

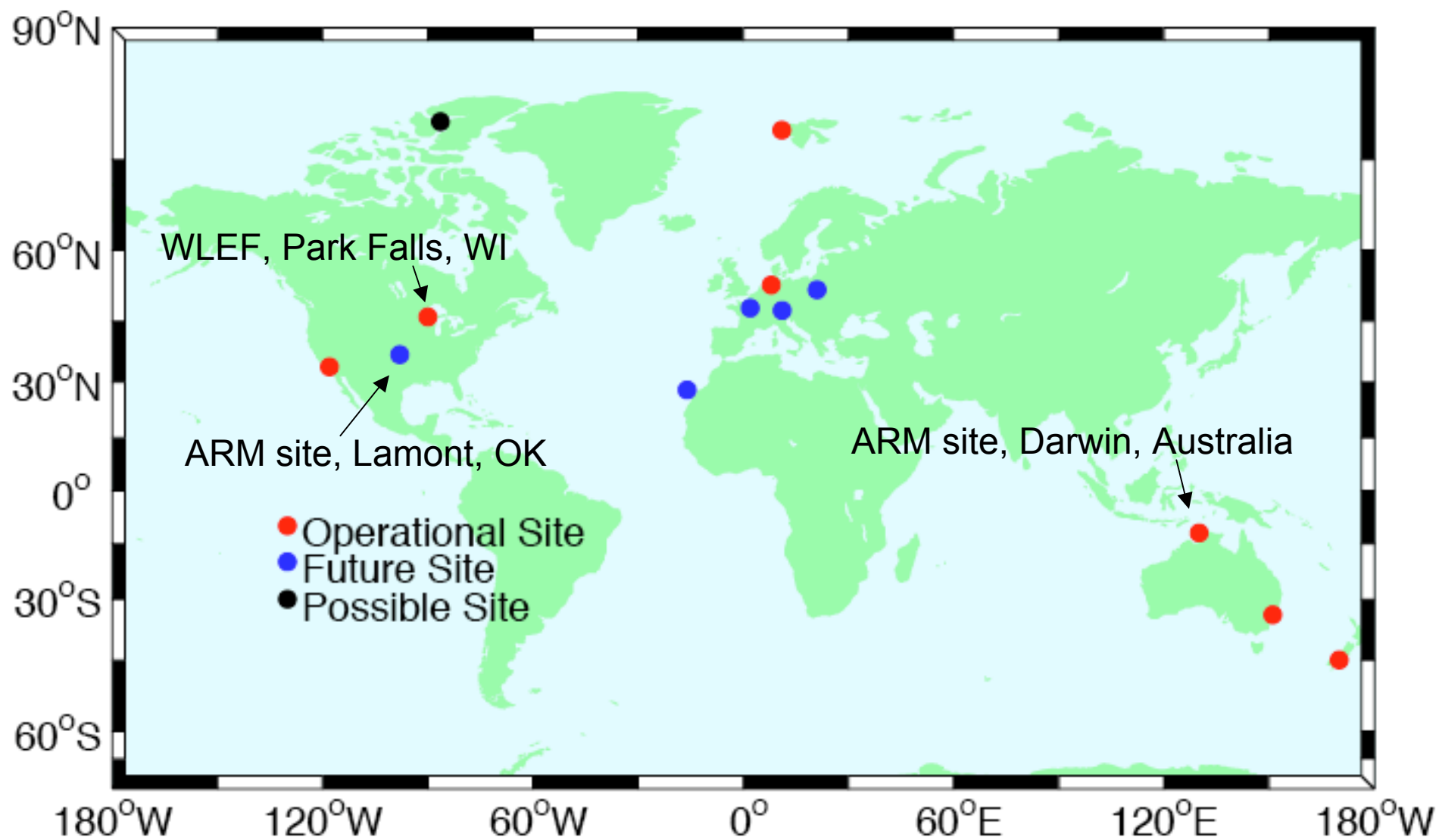
# Ground-based Observations of Total Column CO<sub>2</sub>

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# Total Column Carbon Observing Network



