A combined dataset of path-averaged and in-situ measurements of greenhouse gases to inform on the sensitivities to localized source patterns and transport effects in the urban atmosphere.

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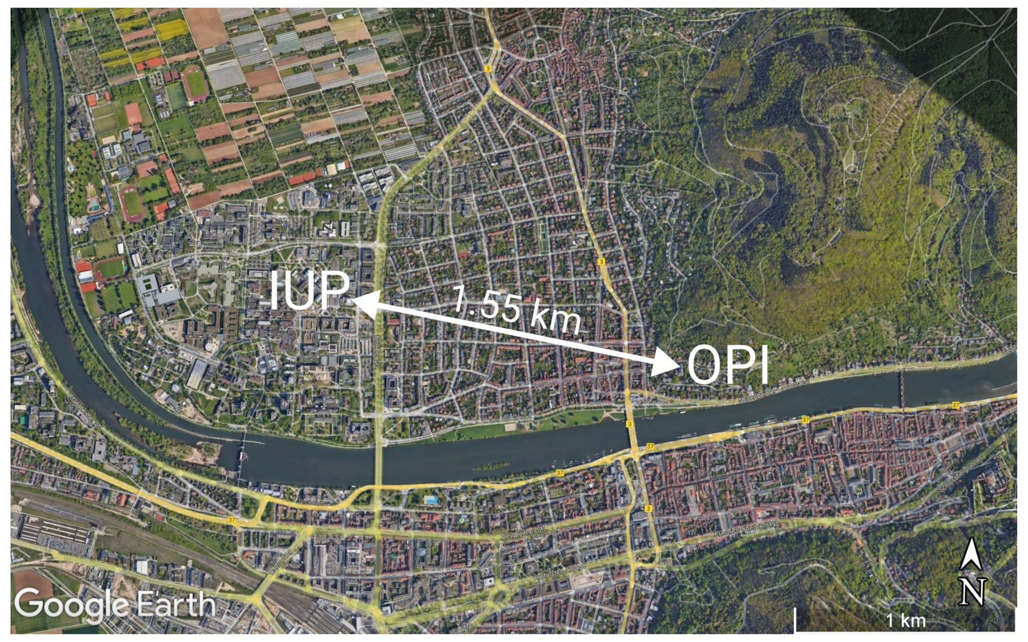
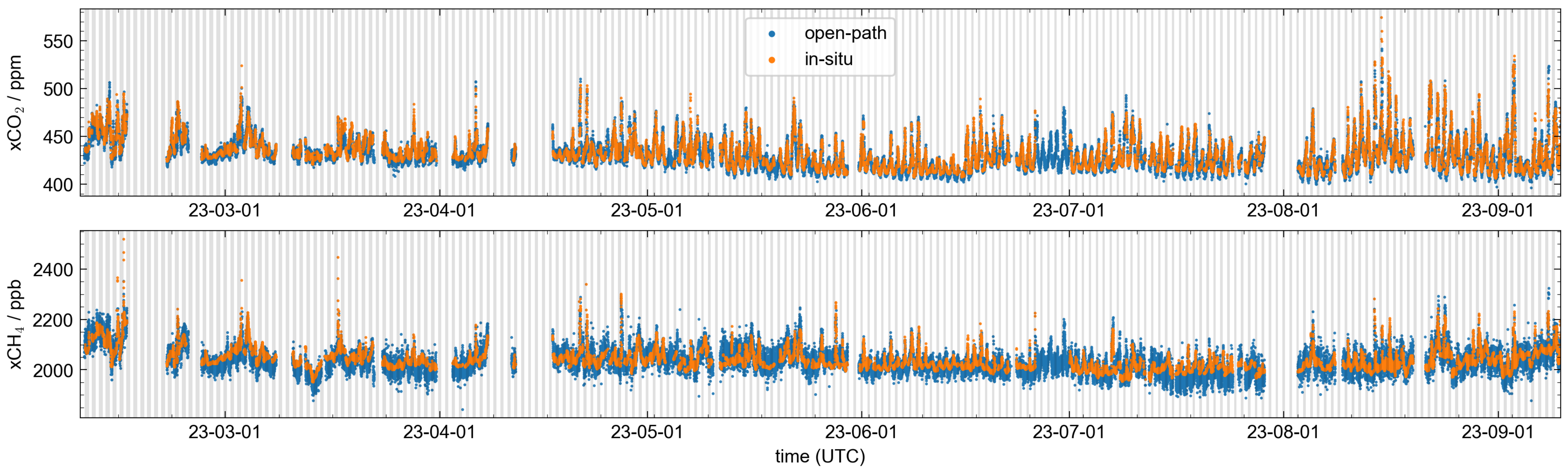
The instrumentation



