

Interactive  
Comment

## ***Interactive comment on “Inverse modeling of European CH<sub>4</sub> emissions: sensitivity to the observational network” by M. G. Villani et al.***

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### **Consistency of the prior distribution**

We further addressed the issue on the consistency of the prior distribution.

We analyzed the frequency distribution of the true emissions versus the *a priori* in the European domain. The attached figure 1 shows the frequency and cumulative frequency distributions of the true emissions versus the *a priori* over the land for the NWE, and the En-EU27 European regions. Here, the distribution of the true emissions is shown in black lines. Solid blue lines represent the value for the *a priori*, and dash blue lines the value corresponding to 300% of the *a priori*. For the only scenario S1 (taken here as an example), the *a posteriori* distribution is plotted in green lines.

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By looking at the cumulative frequency distributions, the percentage of the true emissions lying within 300% of the prior emissions are 90% and 95% for the NWE and en-EU27 respectively.

From the *a posteriori* frequency distribution for S1, very low and the high emissions are less dominant in the posterior. In particular, hot spots regions having emissions values larger than about 50 mg CH<sub>4</sub> /m<sup>2</sup>/ day will be hardly retrieved by the system.

The revised version of the manuscript will contain a summary description of these findings.

### Correlation between grid cells

*“The authors use a correlation length of 50km and a mesh of 1 degree (about 75km in Europe) and claim correlations about 0.6. I would expect rather smaller values.*

There was indeed an error.

The value for the correlation between grid cells is about 0.37, in agreement with the formula we used (see earlier reply). In support of this, using different values of the correlation length L (10 km, 50 km, 100 km, 200 km, 300 km, 500 km respectively) we calculated the B matrix (parameter error covariance matrix), and, for the European domain, we plotted the B matrix values versus distances. Results are in the attached figure 2. Here we see that at a given correlation length (e.g. 100 km), over the same distance (e.g. 100 km) the correlation value between grid cells is about 0.37.

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