## Caltech Automated Solar Observatory at WLEF



# Bruker IFS 125HR Fourier Transform Spectrometer

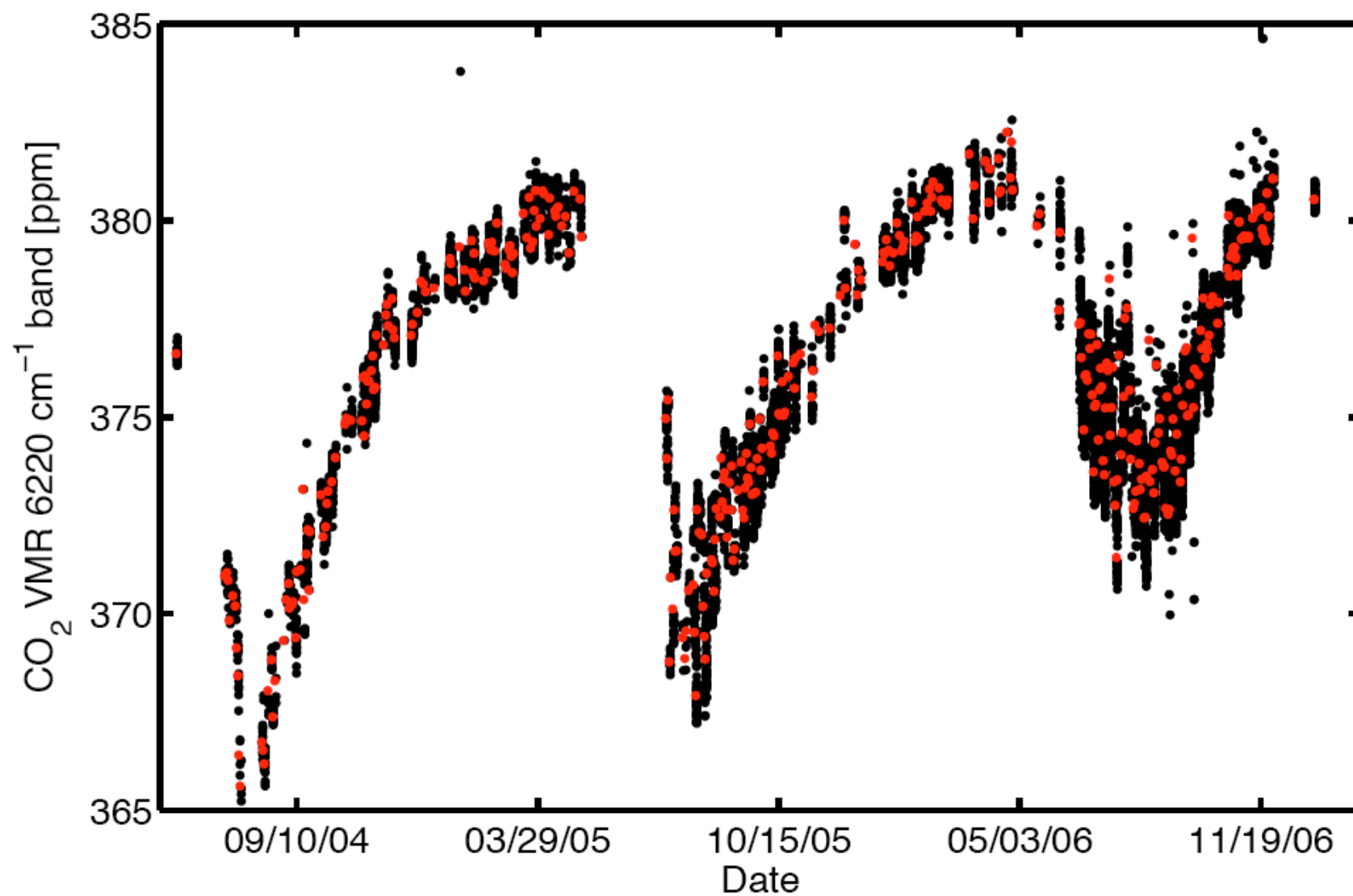


Spectral resolution  
of  $0.02 \text{ cm}^{-1}$

Precision in  
retrievals better than  
0.3%

Measurements  
calibrated to in situ  
profiles obtained  
during INTEx-NA  
(Washenfeller et al,  
2006)

