AirCore: The gold standard for evaluation of satellite retrievals

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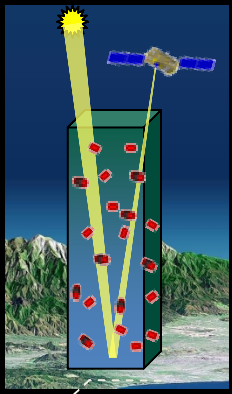
Outline

- Why do we need AirCore measurements?
- What is new about the AirCore?
- Southern Great Plains (SGP) comparison
- Where are we going?

Roadmap to fluxes

Satellite



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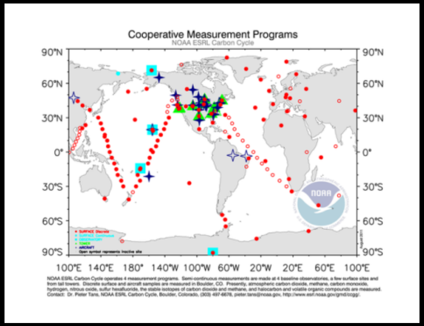
TCCON



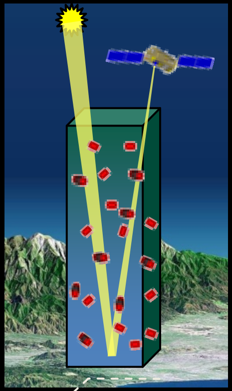
Global Network

Model

FLUXES

Roadmap to fluxes

Satellite



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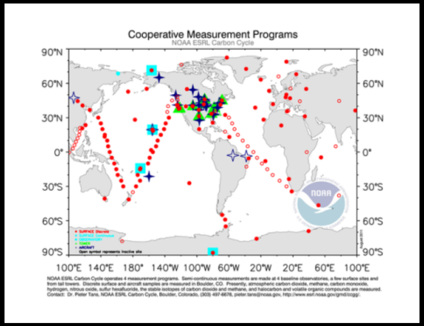
TCCON

