Abstract

In this poster we give a brief description of the Total Carbon Column Observing Network (TCCON), a new network of ground-based Fourier Transform spectrometers (FTS) dedicated to measurement of greenhouse gas absorption (CO\textsubscript{2}, CO, CH\textsubscript{4}, N\textsubscript{2}O) in the near infrared.

We present preliminary retrievals of CO\textsubscript{2} total column densities from the TCCON site in Lauder, New Zealand between July 2004 – when routine measurements began – and April 2005, and compare these retrievals with in-situ CO\textsubscript{2} measurements from the surface monitoring network station at Birring Head, New Zealand.

A discussion of how we plan to compare the ground-based FTS retrievals with in-situ surface observations and greenhouse gas retrievals from satellite radiances follows.

Overview of the TCCON network

TCCON is a global network of ground-based Fourier Transform spectrometers. Near infrared absorption spectra are acquired in the 4000–14000 cm\textsuperscript{-1} interval at 0.02 cm\textsuperscript{-1} resolution and analysed to retrieve CO\textsubscript{2}, CO, CH\textsubscript{4}, N\textsubscript{2}O column densities and column average mixing ratios (denoted X\textsubscript{c}).

Column-integrated trace gas measurements are less sensitive to local sources and sinks and seasonal and diurnal rectifier effects than in-situ surface measurements.

However, if the TCCON network measurements are to provide useful additional constraints for the global carbon budget – both directly, and through validation of satellite column measurements – they must achieve a precision of 0.1\% and an accuracy of 0.3\%.

A prerequisite for comparison of retrieval averaging kernels into account explicitly, following the work of Rodgers and Connor (2003). Planned comparison of ground based FTS and satellite measurements and retrievals will take retrieval errors and averaging kernels into account explicitly, following the work of Rodgers and Connor (2003). One way of doing this is to apply satellite retrieval averaging kernels to ground based FTS profile retrievals.

Boundary layer and free troposphere partial column retrievals should improve comparisons with in-situ surface measurements and provide a potential link between surface and satellite measurements.

Conclusions

Preliminary results are encouraging: Lauder O\textsubscript{3} and CO\textsubscript{2} retrievals have a precision of 0.2\% and O\textsubscript{3} retrievals are in good agreement with data from the Park Falls site.

Work is ongoing to identify the sources of observed variability and improve the precision and accuracy of retrievals to attain the TCCON error targets (0.1\% precision, 0.3\% accuracy).

This work will include monitoring and improving solar tracker accuracy, improving near infrared spectroscopic parameterisations (particularly O\textsubscript{3} column collision induced absorption), and the development and comparison of profile scaling and profile retrieval algorithms, with due consideration of the impact of forward model errors, and preliminary comparisons with in-situ CO\textsubscript{2} measurements at the Lauder site.

References


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