

GEOS-Chem simulations of greenhouse gas measurements (CO_2 , CH_4 and CO) from moving platforms in and around Australia

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Abstract

In this study a combination of Fourier Transform InfraRed Spectroscopy (FTIR) measurements with the global Chemical Transport Model (CTM) GEOS-Chem is used to identify and quantify both anthropogenic and natural sources of the two most abundant carbon greenhouse gases (GHGs) CO_2 and CH_4 along with CO in the Australian region.

With the tagged tracer simulations we calculated the contributions of different regions and processes to the total amount of each gas and we identified the sources that drive their variability.

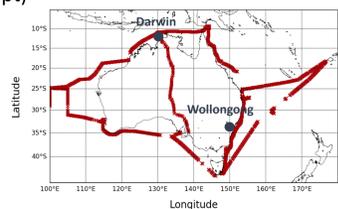
We find that the model can reproduce the spatial variability of the measured carbon GHGs along the Australian coastal regions. However, there are some differences which might be associated with either missing or overestimated sources in the model.

Aim

- To improve our knowledge about GHG sources and sinks in order to reduce the current **uncertainties** in emission estimates.
- This improvement is crucial because:
 - There are still large uncertainties in processes driving atmospheric composition.
 - CTMs that are used to understand what drives the variability in measured quantities rely on emission estimates - inventories.

Measurements & Model Description

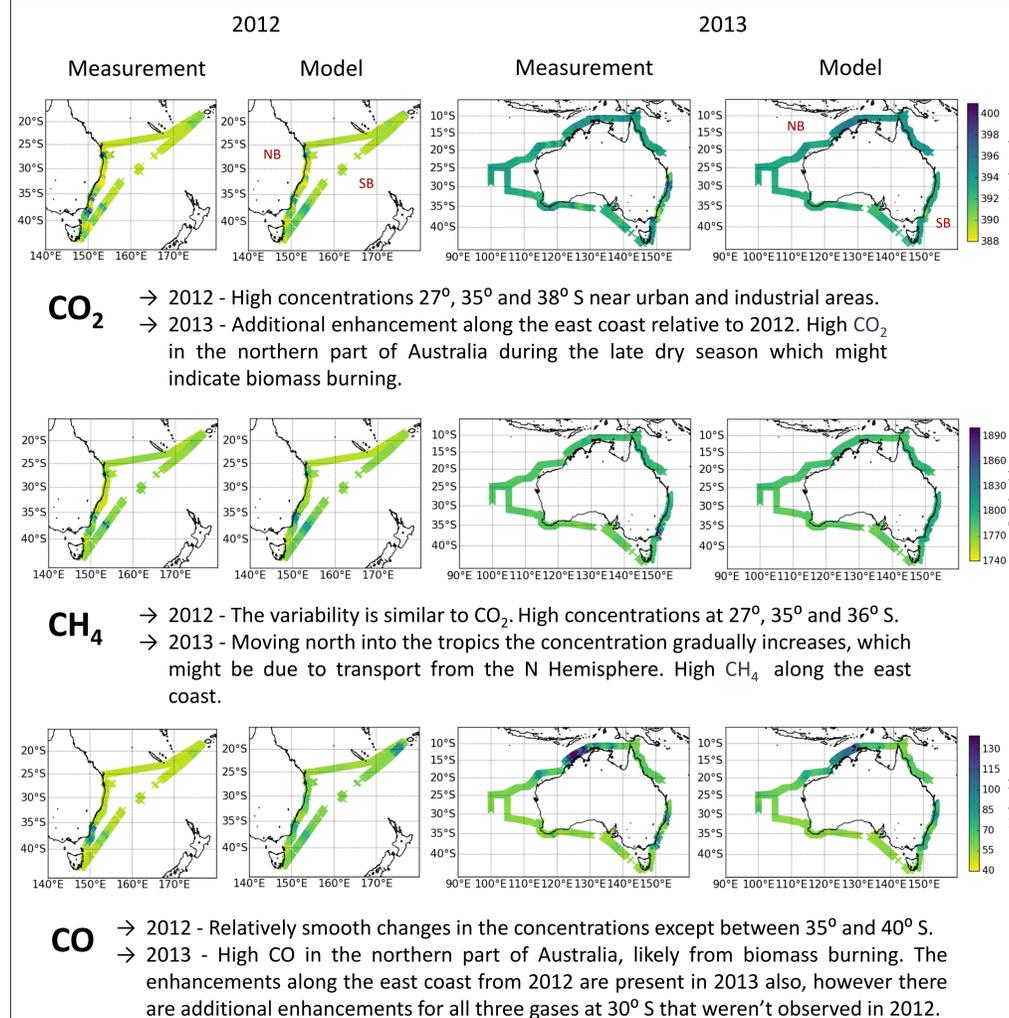
- Ship-borne FTIR measurements^[1]
- CH_4 , CO_2 , N_2O , O_3 , CO and $\delta^{13}\text{C}(\text{CO}_2)$
- Dates: 2012 (Apr - June) -2013 (June -Sept)



- GEOS-Chem model version: CO_2 ^[2], CH_4 ^[3] - v10-01
 CO - V11-01
- Model resolution: $2^\circ \times 2.5^\circ$