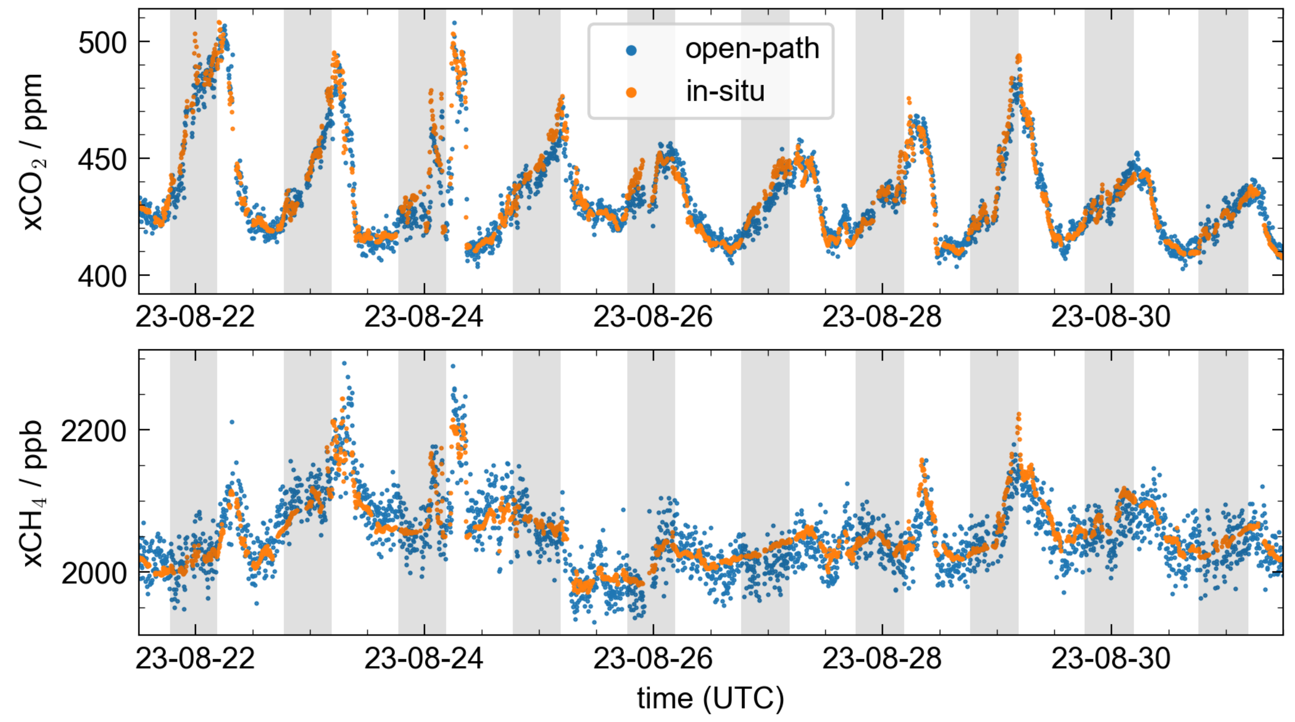
City of Heidelberg + location of the measurement path. All instrumentation is located at the western end of the path.

Left: Fourier Transform Spectrometer and the telescope for the open-path setup.
Right: Reflector at the eastern end of the path at night.

