**Atmospheric
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Interactive
Comment

Interactive comment on "Error characterization of CO$_2$ vertical mixing in the atmospheric transport model WRF-VPRM" *by* R. Kretschmer et al.

Anonymous Referee #1

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This paper examines the error of simulated CO2 mixing ratio associated with the PBL vertical mixing in the model. Numerical simulations using the WRF-VPRM model with YSU and MYJ PBL parameterizations are performed and compared to assess this source of error. A reshuffling method to reconcile CO2 mixing ratios for different mixing layer heights is presented and tested. As pointed out in the paper, model vertical mixing is an important source of error that hinders CO2 source / sink inversion. By using the YSU case as the truth and MYJ as the model, this paper can quantify this error, which is an important step forward toward better estimation of CO2 surface fluxes. The paper is well presented in general. Minor revisions listed below may help improve the paper. 1. It will help the reader to better appreciate the importance of the error discussed here if the paper provides some information (either through citation of papers or the authors' own inversion) about how much error in inverse CO2 fluxes can be caused by the 3ppm

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model bias associated with PBL mixing. 2. Clarify when dry air mixing ratio is used and when total mixing ratio is used, especially for equations. 3. Page 28178 line 25, below Equation (3), "entrainment and vertical advection...". Is the wi part referred to as advection here, or the other part?

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Interactive comment on Atmos. Chem. Phys. Discuss., 11, 28169, 2011.