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

Anonymous Referee #1

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The paper by Schaefer et al investigates the role of ENSO anomalies on atmospheric methane concentrations, with additional insights provided by investigating its isotopologue (13C-CH4) and hydrogen cyanide as a proxy for fire. Using a diverse set of ENSO indicators, with a variety of approaches for smoothing and integrating temporal lags, the authors find that ENSO has a small role on atmospheric CH4 concentrations, and conclude that ENSO has played only a small role on the renewed growth in concentrations since 2006.

The manuscript is an important contribution in terms of the renewed growth discussion of atmospheric methane concentrations because it provides additional evidence that emissions sources that have high interannual-variability, i.e., wetlands and fire, are unlikely to be the dominant cause of sustained emissions. However, while the methods,

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results and discussion are fairly clear, the title and the Introduction could be clarified to reflect the main message.

First, I recommend the authors revisit the title and modify to be more specific than just 'methane cycle' because this implies the authors were looking at methane emissions, but rather the authors investigated atmospheric concentrations. I would prefer a title along the lines of "Limited impact of El Niño – Southern Oscillation on the atmospheric methane growth anomalies"

Second, the Introduction could be clearer to reflect that the authors are motivated by understanding atmospheric methane concentration anomalies rather than anomalies in emissions. The previous studies linking methane emissions to ENSO as a key driver are not in question, but currently the Introduction mixes a little the emissions and concentrations anomalies making the reader have to work to clarify this.

In Table 1, I assume the lag time is in months, so 54 is a 54 month lag? If so, many are longer than 12 months, which is contrary to the statement in Section 5.2 that says most are shorter than a year. I am skeptical of such long lags, it is difficult to judge whether shorter lags were close in terms of significance to the longer lag times because these numbers are not presented.

I commend the authors on the discussion of transport and atmospheric mixing, it was very helpful to have this context while thinking about the correlations and locations of sampling stations.

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