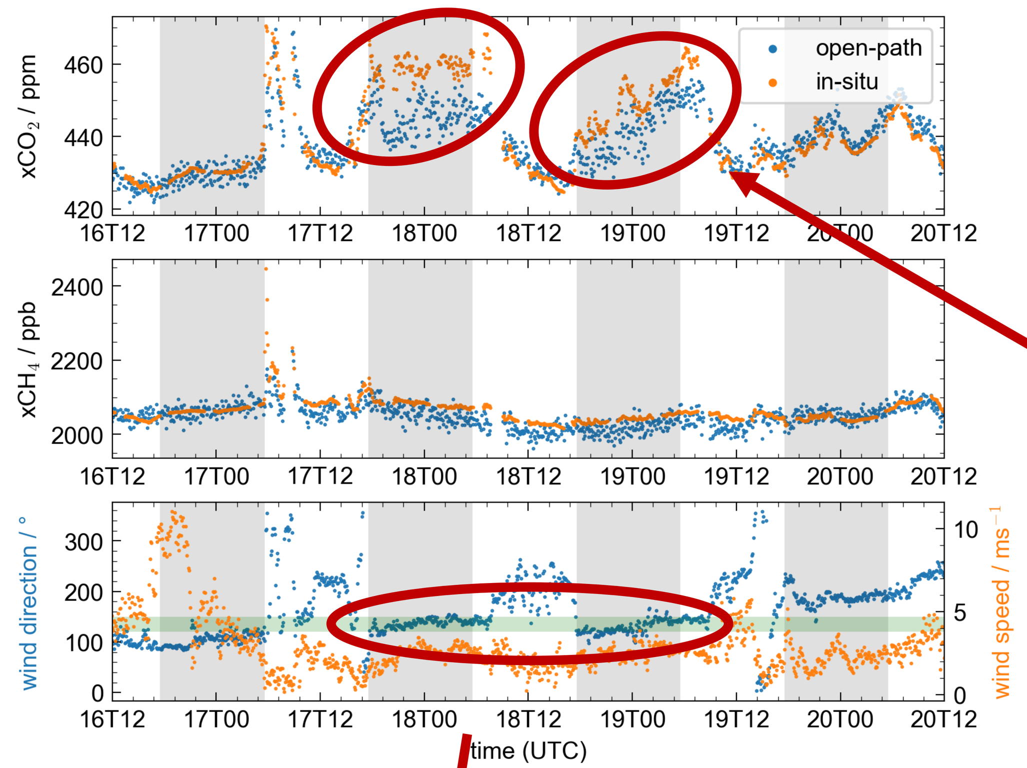
The dataset

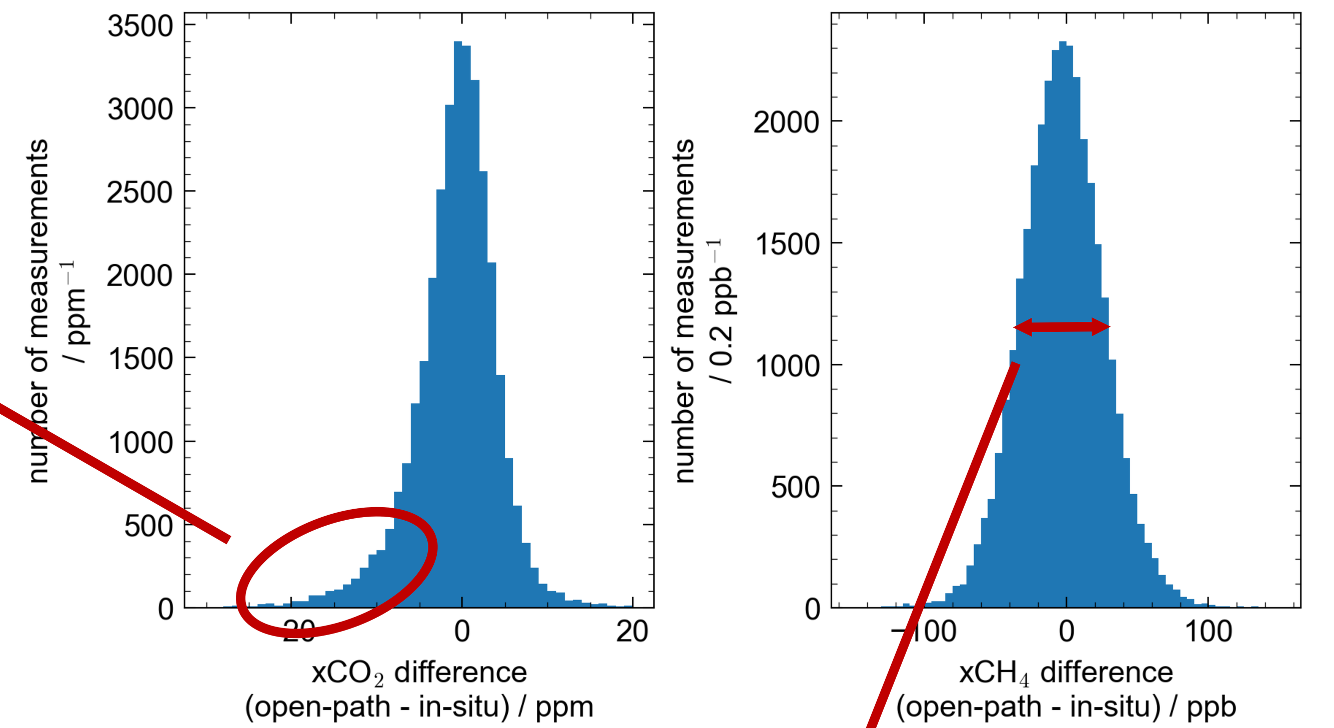


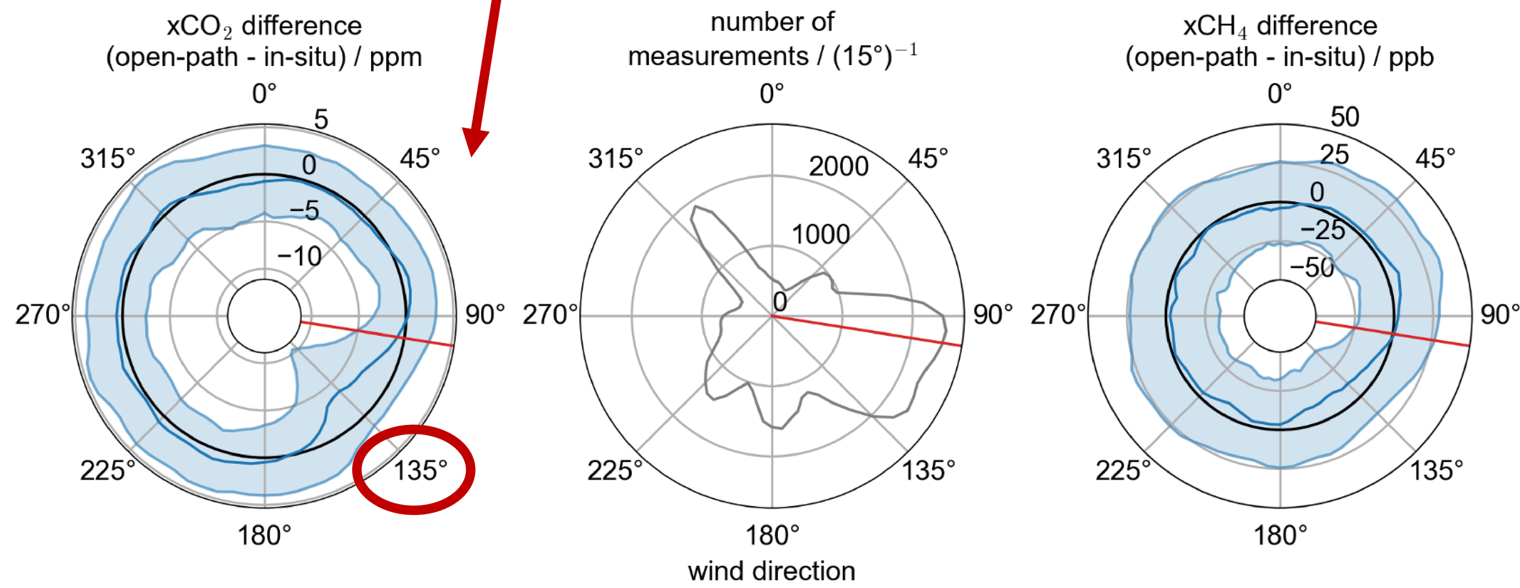
- Continuous open-path measurements of xCO_2 and xCH_4 since Feb. 8, 2023
- Average temporal coverage of 75%, with some months up to 90%.
- Both records are in good agreement concerning seasonal trends (e.g. decrease in xCO_2 in Spring/Summer) as well as diurnal variability.
- Published in Schmitt et al. (2023) and Schmitt (2024).



