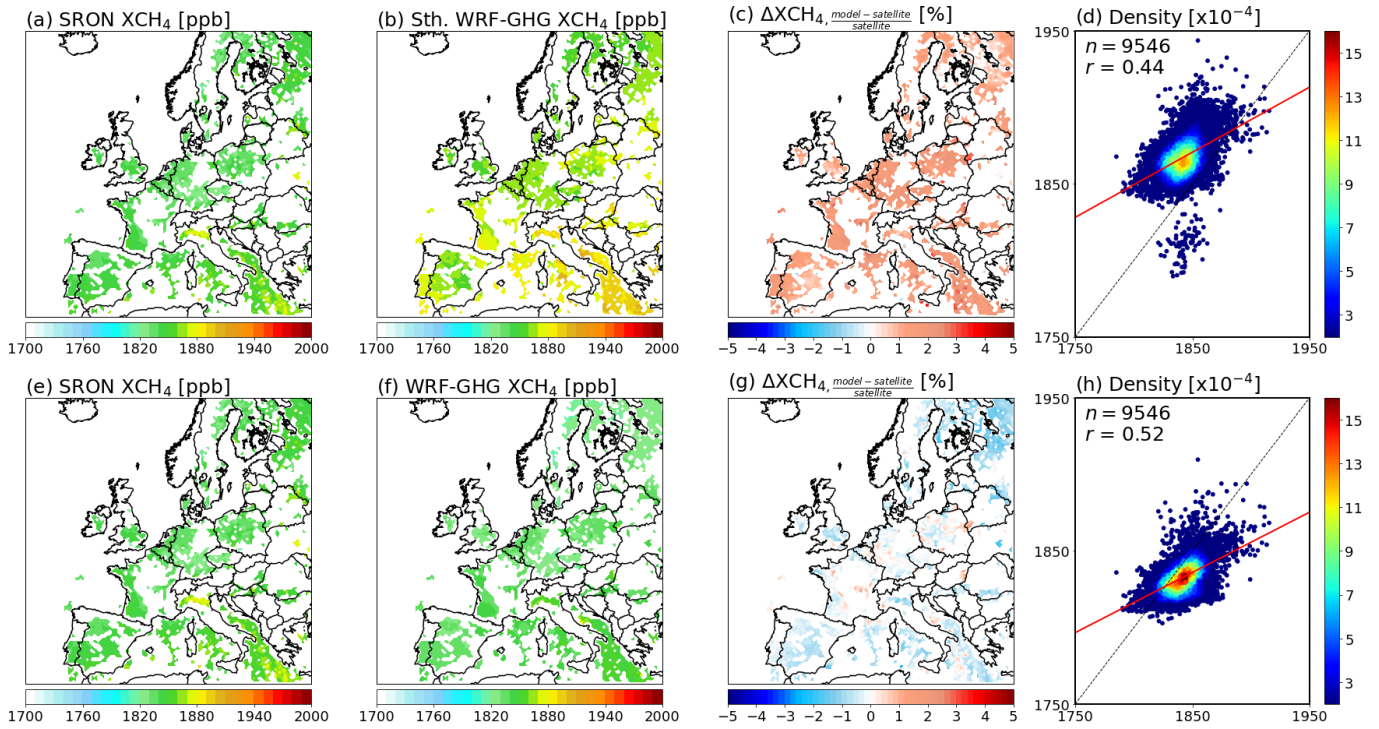


217 **Figure S7.** Temporal mean spatial distributions of XCH<sub>4</sub> concentration from SRON RemoTeC-S5P (panels a and e) and WRF-  
218 GHG estimates with and without smoothing (panels b and f, respectively), along with their relative differences (panels c and g),  
219 averaged over the period from June 1 to June 30, 2018.

