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# ***Interactive comment on “Elevated uptake of CO<sub>2</sub> over Europe inferred from GOSAT X<sub>CO<sub>2</sub></sub> retrievals: a real phenomenon or an artefact of the analysis?”*** **by L. Feng et al.**

## **Anonymous Referee #2**

Received and published: 19 February 2015

After Reuter et al. (2014), Feng et al. specifically address the current inconsistency between satellite-based atmospheric inversions and other sources of information about Europe’s carbon sink. Both studies present a series of sensitivity tests (some tests being rather similar between the two), but they come to a different conclusion. The reason for the divergence is not made explicit, which is all the more surprising that four scientists (half of the current team) co-author both papers. The heart of the present study seems to lie in the short fourth section (“Bias estimation”) that clearly contradicts Reuter et al.: it would deserve more substance. For instance, can the authors demonstrate the superiority of INV\_ACOS\_INS and INV\_UOL\_INS compared to the others

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(inc. INV\_TCCON); are the inferred retrieval biases consistent with misfits to TCCON; can the inferred biases be linked to physical variables? I note that the correction to the West-East retrieval gradient reaches nearly 1 ppm during some months, which is considerable.

In summary, I would therefore only recommend publication if an extra depth of analysis is provided that clearly shows the added value of the new sensitivity tests and justifies the change of conclusion.

### Detailed comments

- Abstract and introduction: the text suggests that current knowledge about regional carbon fluxes comes from atmospheric inversions, but actually most of it comes from process models, flux measurements and inventories.
- As shown throughout the text, the inversion uncertainties are unrealistically small. Does this come from a flaw in their computation or from a flaw in the inversion configuration? Less striking, the prior global uncertainty seems to be quite small (p.1994, l.13) given the type of prior fluxes used. Last, as it is presented, the sensitivity test about the prior uncertainty suggests that the uncertainty about the prior error covariance matrix drives the satellite-based inversion, leaving not much value to the other sensitivity tests, hence to a large part of the paper.
- p.1994, l.15: this is minor, but the reader may wonder why in situ (continuous) measurements are discarded.
- p.1994, l.16: GGG2012 had known problems that can be damped at least with the recommended bias correction ([https://tcccon-wiki.caltech.edu/Network\\_Policy/Data\\_Use\\_Policy/Data\\_Description\\_GGG2012#Laser\\_Sampling\\_Errors](https://tcccon-wiki.caltech.edu/Network_Policy/Data_Use_Policy/Data_Description_GGG2012#Laser_Sampling_Errors)) but the authors seem not to have used it.

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- The comparison to HIPPO would deserve more details, or it should be removed.
- p.1998, l.9-11: it is not clear how the authors come to this conclusion.
- p.1998, l.19-21: the role of this sentence in the logic is not clear.

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Interactive comment on Atmos. Chem. Phys. Discuss., 15, 1989, 2015.

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