# Carbon Dioxide Retrieval 2004-2007

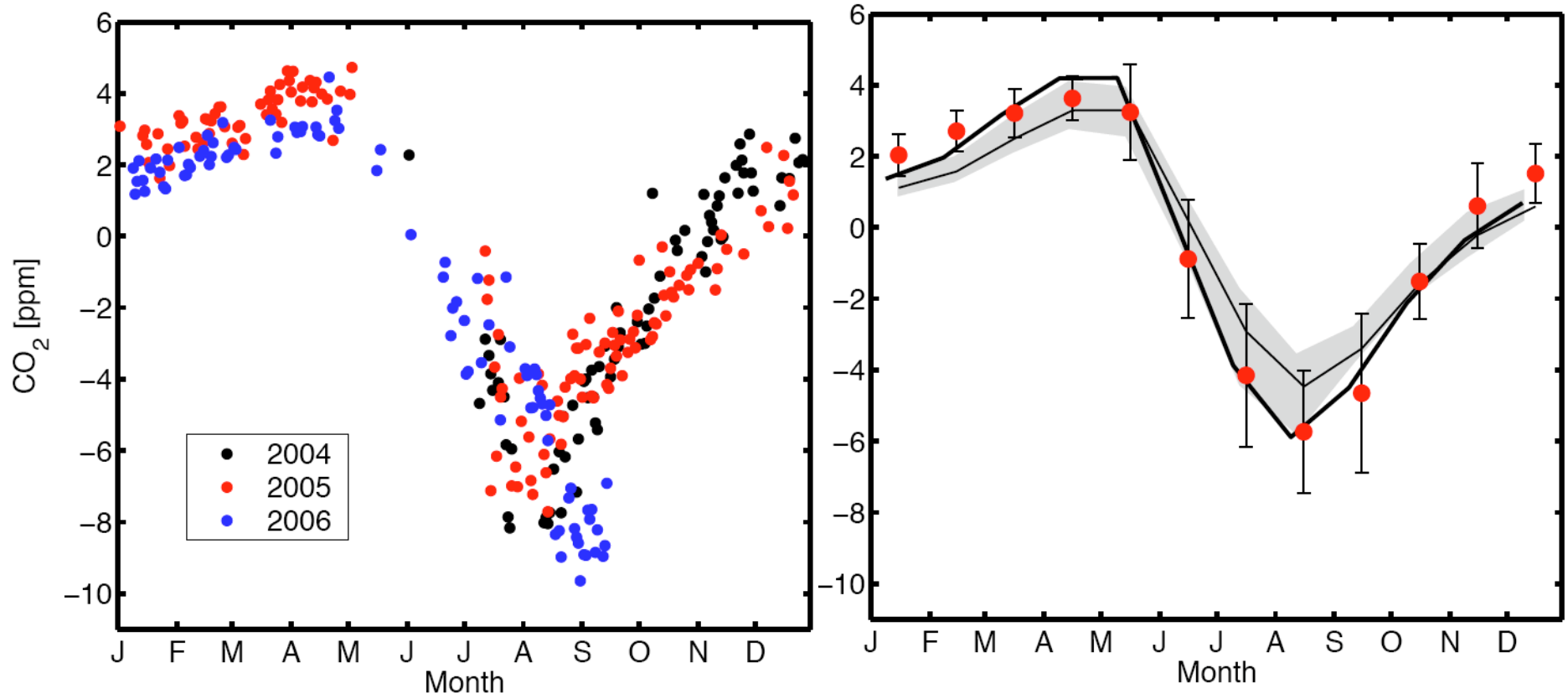


## Weak vertical mixing in CTMs

Use column-averaged  $\text{CO}_2$  to estimate scaling of surface fluxes

CASA underestimates fluxes by 25%

Sluggish vertical mixing compensates for weak surface fluxes



(Yang et al., 2007)

## **What is the information content of the column observations?**

Observe variability at several time scales

Information content of measurements is large - near-continuous sampling, simultaneous retrieval of several gases