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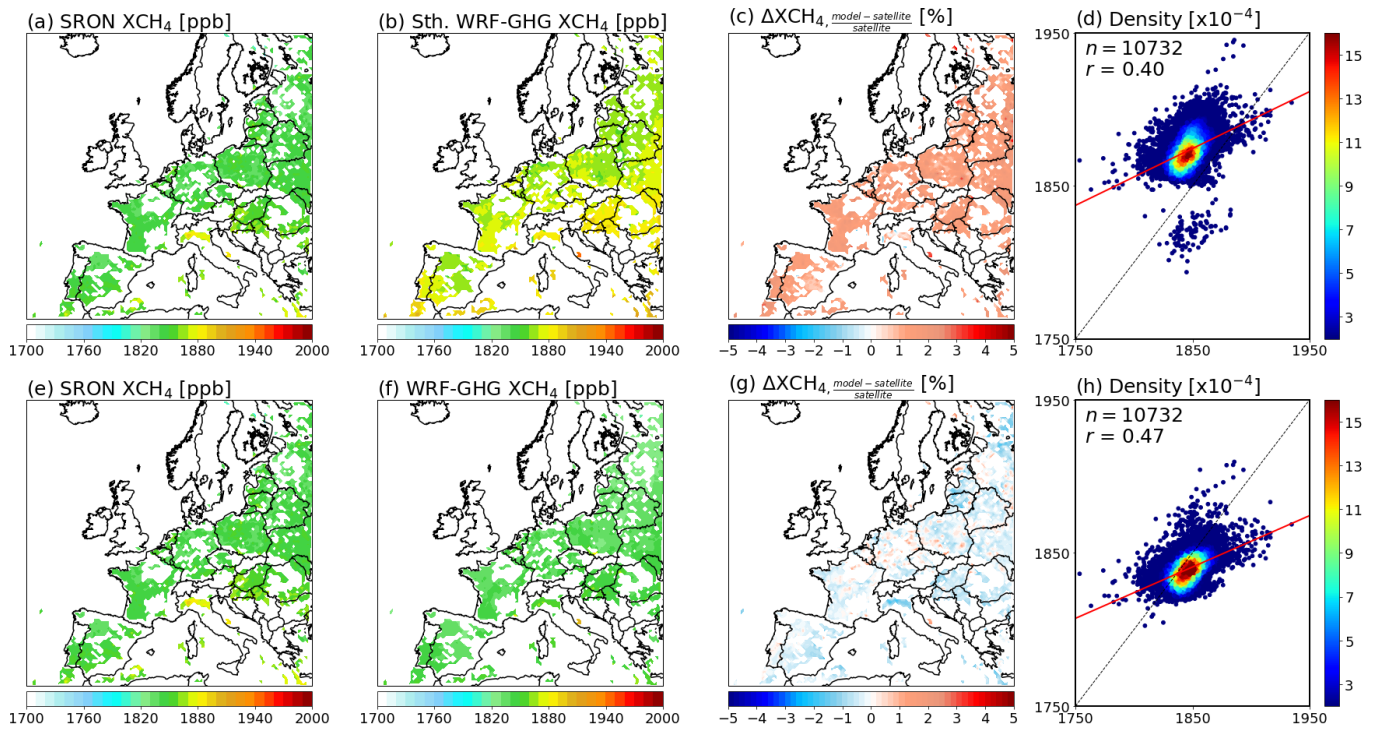
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242 **Figure S8.** Temporal mean spatial distributions of XCH<sub>4</sub> concentration from SRON RemoTeC-S5P (panels a and e) and WRF-  
243 GHG estimates with and without smoothing (panels b and f, respectively), along with their relative differences (panels c and g),  
244 averaged over the period from July 1 to July 31, 2018.

