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Atmospheric Measurement Techniques Discussions

Interactive comment on "Regional uncertainty of GOSAT XCO_2 retrievals in China: Quantification and attribution" *by* Nian Bie et al.

Anonymous Referee #1

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The paper shows an inter-comparison between the 5 main CO2 retrieval algorithms from GOSAT over China and a comparison to an atmospheric transport model to study regional "uncertainties" in XCO2 retrievals under different conditions (ranging from anthropogenic emissions of CO2 and aerosols to desert conditions with no CO2 emissions but natural aerosols).

The paper is interesting to the CO2 remote sensing community although in the end it stays rather inconclusive. The reason is that there is no absolute reference for the true XCO2 in this study. The conclusions that are being drawn are based on (in-)consistency between different retrieval algorithms and comparison to the GEOS-CHEM model and are hence to large extend speculative. The discussion on the aerosol and albedo effect stays qualitative while a more quantitative analysis would be of inter-

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Discussion paper

est here.

I suggest to revise the paper to include a more quantitative analysis of the effect of aerosols and albedo on differences in retrieved XCO2 between different algorithms. This analysis should show to what extend the differences between algorithms, and between retrieved and models XCO2, are correlated with AOD and surface albedo. When such an analysis is included I recommend publication of the manuscript in AMT.

Other points: - How accurate are the XCO2 values modeled by GEOS-CHEM? The paper would benefit from a demonstration of the capability of GEOS-CHEM, for example from a comparions with TCCON (albeit outside the study region). - EMMA should be excluded from the analysis in this paper as it is not a retrieval algorithm itself but is composed from the different algorithms that are also analyzed in the present study. In fact, each EMMA value is the XCO2 retrieved by one of the algorithms that is closest to the median value for a given grid box. By including it in this study it correlates algorithm to itself. - A proper reference should be made to EMMA as a tool to study consistency between different algorithms, like is being done in the present study. -Line 132 states: " The recommended bias corrections are applied to the collected XCO2 data from ACOS, OCFP and SRFP". What is meant here? The files for both products already contain bias corrected products. Have these been used? - Line 364 stated:" while Aerosol Optical Depth (AOD) is greatly affected by high surface albedo because of the optical lengthening effect.". What is meant here? AOD is not affected by surface albedo. - The additional analysis of the new ACOS V7.3 product is confusing. It should either be used in the full analysis or the discussion should be shortened by only stating to what extend the conclusions would be different if the ACOS V7.3 product would have been used. The more detailed analysis could be moved to an appendix.

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