AirCore



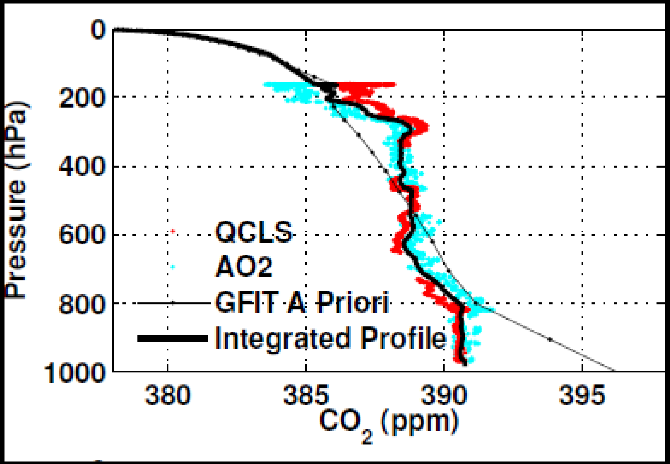
Global Network

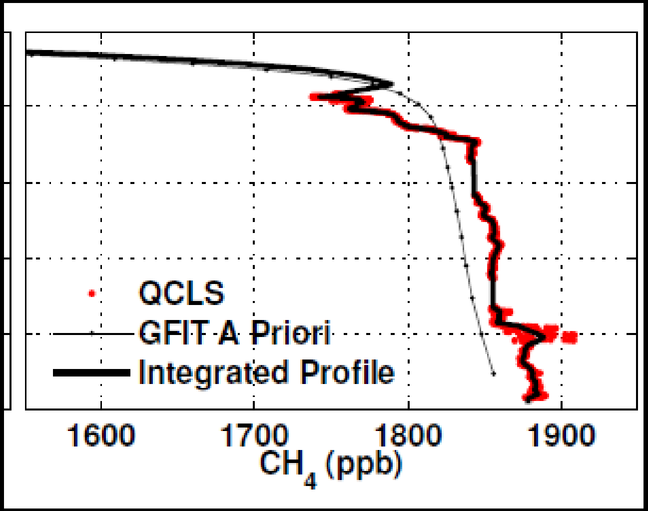
Model

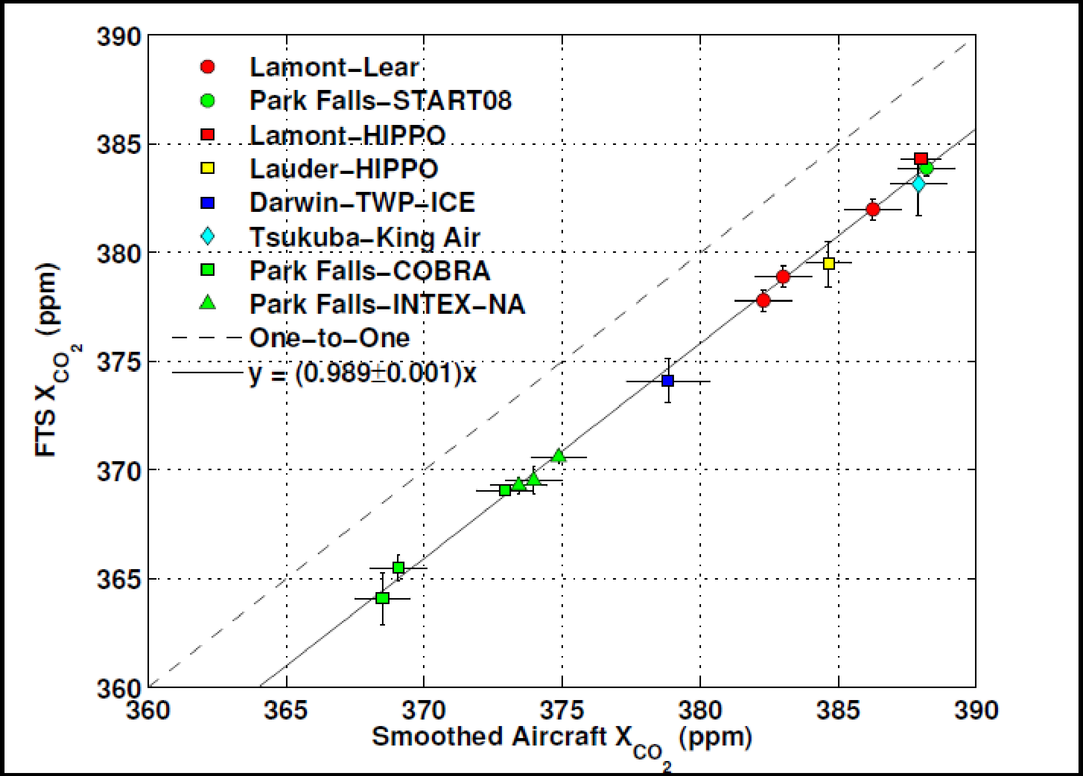
FLUXES

Need direct measurements of the total column to link remote measurements to ground network.