Differences between the instruments



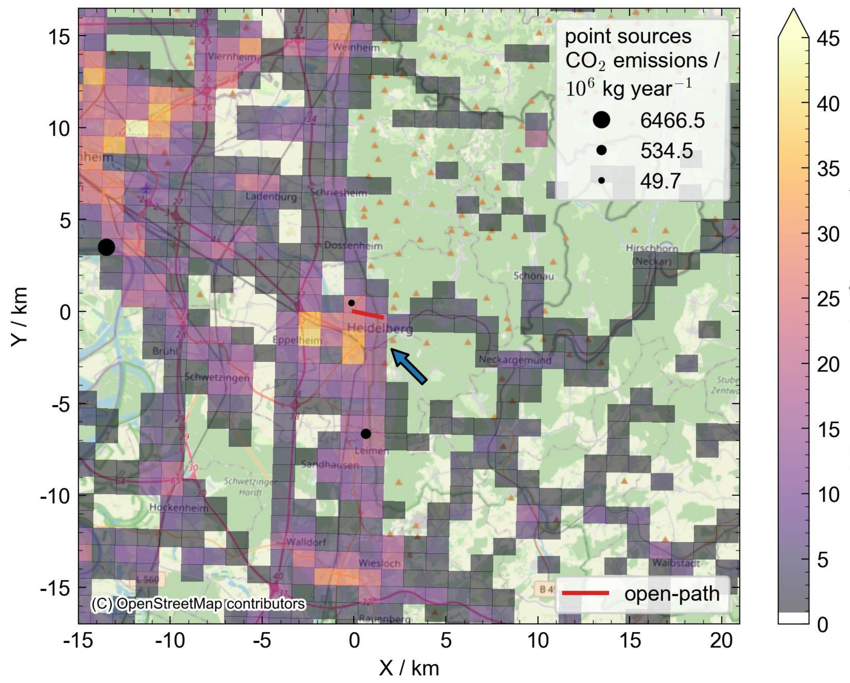




Instrument differences for xCH_4 are around 40% larger then expected from individual instrument performance.

Likely caused by spatially and temporally variable emissions of the natural gas distribution system

Possible explanations and validation opportunities



- xCO_2 difference is probably the result of a local transport effect.
- Most emissions are sourced within the flat Rhine valley, few within the mountain range to the east.
- For winds from the south-east, air masses with low enhancements might be channeled through the Neckar valley in the east.
- At the mouth of the valley, they meet air with strong enhancements and cause large local gradients.

