**Atmospheric
Chemistry
and Physics
Discussions**

Interactive comment on "WRF-Chem simulations in the Amazon region during wet and dry season transitions: evaluation of methane models and wetland inundation maps" *by* V. Beck et al.

Anonymous Referee #1

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General comments

In this paper a model-measurement comparison is presented for atmospheric methane in the Amazon basin. For two monthly periods (November 2008 and April 2010) airplane observations using flasks and continuous CRDS measurements are compared with WRF-Chem simulated mixing ratios. Two different wetland methane emission models are tested using three different wetland inundation mapping data sets. All driving meteorology for the emission models base on the WRF meteorology. Boundary conditions are taken from a global TM5 model simulation and analysed ECMWF meteorology.

The paper is generally well written and is of interest as one of the first papers that deals with the issue of methane emissions from the Amazon region in this detail and based on actual observations that are very scarce in this region. After some minor corrections and some improvements, as indicated in the following, the article is worth publishing.

Specific comments

From the evaluation of the meteorological performance of the WRF model against observations in section 4.1 we can see that significant model errors (vertical diffusion, convection) occur that will influence the transport of methane and the underlying couple flux models due to biases in temperature and most importantly rainfall (both timing and absolute values). The overestimation of rainfall with a factor of two will of course bias the inundation models in this region to a large extent. The influence of this bias on the water tables and sensitivity for the corresponding calculated methane emissions should be quantified. It could well be that biases in vertical transport now get balanced by contrasting biases in emissions, leading to erroneous conclusions on emission estimates.

I would prefer to completely leave out the Keppler et al (2006) based CH4 emissions from the paper.

The selection of "good" and "bad" flights (section 4.3.2) is not made transparent and should be based on objective criteria. There is a large risk of biasing the results by using evaluations based on "expert" evaluation of data by the eye.

From the description in the paper it is completely unclear how the adjustment of the wetland fluxes in section 4.3.3 has been carried out. We could assume that a LSQ fit has been carried out to find a best fitting adjustment factor for the wetland flux, but this need to be explained. Also the uncertainty of these factors should be evaluated, as well as the gain in forward performance (biases, r2) of the WRF modelled mixing ratios after applying these updated factors.

Technical comments

22827-1+22838-7 significantly -> substantially

22837-4 To present the work in the paper as an "inverse modelling framework" is stretching things too far, only forward modelling is being presented.

22845-2 describe PREP_CHEM_SRC-1.0 (standard WRF-Chem emission preprocessor fortran source code)

22857-22+29 significant: state significance level

22861-22 factor two -> factor of two

22862-10 As last -> As a last

22862-20 denotes -> predicts

22864-11 state -> conclude

22864-17 Should better read something like: From comparison with the aircraft observations we conclude that the choice of the wetland inundation map that defines the distribution of the inundated areas is more important than the choice of the wetland model.

22864-21 significantly »> state significance level or change: significantly -> substantially

22866-10 unclear, please rephrase

22866-14 allow for -> put on

Figures 1-5 are too low resolution and almost all too small.