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# Airborne Measurements for estimating Methane Emissions in the Surat Basin, Australia

Bruno Neininger (1), Jorg M. Hacker (2), and Wolfgang Lieff (2)

(1) METAIR AG, Airborne Research, Hausen am Albis, Switzerland (bruno.neininger@metair.ch), (2) Airborne Research Australia Ltd. and Flinders University, PO Box 335, Salisbury South, 5106, Australia (jorg.hacker@airborneresearch.org.au)

The Surat Basin, Queensland, Australia, is a hot-spot of methane emissions in Australia. The different sources and the overall project will be presented in a separate overview (Kelly et al., 2019).

This presentation will discuss the methods applied for the flight planning in order to achieve a quasi-Lagrangian observation of the air mass in which the various sources are emitting methane and carbon dioxide. Over this dry area in sunny Queensland in springtime, the emissions were quickly mixed into a rather deep convective boundary layer. Although this is an advantage for regional mass balances (as long as the boundary layer growth is known), it is a challenge for source attribution. Furthermore, as already discussed in Hiller et al. (2014), the data is suggesting, that dry deposition and photochemical reactions during the transport cannot be neglected. In Yacovitch et al. (2018) we have also shown that the uncertainty of a regional emission estimate is large when the conditions are not ideal. All of these experiences allowed to improve the methods and flight strategies now applied in the Surat Basin.

In contrast to point measurements and mobile surveys on the ground, airborne measurements are covering a wide range of scales, i.e. from 5 m for the fast $CO_2$ measurements (50 m for CH4) up to 100 km. The collected data along the tracks flown are therefore both useful for the identification of individual sources (as discussed in detail in Hacker et al., 2016), and for the regional mass balance. The vertical extend of the mixing was documented by ascents to the top of the actual convection, and the evolution of this mixing was also reproduced by a convection model.

The high-resolution measurements allow to include turbulent vertical fluxes in the overall budget which will be an important aspect of our discussion.

In summary, the data set and the diverse methods applied should allow to provide an overall emission estimate for the Surat Basin between Dalby and Miles with acceptable error bars. The 88 bag samples taken during the flights will support the source attributions as discussed by Kelly et al. (2019)

References

Hacker, J.M., D. Chen, M. Bai, C. Ewenz, W. Junkermann, W. Lieff, B. McManus, B. Neininger, J. Sun, T. Coates, T. Denmead, T. Flesch, S. McGinn and J. Hill, 2016: Using airborne technology to quantify and apportion emissions of CH4 and NH3 from feedlots. Animal Production Science, 2016, 56, 190-203.

Hiller R.V., B. Neininger, D. Brunner, C. Gerbig, D. Bretscher, T. Künzle, N. Buchmann, W. Eugster, 2014: Aircraft based CH4 flux estimates for validation of emissions from an agriculturally dominated area in Switzerland. Journal of Geophysical Research: Atmospheres 03/2014; DOI:10.1002/2013JD020918.

Kelly et al.: Direct Measurement of Coal Seam Gas and Agricultural Methane Emissions in the Surat Basin, Australia. Submitted for EGU 2019.

Yacovitch T.I., B. Neininger, S.C. Herndon, H.D. van der Gon, S. Jonkers, J. Hulskotte, J.R. Roscioli, D. Zavala-Araiza: Methane Emissions in the Netherlands, 2018: The Groningen Field. Elem Sci Anth, 6: 57. DOI: https://doi.org/10.1525/elementa.308.