

Review of “*Estimating CH₄, CO₂, and CO emissions from coal mining and industrial activities in the Upper Silesian Coal Basin using an aircraft-based mass balance approach*”

The authors describe 2 mass balance flights performed during a single day over a coal basin in Poland. Despite only having data for a single day, the analysis done is extremely thorough for this type of study, providing an extra layer of confidence to the overall solution, and serve as a sanity check for bottom-up inventory estimates of CH₄ from coal in the region (and helpful guidance for other trace gases). Nothing about the results are particularly remarkable, but it's good, necessary science nonetheless, and well-written at that. In its current state, I have no objection with publishing this paper after some extremely minor revisions are addressed.

Minor comments

Line 110: “*Since the 110 morning is not an ideal time for the in situ mass balance method because of the growing convective planetary boundary layer, we consider the estimate from the afternoon flight to be more reliable. However, we describe the morning flight as well and consider its results as additional information.*”

The later, afternoon loop tends to be more reliable for a number of reasons (morning blobs everywhere!). When I read this statement, I was bracing myself for crazy signals that cast doubt on the entire study. But such a thorough job regarding capturing the signal and meteorology from the first flight (as well as the period before it) that I would argue you're underselling your loop 1 results with this comment. To me, loop 1 and loop 2 together provide pretty good confidence in your calculated total for the day. I'd consider dropping these sentences entirely.

Line 126: It would be helpful to mention here the local time relative to UTC time.

Line 207: The background downwind method also requires the assumption that there are no sources upwind of your area of interest that would create a complex concentration pattern flowing into your domain. With that said, you have an upwind here and it's pretty clean, so it's obviously not an issue here.

Line 385: I just wanted to say I appreciate you mentioning the overnight winds, because so many mass balances neglect possible accumulation from stagnant winds in the overnight/dawn hours, leading to massive enhancement blobs scattered throughout the observations.

Minor comments bonus points:

This study does a remarkable job ensuring the validity of the mass balance technique by performing multiple vertical transects and even driving underneath the flight path to capture the signal at the surface layer. Many mass balance studies do not put in this level of effort, and it

would be good to know how necessary these extra precautions are with regard to calculating the true emissions. Furthermore, if we're going to use mass balance techniques at any point to verify emissions from a policy enactment standpoint, we'd want to be as efficient as possible with resources. So what I'd be curious about is, if you took the central transect from each loop and calculated the emissions using the simple assumption of a perfectly mixed boundary layer, how different would your solution be compared to your kriging results? Such a simple comparison would be useful to have in your uncertainty analysis and increase the scientific impact of your findings.

Grammar

Line 43: change "affect" to "affecting"

Line 473: "don't" to "do not", because a bunch of grumpy scientists gathered together in a room and decided that the use of contractions makes our science less impactful.