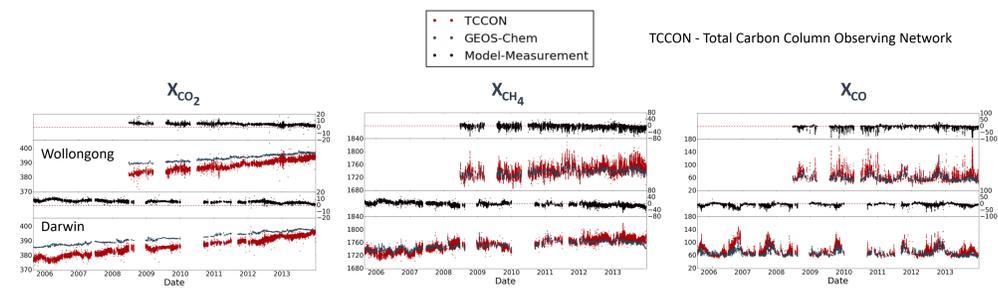


Comparison and Analysis



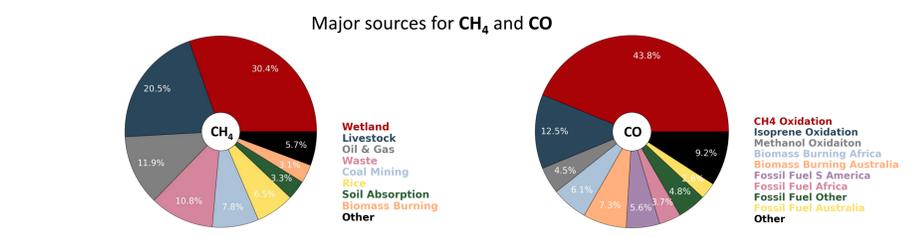
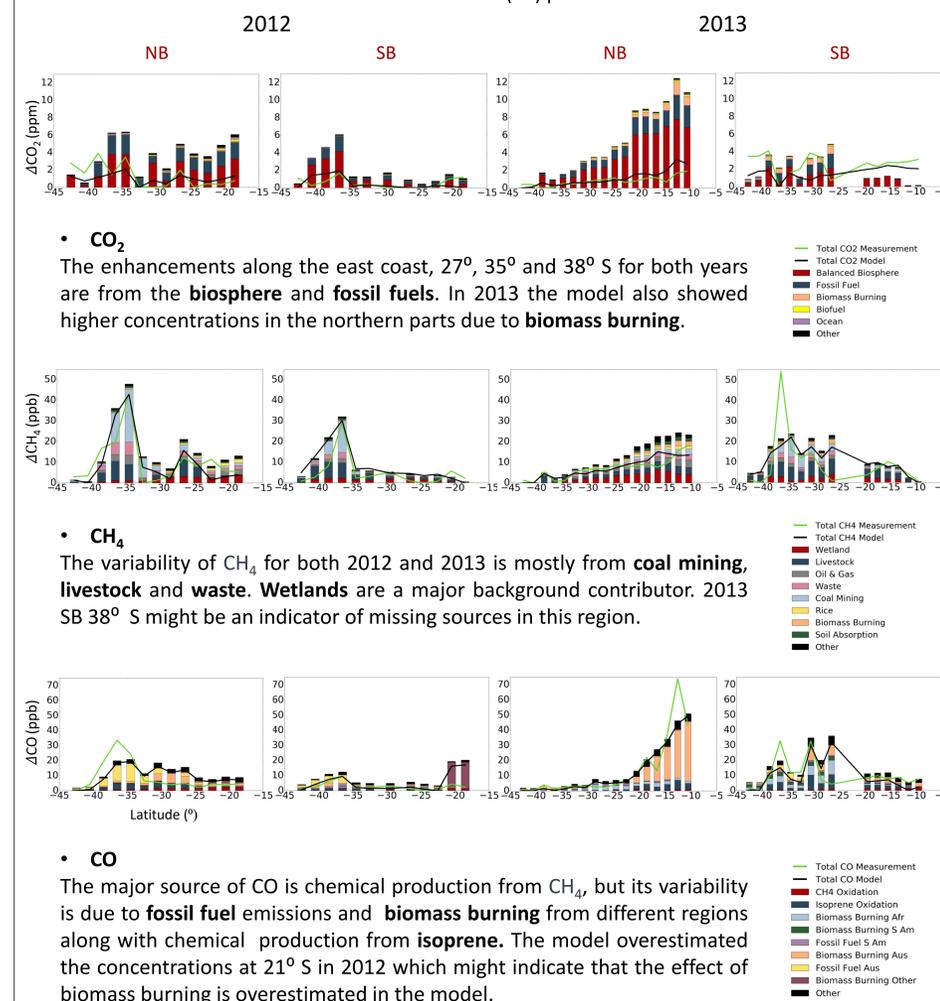
Future Directions

- The presented dataset will be complemented with:
 - Train-borne in-situ FTIR measurements across the N - S Australian continental transect (from Adelaide to Darwin), 8 trips total (2008-2012) - to gain information about the sources/sinks in other parts of Australia.
 - Fixed location in-situ and solar FTIR measurements from TCCON sites in Australia (Wollongong and Darwin) - to distinguish information about the sources on both local and regional scale.
- A new GEOS-Chem simulation will be created combining CO_2 - CH_4 - CO in collaborative work with the University of Toronto.



Source Contribution

The figures below describe the variability of the measurements (orange line), model (black line) and different tracers (stacked bars). The measurements were divided into a North (NB) and Southbound (SB) part.



Acknowledgments

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References

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