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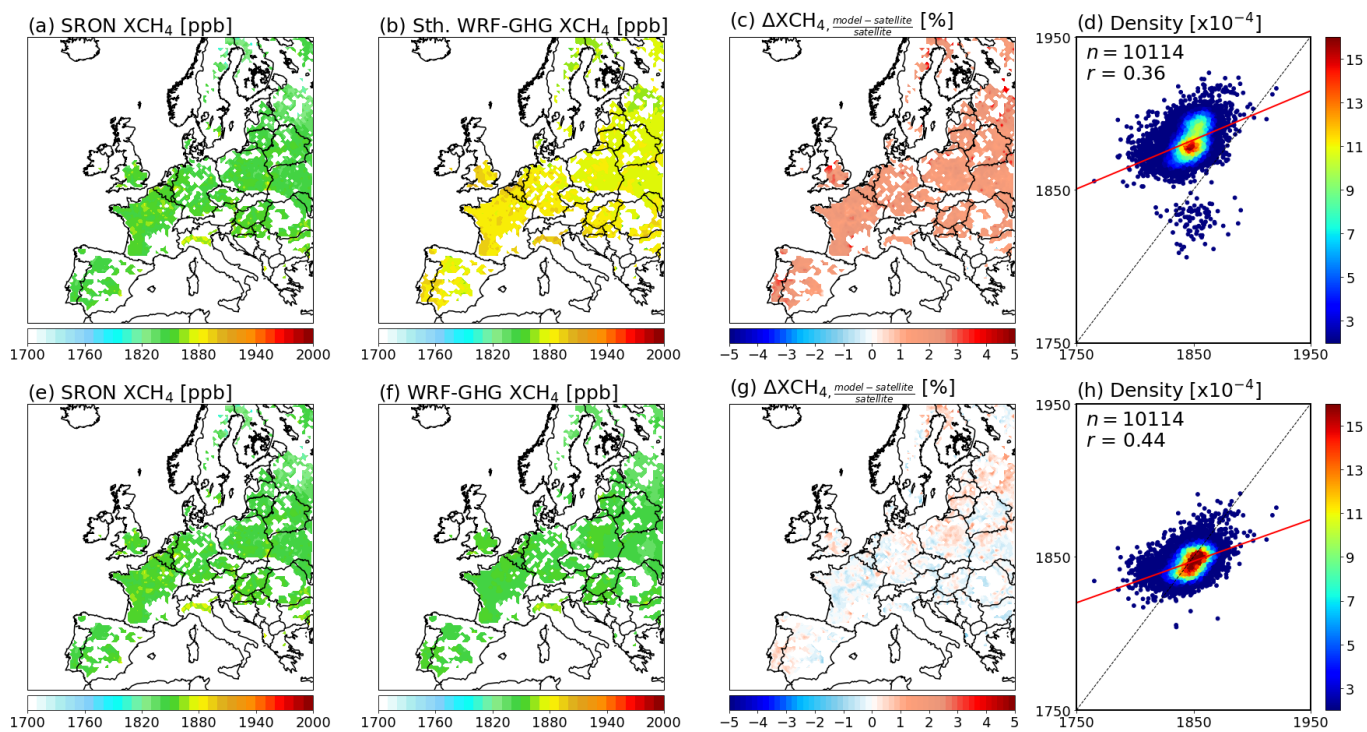
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264 **Figure S9.** Temporal mean spatial distributions of XCH<sub>4</sub> concentration from SRON RemoTeC-S5P (panels a and e) and WRF-  
265 GHG estimates with and without smoothing (panels b and f, respectively), along with their relative differences (panels c and g),  
266 averaged over the period from August 1 to August 31, 2018.

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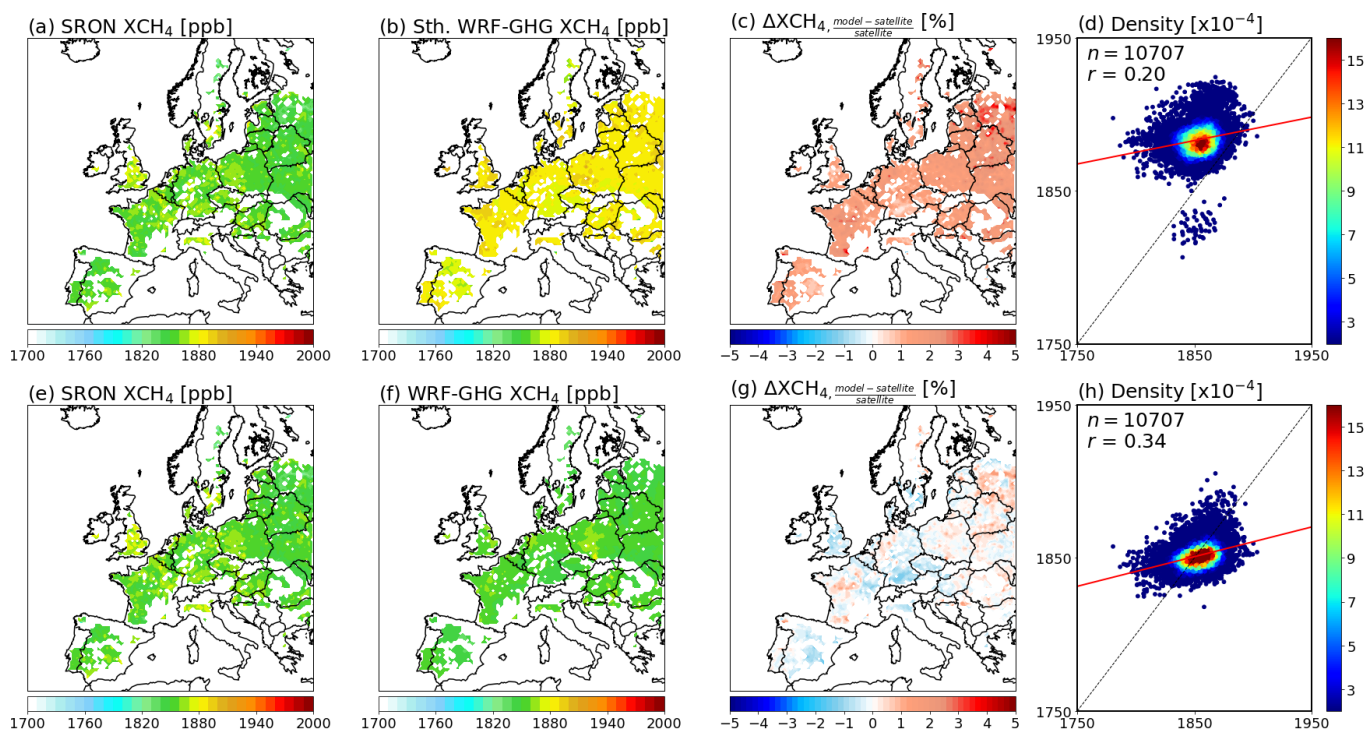
