

Interactive comment on “Limited impact of El Niño – Southern Oscillation on the methane cycle” by Hinrich Schaefer et al.

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I have short comments on Schafer et al., (2018) BGD. Generally, I think the topic of this paper is very interesting and it could be an important contribution to the community. However, I found the title is a bit misleading as it sounds like ENSO has limited impacts on CH₄ sources and sinks, which is not supported by previous studies. Also, some of the assumptions used in speculating CH₄ sources-related statements/conclusions are not fully justified and need to be clarified. Here below are my specific comments:

-The response of CH₄ concentration to natural CH₄ sources could be weak during weak/moderate ENSO events and the methane sources from anthropogenic activities could be dominating. Also, the general assumption of lower CH₄ during El Ninos

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seems to be controversial to the observations in some El Nino event (e.g. 1997/98). I feel it would be very helpful if the authors could add an additional analysis to maximize the signals by focusing on strong ENSO events.

-For C13-CH₄, the authors assume that a detectable change in C13-CH₄ during ENSO should be observed if ENSO has significant impacts on wetland and biomass burning given that the suppression of wetland and enhanced biomass burning act in the same direction on C13-CH₄. I wonder if this signal can be detected without removing noises from other factors like atmospheric transport, local OH, and other biogenic sources which are also influenced by climate conditions (e.g. landfills and agricultural sources, which have similar C13-signature as wetlands and also respond to changing rainfall and temperature). In addition, the growth of wetland CH₄ emissions during El Ninos is more complex than previous thoughts, Zhang et al., (2018) suggest that wetland CH₄ emissions were suppressed at the early stage of El Nino but the wetland CH₄ growth rate is in the rising phase at the later stage of El Ninos. Given that the peak of CH₄ growth for wetland and biomass burning occur differently, this could weaken the net impact on the C13-CH₄ signal.

- Zhang et al., (2018) suggests that wetland CH₄ emission could have a step increase of ~ 9 Tg CH₄/yr for the period of 2007-2014 compared to 2000-2006. Could this affect some of the authors' conclusions?

Reference: Zhang Z., Zimmermann E. N., Calle L., Hurtt G., C. A., and Poulter B. 2018. Enhanced response of global wetland methane emissions to the 2015–2016 El Niño-Southern Oscillation event. *Environmental Research Letters* 13:074009.

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