

# Atmospheric Total Column Measurements of Carbon Dioxide and Methane over the ABoVE Domain

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# East Trout Lake, Saskatchewan

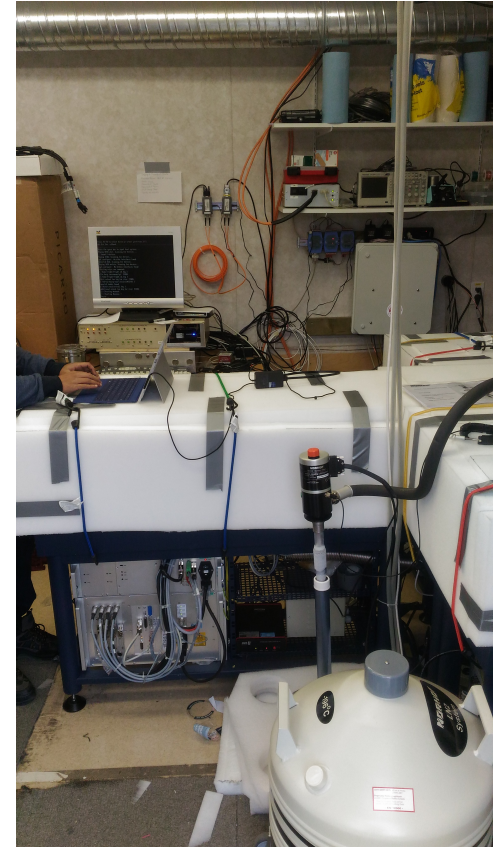


- East Trout Lake Environment and Climate Change Canada's Tall Tower Facility
- 100-m tower with hourly  $\text{CO}_2$ ,  $\text{CH}_4$ ,  $\text{CO}$ ,  $\text{N}_2\text{O}$  dating back to 2005
- Monthly NOAA aircraft flights with  $\text{CO}_2$ ,  $\text{CH}_4$ ,  $\text{CO}$



# Atmospheric Total Column Measurements

- Measure atmospheric vertical column-averaged dry-air mole fractions of  $\text{CO}_2$ ,  $\text{CH}_4$ ,  $\text{CO}$ ,  $\text{N}_2\text{O}$ ,  $\text{C}_2\text{H}_6$ ,  $\text{OCS}$  and other trace gases
- Remote sensing, solar viewing technique
  - Only measure when there is sunlight
- Measure a spectrum every ~90 seconds when sunny

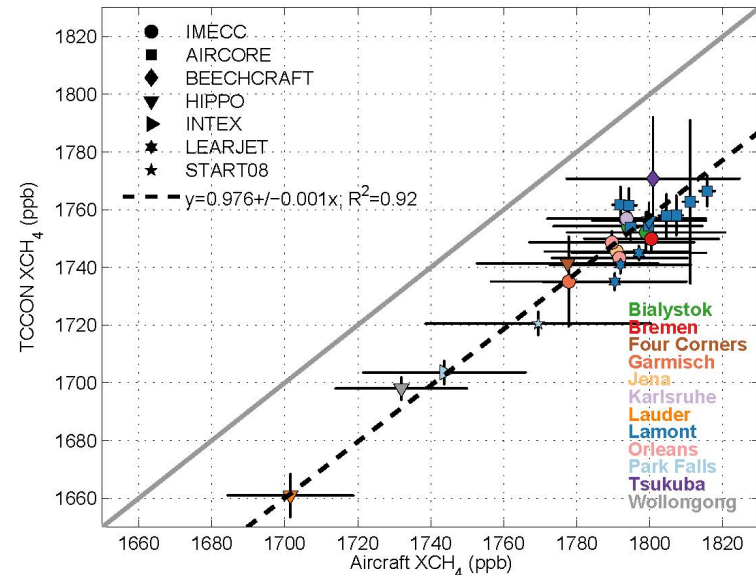
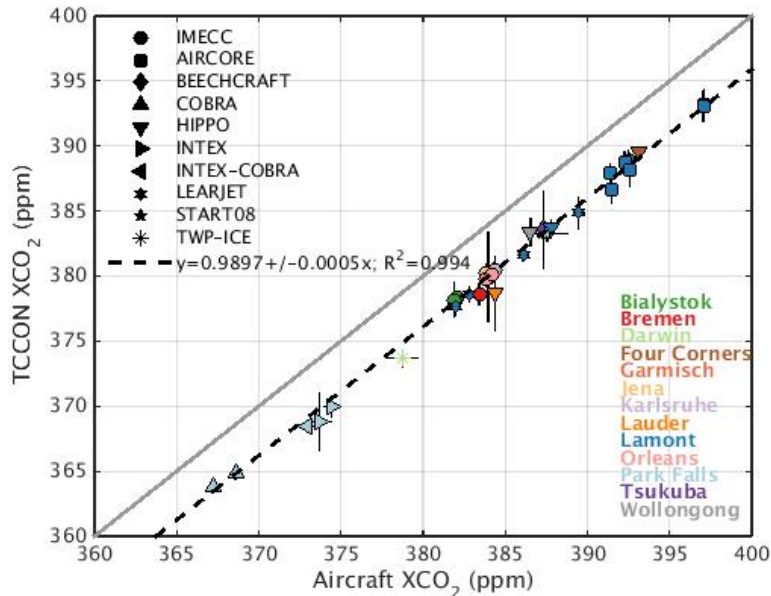