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288 **Figure S10.** Temporal mean spatial distributions of XCH<sub>4</sub> concentration from SRON RemoTeC-S5P (panels a and e) and  
289 WRF-GHG estimates with and without smoothing (panels b and f, respectively), along with their relative differences (panels c  
290 and g), averaged over the period from September 1 to September 30, 2018.

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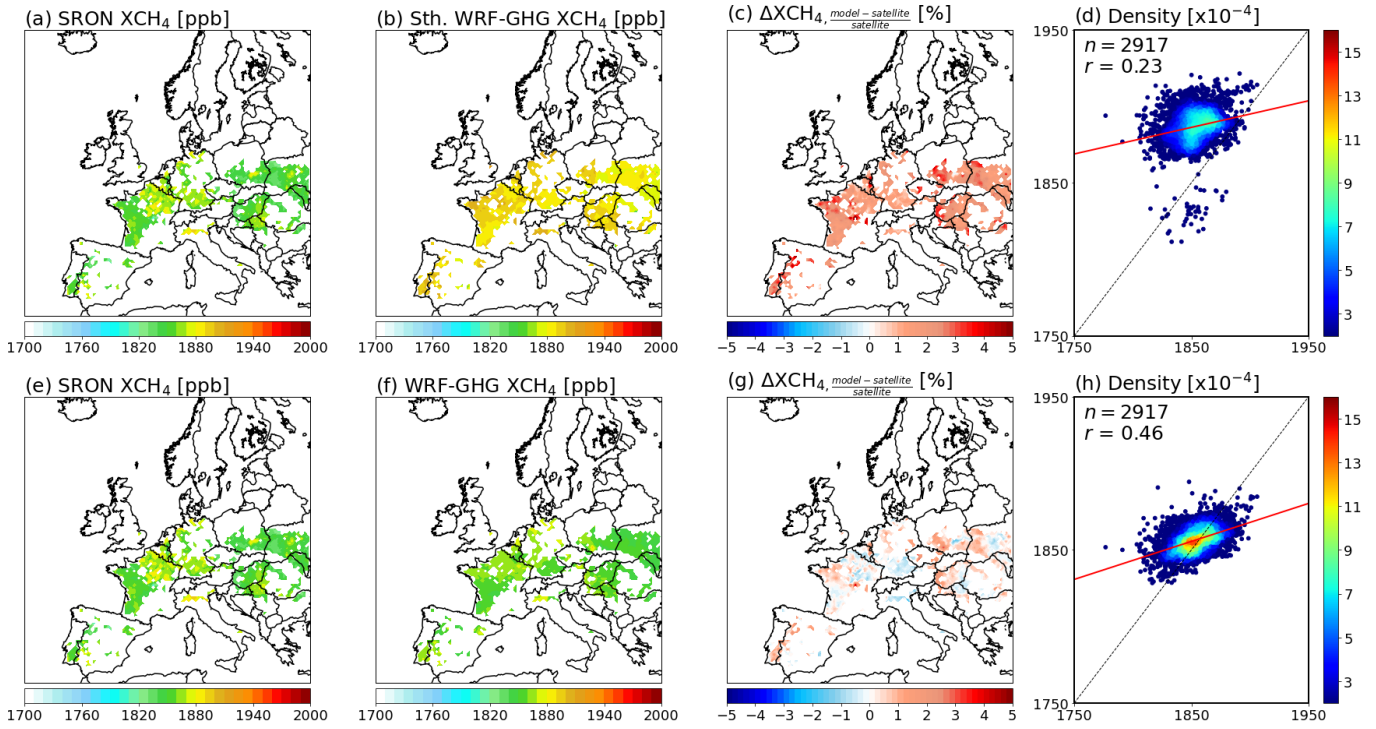
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310 **Figure S11.** Temporal mean spatial distributions of XCH<sub>4</sub> concentration from SRON RemoTeC-S5P (panels a and e) and WRF-  
