

## **General Comments**

Murguia-Flores et al., presented a process-based CH<sub>4</sub> consumption model to quantify global soil CH<sub>4</sub> consumption. This version has appropriately addressed comments from two previous reviewers including their major concerns.

The topic is timely and appropriate for GMD. And, the model development, parameterization, global extrapolation, and inter-model comparison are all written and convincingly presented. Below are some of my specific but minor comments.

## **Specific comments**

P1L16 potent greenhouse gas

P1L22 at the global scale

P1L26 “We show that the improved representation of these key drivers of soil methanotrophy results in a better fit to observational data.” Actually, it’s hard to tell is the better model-data fit coming from process representation, driver representation, or just parameterization. But it’s totally fine to conclude that the model improved structurally and parametrically.

P2L5 preindustrial era

P3L11 interannual variability and uncertainty

P5table 1. Values for some critical constants are missing (e.g.,  $k_d$ , A, B)

P13Table 3. What’s the uncertainty of MeMo  $k_0$  parameters?

P19 Figure 4. It’s actually a little bit ambiguous that  $r_N$  is parameterized with N input rate. With the same N input rate ( $\text{gNm}^{-2}\text{y}^{-1}$ ), one can fertilize the system with a monthly frequency verses a daily frequency. Then the actual N retained in the soil will be totally different across the year. Thus, the same N input rate could have different inhibition controls on CH<sub>4</sub> consumption.

P21 Table 7 global soil CH<sub>4</sub> uptake has mean value and uncertainty. It’s not clear in the manuscript, where the uncertainty is from? In particular, why the uncertainty is so large in observation but the uncertainty is so small in MeMo.