Biogeosciences Discussions

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Comment on bg-2022-218

Santosa Sandy Putra (Referee)

Referee comment on "A process-based model for quantifying the effects of canal blocking on water table and CO_2 emissions in tropical peatlands" by Iñaki Urzainki et al., Biogeosciences Discuss., https://doi.org/10.5194/bg-2022-218-RC1, 2022

Tropical peatlands has been drained in the past decades, causing in low water-table conditions, peat decomposition and subsidence, and also greenhouse gases emissions. Drained tropical peatlands are susceptible to fire and smoke, which might lead to health problems.

In order to mitigate environmental issues caused by tropical peatland drainages, massive efforts have been allocated to restore the drained peatlands. Canal blockings are commonly implemented to increase the water table of drained peatlands, but studies evaluating the performance of those structures are limited.

This study simulates the effectiveness of canal blockings in raising the water table of tropical peatlands over large areas, and the estimation of CO_2 emission reductions resulted by canal blockings. In this study, a process-based hydrological model was developed to simulate the effect of canal blocks in a 22000 ha of tropical peatlands in Sumatra, Indonesia. The water-table dynamics were modelled in two blocks scenarios (with and without blocks), two El Niño–Southern Oscillation (ENSO) scenarios, and four peat hydraulic properties scenarios. The specific yields and the transmissivity of peat were calculated based on literatures and assumed to be varied with depth, following some empirically generated logarithmic equations.

The simulations were performed using two modules, the canal water flow module (CNM) and the peat water flow module (PHM). The canal water flow module (CNM) was using a diffusive wave approximation of the open channel flow equations. The flow through a canal block was modelled using a coefficient that regulates the flow rate and based on canal water-level state. The peat water flow module (PHM) was using a two dimensional groundwater flow equation. Field water-table data are reported and used to check the model results, though the authors recognized that the variation of peatland topography within the modelling cells (50 m × 50 m) does not allow one-to-one comparison between the modelled and the measured water tables to be done.

The authors have done a novel job. This study accommodated the canal and the peatland water-level interaction in a time step basis, which has not been studied and reported before. I find that this study provides meaningful contribution to tropical peatland studies as it provides efficient approach for analysing tropical peatland water management schemes that involve canal blocks.

Nonetheless, I feel the authors could improve this paper by clarifying some issues as highlighted in this review report.

Please also note the supplement to this comment:
https://bg.copernicus.org/preprints/bg-2022-218/bg-2022-218-RC1-supplement.pdf