311 GHG estimates with and without smoothing (panels b and f, respectively), along with their relative differences (panels c and g),  
312 averaged over the period from October 1 to October 31, 2018.

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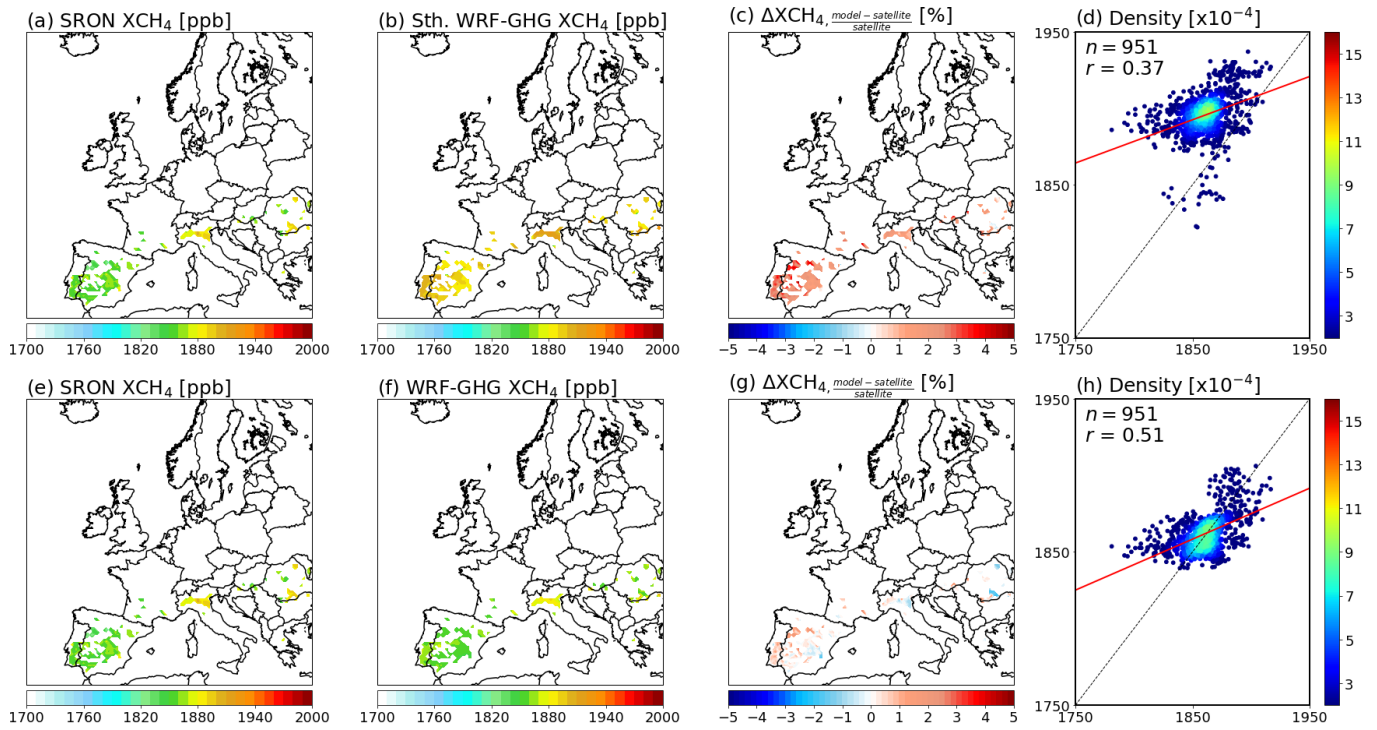
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334 **Figure S12.** Temporal mean spatial distributions of XCH<sub>4</sub> concentration from SRON RemoTeC-S5P (panels a and e) and  
335 WRF-GHG estimates with and without smoothing (panels b and f, respectively), along with their relative differences (panels c  
