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Interactive comment on "Integrating aquatic and terrestrial biogeochemical model to predict effects of reservoir creation on CO$_2$ emissions" *by* Weifeng Wang et al.

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I just want to clarify that FAQ-DNDC (this study) is not a combination of FF-DNDC (Kim et al., 2016) and SIWAS (Wang et al., 2016). FF-DNDC and FAQ-DNDC are more like brothers rather than father and son.

Indeed, FF-DNDC is the first attempt to simulate the effects of deep flooding (i.e. reservoir conditions) on soil carbon efflux from forests and peatlands based on the soil biogeochemistry. FAQ-DNDC aims to predict the effects of flooding terrestrial ecosystems (e.g., forests in this study) on reservoir surface CO2 emissions. For both models, the backbone of soil/sediment organic carbon dynamics is "DNDC" (Li et al., 1997). However, the two models are different in terms of the representation of overlying water

column processes due to their different development purposes aforementioned. The FF-DNDC model treats the water column processes using a simple empirical equations and prescribed parameters, such as sedimentation and aquatic primary production rate (0.16 g C m-2 d-1) and the open water period (215 days). These simple functions and prescribed parameters are not used in the FAQ-DNDC model. Instead, to simulate reservoir CO2 emissions, the FAQ-DNDC model includes important physical and biogeochemical processes such as water vertical movement and DOC/DIC/POC dynamics in the water column and gas/mass exchange across air–water and water–sediment interfaces through integrating a lake carbon model (Hanson et al., 2004), a thermal and water stratification model (Wang et al., 2016), and Forest-DNDC (Li et al., 2005, Miehle et al., 2006).

FF-DNDC and FAQ-DNDC are different, although they have similar characters in the sediment organic carbon dynamics. I believe that FF-DNDC should be mentioned in the introduction other than in the model description.

Q: "Is there any improvement with the addition of the water column model?"

A: In this study, the lake carbon model (Hanson et al., 2004) and the thermal and water stratification model (Wang et al., 2016) are integrated to simulate carbon processes in the water column, which is the "future plan" for FF-DNDC to predict reservoir surface CO2 emissions (Kim et al., 2016). Please note that FF-DNDC only includes a simple empirical-based water column module that does not include detailed biogeochemical processes like DOC decomposition in the water column in terms of its purpose. However, in the FAQ-DNDC model, the biogeochemical and physical processes such as DOC, POC, DIC dynamics in the water column, gas exchange across air–water interface, and mass transfer across water–sediment interface are considered (see section 2.1.1).

Q: "Was the Forest-DNDC model modified compared to the version of Kim et al. 2016"

A: There are many differences in modifying Forest-DNDC between FF-DNDC and FAQ-

DNDC. FF-DNDC modified the parameters and functions of DNDC for the flooded simulations. However, the most modifications (e.g., new DIC pool in each sediment layer, diffusion processes within the sediment and sediment-water interface) described in section 2.1.3 in this study are not applicable for FF-DNDC.

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