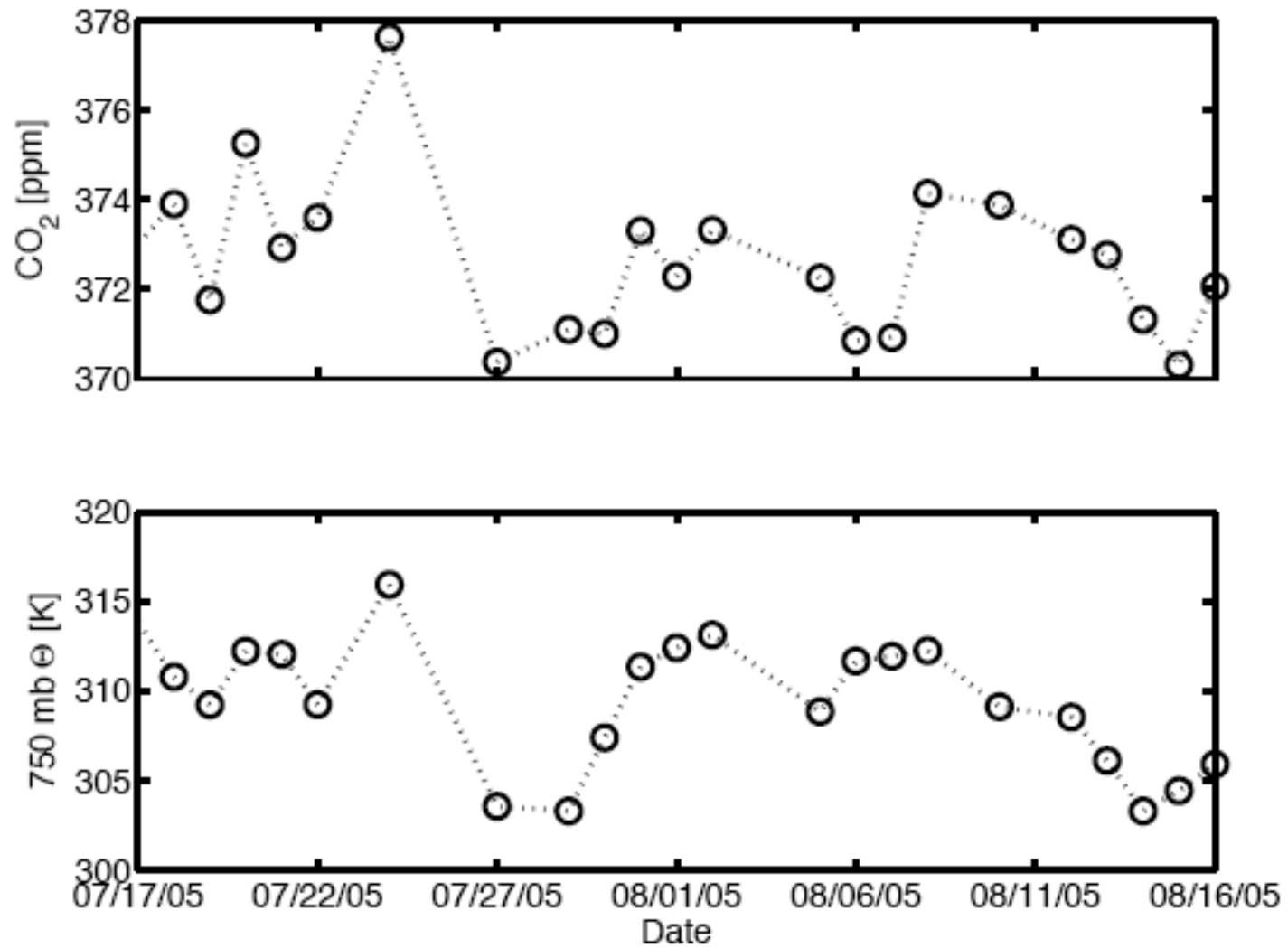
Challenge is to attribute variability in CO<sub>2</sub> to individual processes  
Use of CO, CH<sub>4</sub> correlations fruitless, so far

