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Earth System Dynamics
Discussions

Interactive comment on "ESD Reviews: mechanisms, evidence, and impacts of climate tipping elements" *by* Seaver Wang and Zeke Hausfather

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We thank the reviewer for these thoughtful comments, and have added additional text to further emphasize the importance of soil moisture in modulating methane fluxes from thawed permafrost. The suggestion that methane production from peat bogs is unlikely to be dependent on temperature is inconsistent with field and laboratory studies that indicate a strong temperature relationship (e.g. Blanc-betes et al. 2016, Metje and Frenzel 2007, Rivkina et al. 2004, van Winden et al. 2012). The Winden et al. finding, which utilized incubated peat samples, would not be influenced by seasonal transitions in soil moisture content. This said, the reviewer's points regarding the role of

soil moisture in governing the relative production of methane and carbon dioxide from thawed permafrost are important to stress, and our edits have further emphasized this within the passage indicated.

Edited passage now reads:

"Consequently, higher soil water content and inundated conditions for thawed permafrost would favor increased methane generation while drier environments would result in reduced methane production and a relatively higher fraction of CO2 release (Blanc-Betes et al., 2016; Walter et al., 2001; Zhuang et al., 2004). Additionally, methanogenic bacteria also exhibit a strong temperature response, with experiments demonstrating a greater than hundred-fold increase in methane production for a temperature rise of 10°C (Metje and Frenzel, 2007; Rivkina et al., 2004; Tveit et al., 2015). However, warming temperatures themselves drive soil moisture effects that could reduce or increase methane fluxes if soils become respectively drier and more oxic or wetter and more anoxic in response to permafrost thaw (Blanc-Betes et al., 2016)."

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