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# Recent developments in the Total Carbon Column Observing Network (TCCON)

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The Total Carbon Column Observing Network (TCCON) currently consists of 16 operational ground-based remote sensing stations measuring total column $CO_2$, $CH_4$ and other gases by solar Fourier transform spectrometry in the near infrared. TCCON aims to measure column average dry air mole fractions $X_Y$ with sufficient accuracy and precision network-wide for the TCCON data to provide both ground-based validation for $CO_2$ and $CH_4$ retrievals from near-infrared satellite instruments such as GOSAT, SCIAMACHY, OCO-2 and ASCENDS, and constraints on surface trace gas fluxes in their own right.

In this paper we will give an overview of recent developments within the TCCON to characterise and improve network accuracy and calibrate TCCON measurements to the World Meteorological Organisation trace gas measurement scale. We briefly describe the application of TCCON measurements to the validation of $CO_2$ and $CH_4$ retrievals from GOSAT, and the limitations due to small sample sizes for colocated TCCON and GOSAT data sets. We discuss the results of two new modelling studies by network partners, which examine the sources of variability in $X_{CO_2}$ in the Northern and Southern hemispheres. These studies are used to characterise the representativity of the sparsely distributed TCCON sites, enabling TCCON measurements to be used to validate a wider sample of GOSAT observations, and provide examples of the types of new information on surface fluxes which may be inferred directly from TCCON measurements.