336 and g), averaged over the period from November 1 to November 30, 2018.

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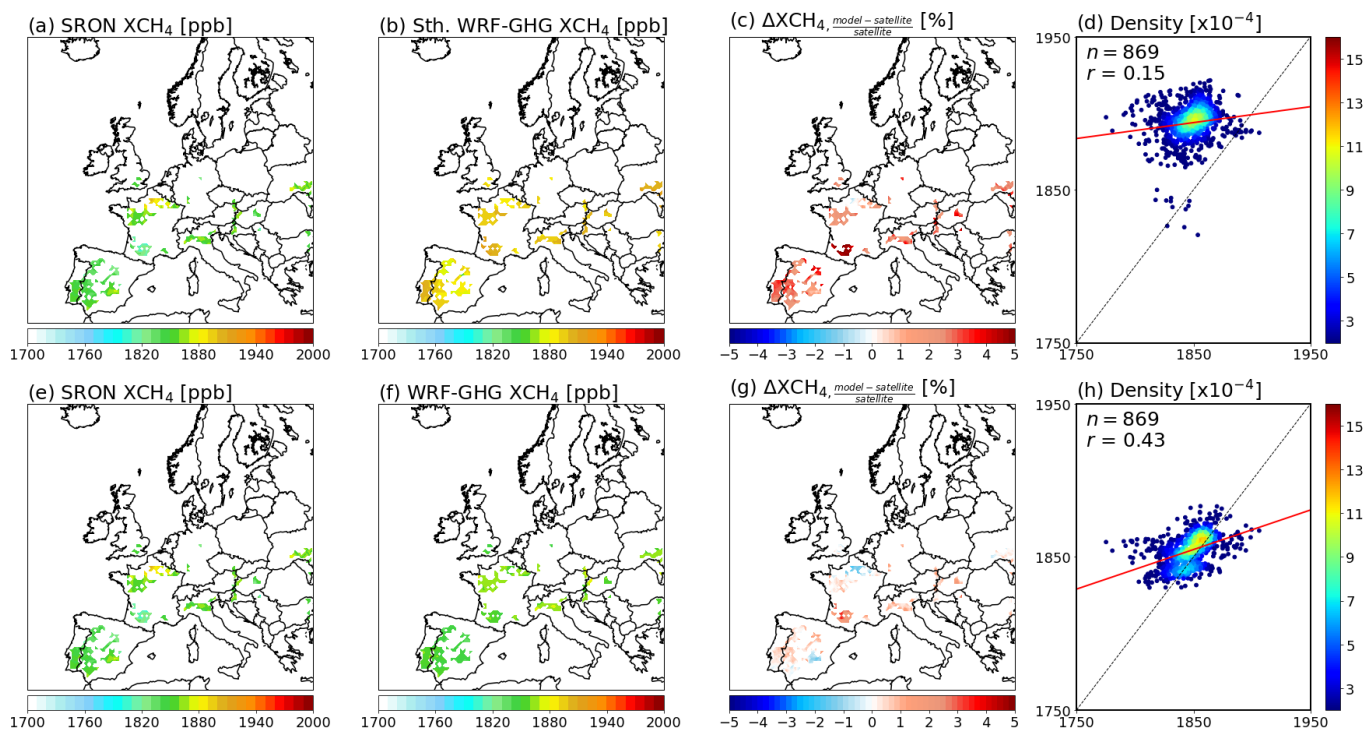
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357 **Figure S13.** Temporal mean spatial distributions of XCH<sub>4</sub> concentration from SRON RemoTeC-S5P (panels a and e) and  
358 WRF-GHG estimates with and without smoothing (panels b and f, respectively), along with their relative differences (panels c  
359 and g), averaged over the period from December 1 to December 20, 2018.

