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Interactive comment

Interactive comment on "Remote sensing of methane leakage from natural gas and petroleum systems revisited" *by* Oliver Schneising et al.

Anonymous Referee #1

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The paper by Schneising et al. uses recent years of TROPOMI satellite CH4 data to estimate fugitive emission rates for CH4 from several large oil and gas extraction fields in the US as well as one in central Asia. They employ a previously demonstrated semi-Lagrangian integral approach using wind data from ECMWF analyses, and relate the estimated CH4 emissions to the reported energy production of the fields in order to assess whether the overall emissions (fugitive plus combustion) are an improvement upon a coal-based system in terms of global warming potential. Overall, this is a very nicely done paper. The data are relatively new and unique, the analysis approach is sound and well-described, including uncertainty estimates, and the paper is exceptionally well-written. Although the climate break-even point for leaks relative to production is a somewhat qualitative metric for assessing the industry and its technology, it does

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Discussion paper

serve to put different fields and prior estimates on a common footing from which relative advantages can be compared. The paper's conclusions are robust, interesting, and probably useful for policy considerations.

In terms of comments and suggestions for revision of the paper, there is not much more to recommend. The paper was a pleasure to review. The one thing, however, that the authors should address is the findings of the recent paper by Zhang et al. (2020). I realize that the latter appeared after the submission of the Schneising et al. paper, but the two have so much in common, yet rather different messages, that it would be remiss not to have the authors discuss it. This could, perhaps, be handled in Discussions, but since many readers will just download the manuscript and forego the Discussions, they would miss out on a key aspect of the work.

To initiate the discussion, it is very interesting that the two papers, using quite different analysis methods (Zhang et al. used TROPOMI data with a Bayesian inverse), produce almost identical (within uncertainties) estimates for total fugitive CH4 emissions for the Permian. This is remarkable in its own right. What is more striking, however, is the difference in messaging. The two produce very different qualitative assessments (i.e., 'spin') of their policy implications. In one case (Schneising et al.), the emissions are framed as acceptable: 'below the break-even rate for immediate climate benefit,' while in Zhang et al. the fugitive emissions are regarded with alarm: 'Permian Basin appears to be associated with insufficient infrastructure . . . leading to extensive venting and flaring (Fig. 3), which contributes to high methane emissions.' Besides the technical difference of how CH4 emissions are related to the total energy production (divisor for the waste percentage), it seems that preconceptions are influencing how the results are discussed. While both papers reach the obvious conclusion that much more can and should be done to limit fugitive emissions, we need a balanced consideration of how to use the satellite data to that effect. Note how the press took off with the Zhang et al. paper: https://www.newscientist.com/article/2241347-fracking-wells-in-the-us-are-leaking-loads-of-planet-warming-methane/. At a minimum the authors Schneising et al. should put the percentage waste estimates on the same divisor, address any other discrepancies, e.g., the relation to prior estimates, and, hopefully, initiate an informed discussion on how to use these results for progress in reducing effective emissions.

Y. Zhang, R. Gautam, S. Pandey, M. Omara, J. D. Maasakkers, P. Sadavarte, D. Lyon, H. Nesser, M. P. Sulprizio, D. J. Varon, R. Zhang, S. Houweling, D. Zavala-Araiza, R. A. Alvarez, A. Lorente, S. P. Hamburg, I. Aben, D. J. Jacob, Quantifying methane emissions from the largest oil-producing basin in the United States from space. Sci. Adv. 6, eaaz5120 (2020).

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