TCCON calibration

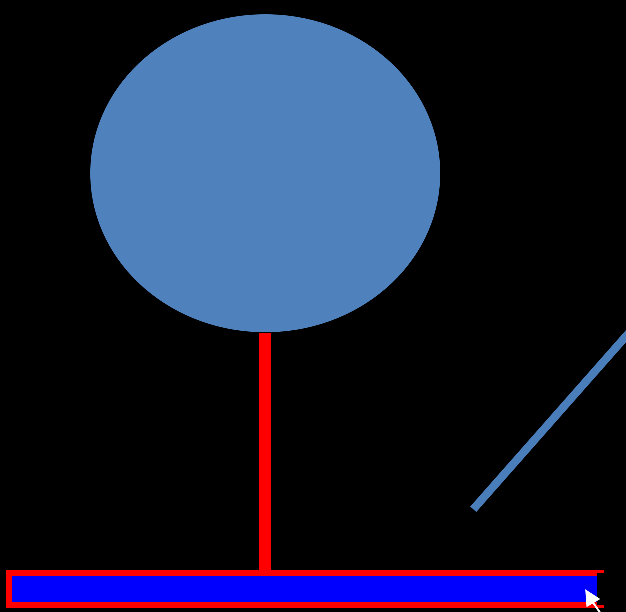


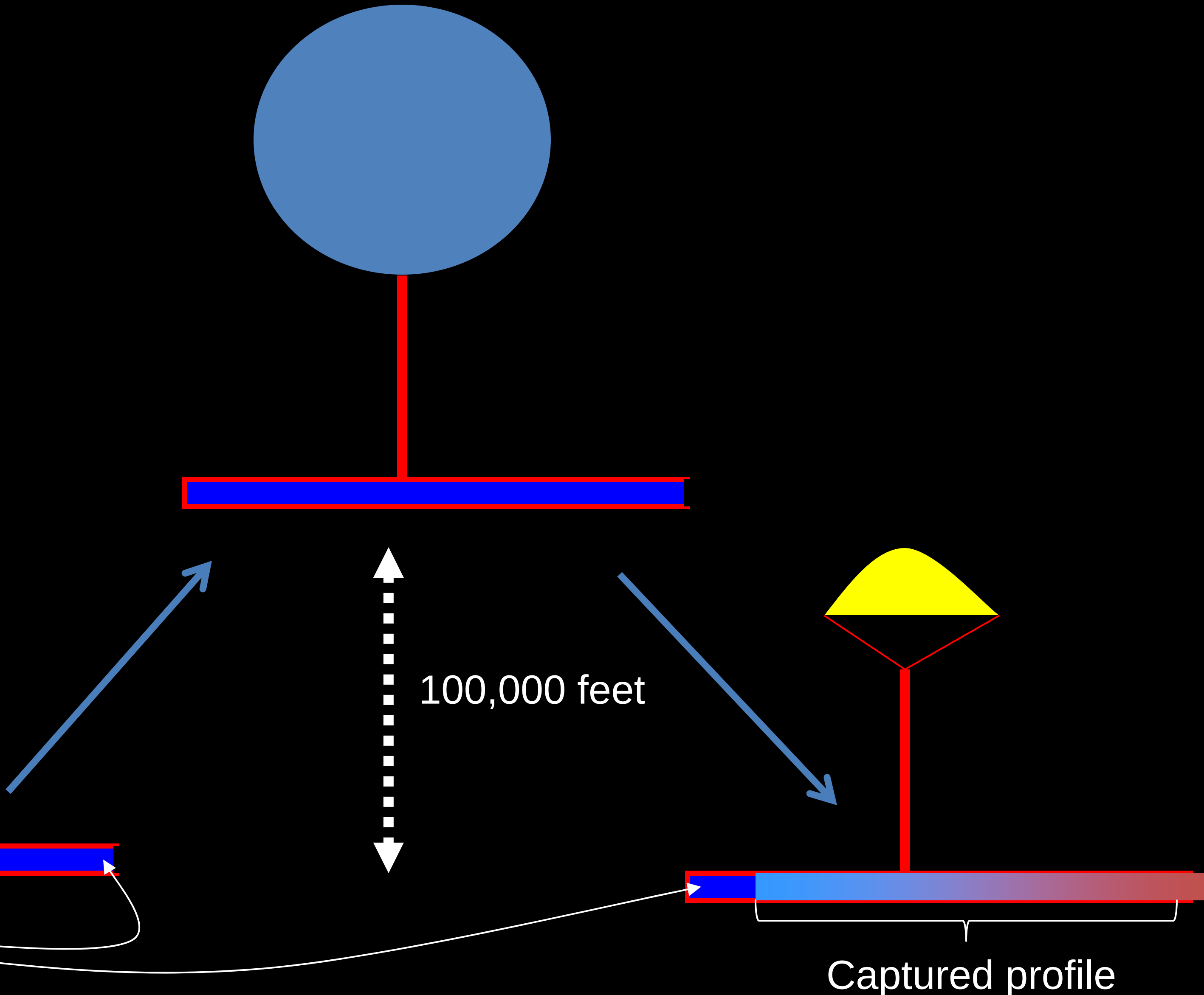




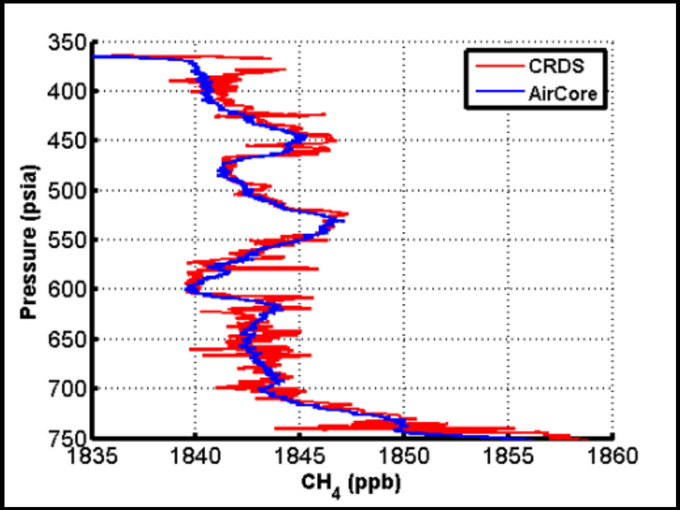
Typical aircraft profiles only go to 200 mbar