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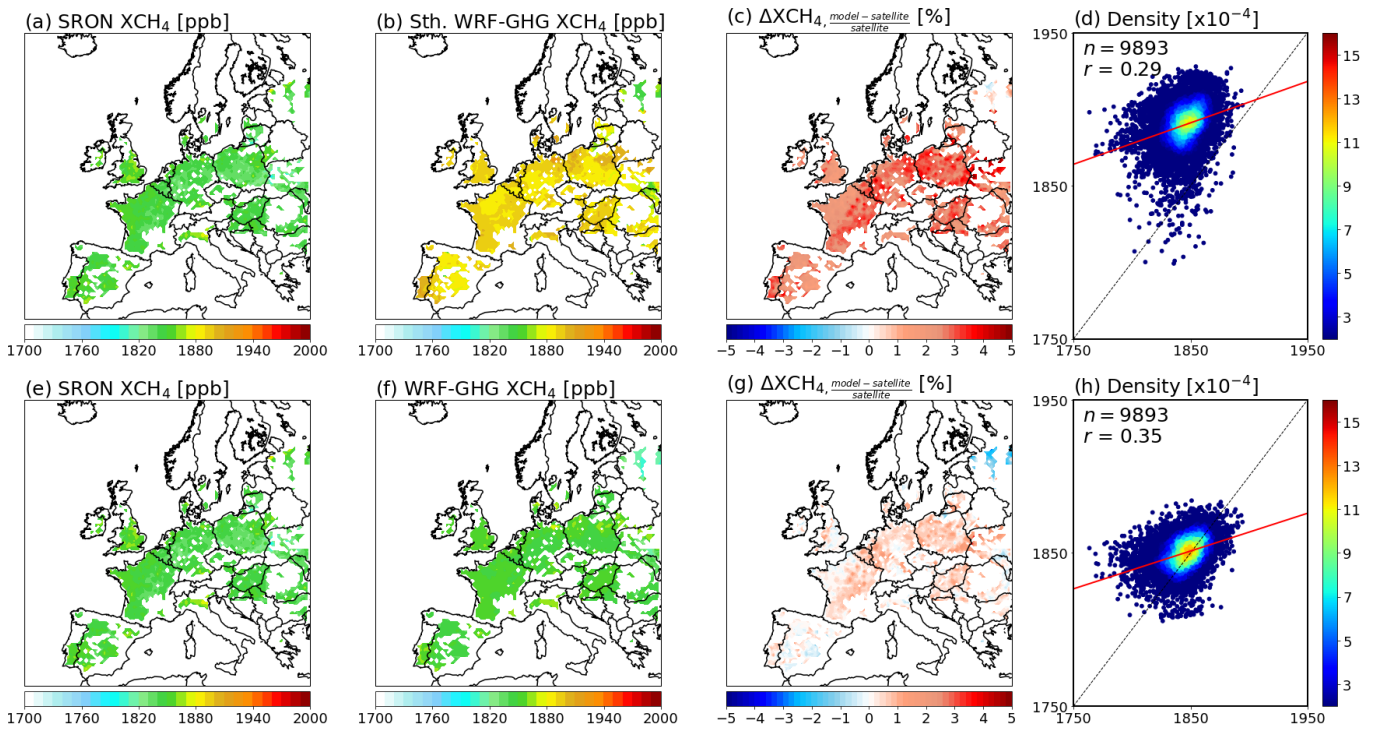
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381 **Figure S14.** Temporal mean spatial distributions of XCH<sub>4</sub> concentration from SRON RemoTeC-S5P (panels a and e) and  
382 WRF-GHG estimates with and without smoothing (panels b and f, respectively), along with their relative differences (panels c  
383 and g), averaged over the period from January 15 to January 31, 2019.