## **What is the footprint of the column observation?**

**How can we use transport models to better understand the processes controlling the column?**

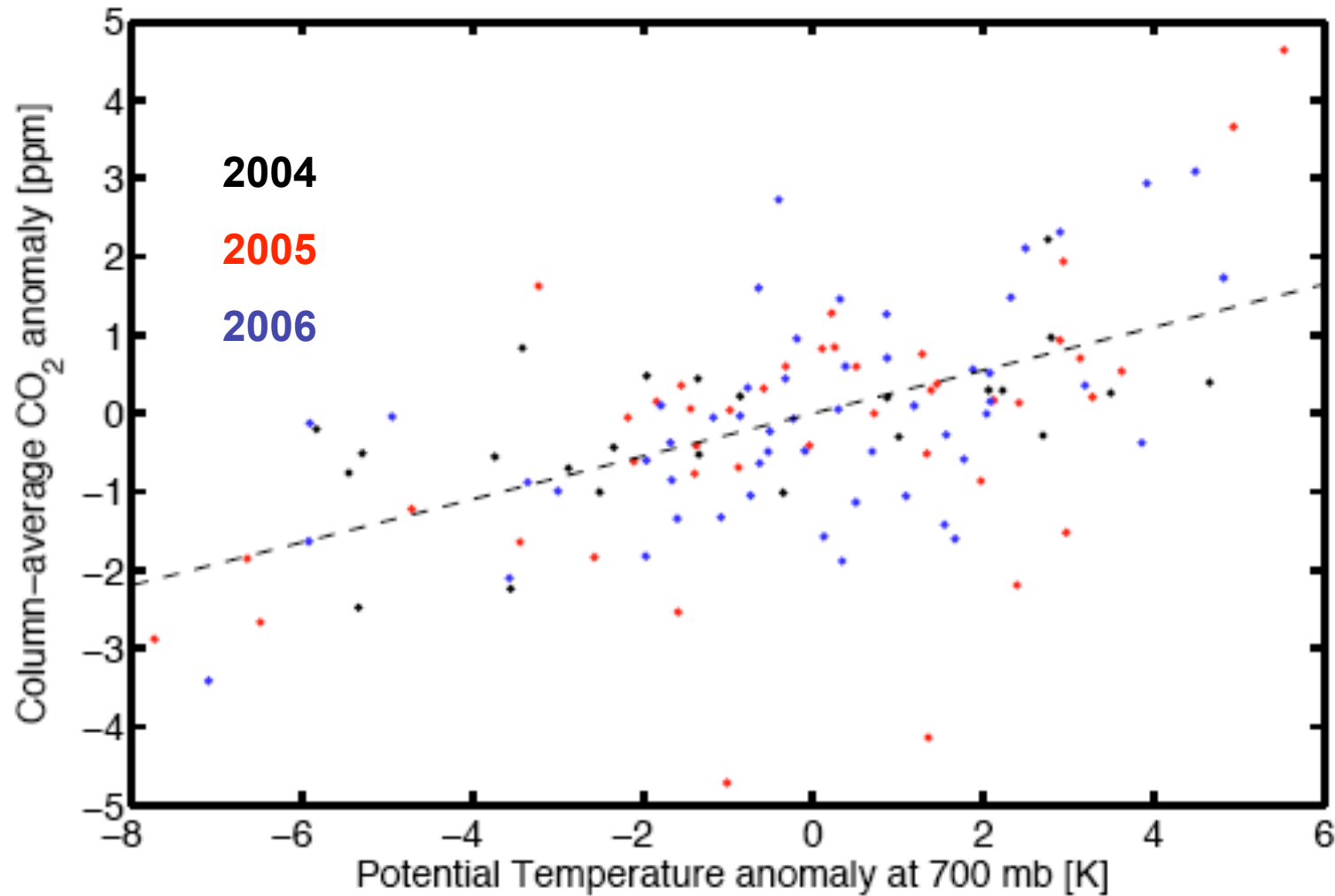
**How can we use the measurements to infer fluxes?**

## Synoptic Scale CO<sub>2</sub> Variability





## July / August Observed Park Falls CO<sub>2</sub> Anomaly



NCEP Reanalysis used to calculate potential temperature  
Anomaly determined by 30 day high pass filter

# What can we learn from CTM and reanalysis output?

