Review of **Development of a small unmanned aircraft system to derive CO2 emissions of anthropogenic point sources** by **Maximilian Reuter et al.**

The authors describe the design and a few test flights of a UAV to estimate CO_2 emissions from a point source by an integral advection method. The paper is well written and the description of the UAV is comprehensive. The estimation of the accuracy for emission assessment is somewhat short but for a first guess acceptable. For a reliable application more flights are necessary. Furthermore, as anthropogenic point sources and regulated airspaces typically coincide the issue of airspace clearance for potential applications should be discussed.

A few specific comments:

Generally, all figure labels are too small. Figures should be redrawn before final publication. Some figures (e.g. Fig.4) would benefit from rescaling or splitting.

The anemometer calibration (Section 4) looks reasonable. With a small, slow aircraft that even can hold a fixed position, a comparison with a proven reference at a mast is possible, a big advantage to faster, manned planes. For future applications that characteristic should be exploited more in calibration and measurement pattern design.

Section 5, validation with ICOS: Why do you use level 1 data for comparison ? At low level there is more horizontal variation on a small scale in the flow and in the scalar fields than there is at higher level, where a horizontal distance to the reference has less effect.

p14, l240: The discrepancy in the wind data between UAV and mast around 700s (S12) looks like a problem in the directional data of the UAV. Can you comment on that ?

Has S12 been flown at 32 m ? The height of the legs should be given.

You could even try to get the mean wind by having the UAV drift with it by keeping only a constant height and horizontal leveling active and deactivate position holding. Then, the drift speed should be the mean wind speed, like with a radiosonde. A tilt error should then be checked by repeating with the UAV turned by 180deg around the vertical axis.

Minor specific point, typos and such:

- p3, l85: ... via a**n** RS-232, a**n** RS-485 ...
- p4, caption Fig.1: the labels in the left photography of are hard to read
- p6, Fig.2: labels far too small, caption too brief
- p9, Fig.3: labels too small
- p10, Fig.4: labels too small, abscissa could be reduced to the range of 350s–1200s, e,f,g: labelling/text mismatch.
- p12, Fig.5: labels too small
- p13, Fig.6: labels too small.
- p15, l266: A **?possible?** explanation
- p15, l276: 40k **west** of Bremen, dito in captions Fig.7 and 8., p20,l382
- p16, l305: while this method seems acceptable for a first estimate in using a new device, shouldn't the background concentration be determined on the upwind side of the emitter ?
- p17, l308: With a linear interpolation you assume a horizontal gradient in the concentration, why ? Why dont't you take the average ? Especially as you assume no upwind sources anyway.
- p19, l339: ... beyond the scope of this paper ...: Well, you could at least tell us the difference in the estimate between both flights.