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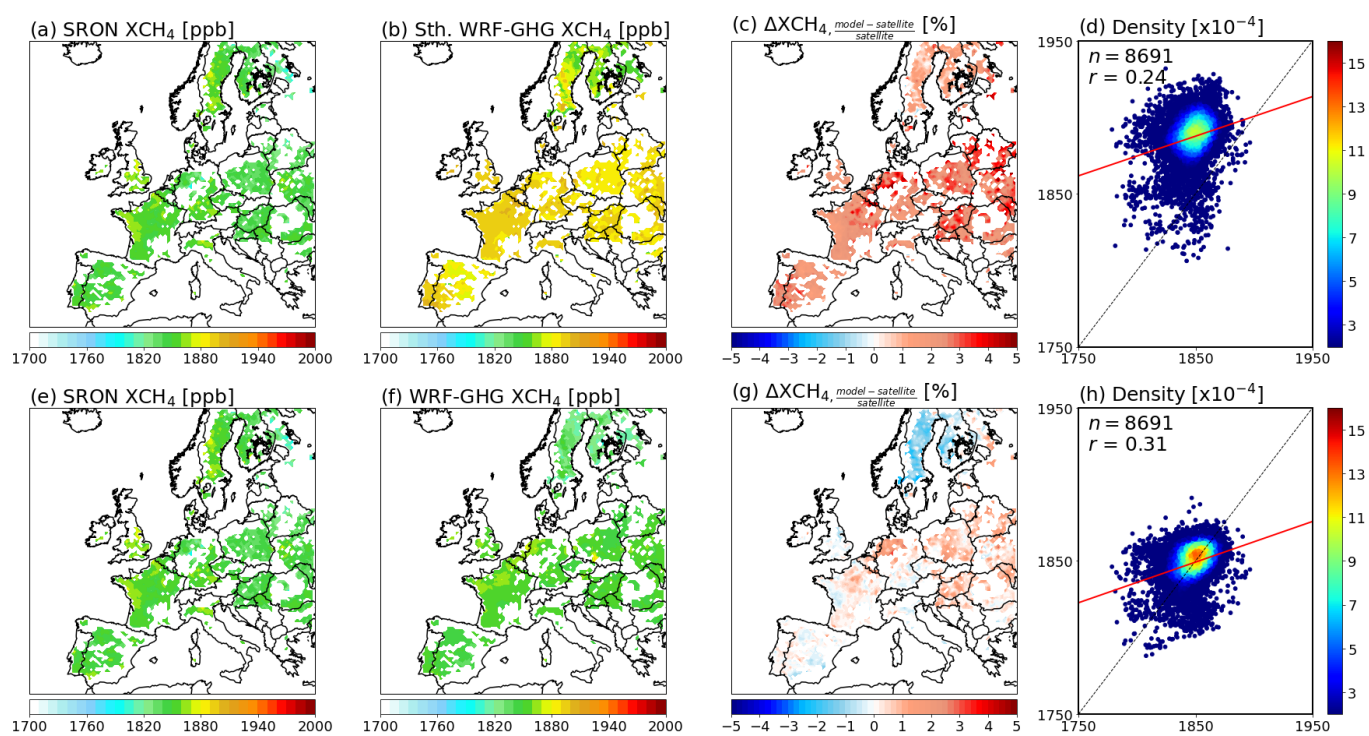


403 **Figure S15.** Temporal mean spatial distributions of XCH<sub>4</sub> concentration from SRON RemoTeC-S5P (panels a and e) and  
404 WRF-GHG estimates with and without smoothing (panels b and f, respectively), along with their relative differences (panels c  
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427 **Figure S16.** Temporal mean spatial distributions of XCH<sub>4</sub> concentration from SRON RemoTeC-S5P (panels a and e) and  
428 WRF-GHG estimates with and without smoothing (panels b and f, respectively), along with their relative differences (panels c  
429 and g), averaged over the period from March 1 to March 31, 2019.

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