# Potential TCCON Site



- Total Carbon Column Observing Network
- Provides primary validation data for OCO-2, GOSAT
- Aim to become an official TCCON station within the year

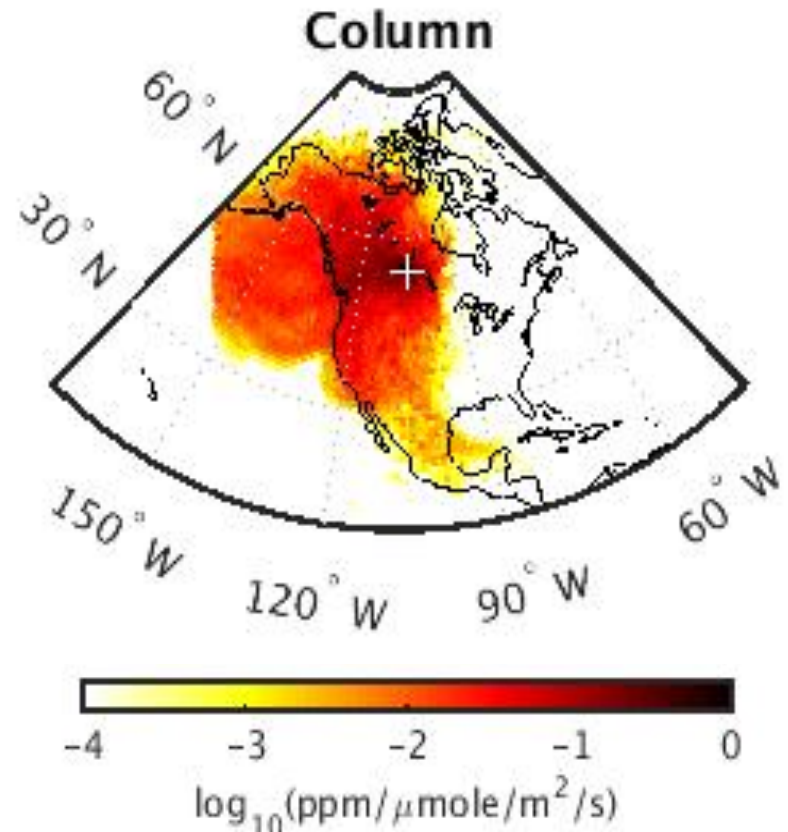
# TCCON Provides Link between Satellite Measurements and Surface In Situ



- Aircraft fly WMO-calibrated instrumentation in spirals or missed-approaches over TCCON stations
- Integrate the aircraft profiles and compare with TCCON
- Single scaling factor places TCCON on the “WMO scale”

# TCCON Footprint

- Column measurements have good sensitivity to the entire ABoVE domain
- Constrain the ABoVE-scale column abundances
- “Big picture” of trace gases in the region



July-August 2012 aggregated footprint analysis from WRF-STILT, courtesy A. Andrews

# Links to ABoVE

- Long-term, time-resolved, high precision and accuracy total column dry-air mole fractions of carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and other gases in the ABoVE-domain atmosphere.
- Serve as the link between surface in situ measurements of atmospheric CO<sub>2</sub> and CH<sub>4</sub> in the region, and satellite-based measurements from OCO-2, GOSAT, and follow-on missions.
  - Will be targeted by OCO-2 beginning spring 2017
- Interannual variability in measured DMFs will allow us to investigate the impacts of interannually varying climate variables
  - surface temperature, soil moisture, drought, fires and insect infestation
- Provide insight into the boreal forest's response to these changes, its ability to recover after disturbance, and its future role in the carbon cycle.

# First Results and Funding Acknowledgments

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