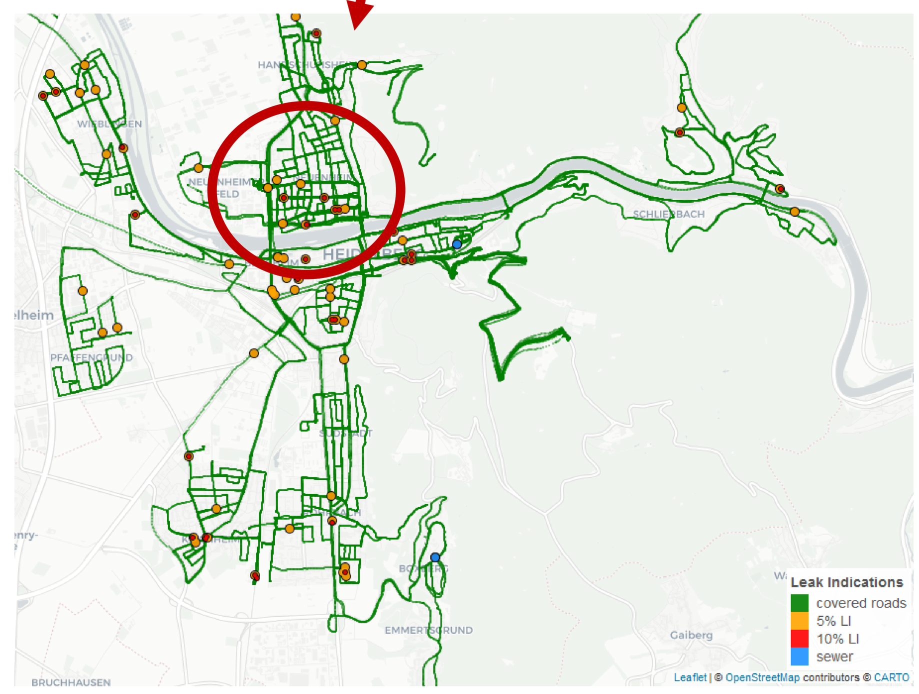
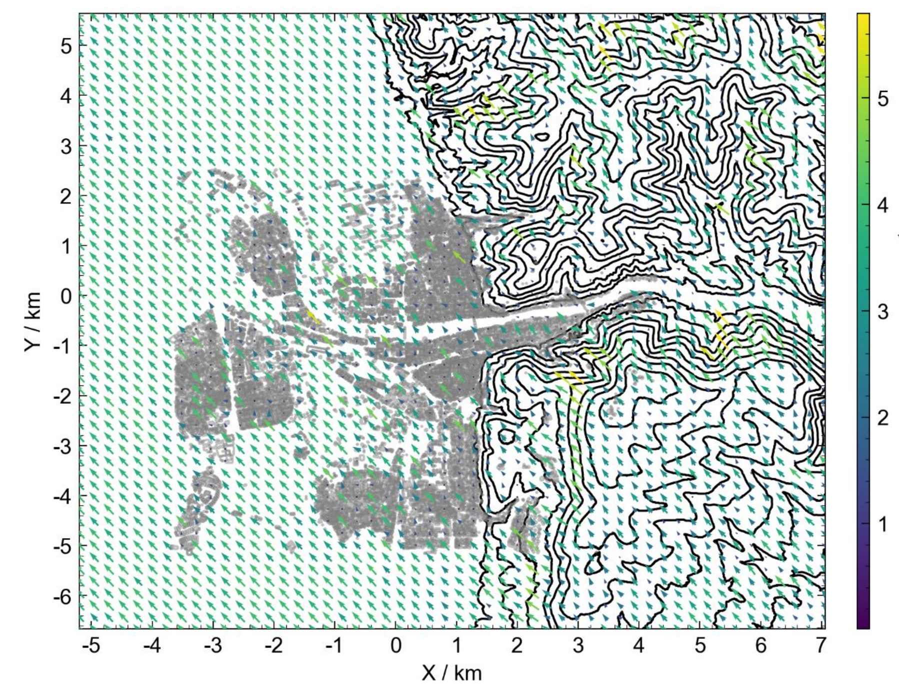


Figure taken with kind permission from Wietzel and Schmidt (2023).



➔ Opportunity to test transport models and emission inventories, how good they represent local effects, and if they can correctly resolve processes below the kilometer scale.

➔ A data basis to test the impact of misrepresentation between in-situ sensors and the kilometer scale of emission estimates.

More information in Schmitt et al. (2023):

Sharing is encouraged

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References

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