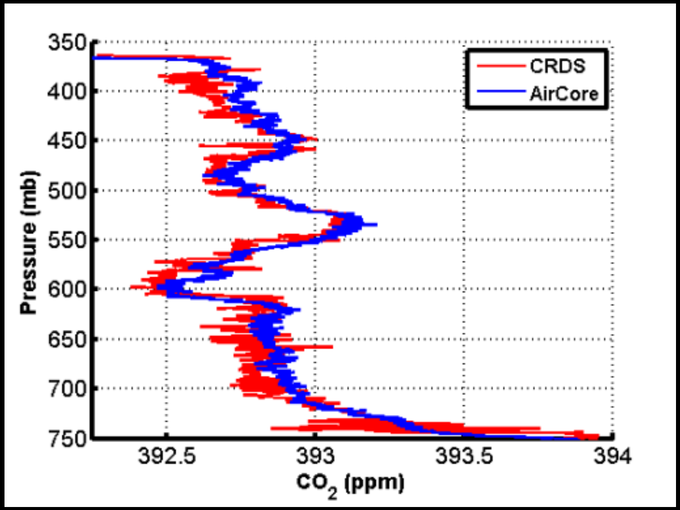
Passive AirCore Sampling System





Comparison with insitu measurements





CH_4 **Column Mean offset** CO_2

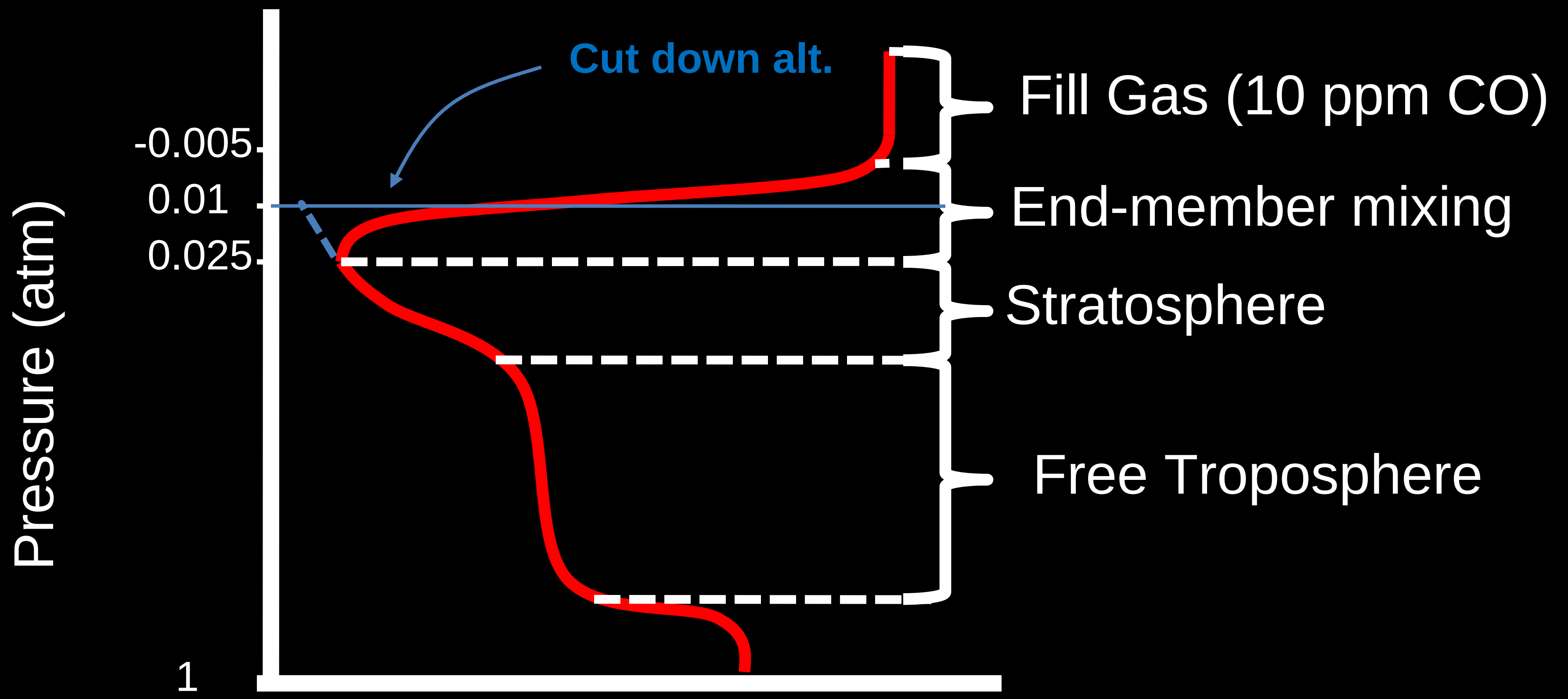
CO_2 (ppm)	**-0.07 ± 0.04**	**(±0.02%)**
CH_4 (ppb)	**-0.1 ± 0.4**	**(±0.01%)**

AirCore v. Aircraft
errors in estimate of total column

Sampling platform	Sampling range	Cost ($)	Error in XCO_2	Error in XCH_4
Small aircraft	0 – 4 km	1.5K	0.77 - 2.14 ppm	10 ppb
Small aircraft or Jet	0 – 8 km	2.5K	0.76 ppm	7 ppb
Jet	0 – 12 km	10K	0 - 0.40 ppm	6 ppb
AirCore	0 – 30 km	4.2k	0.10 ppm	1 ppb

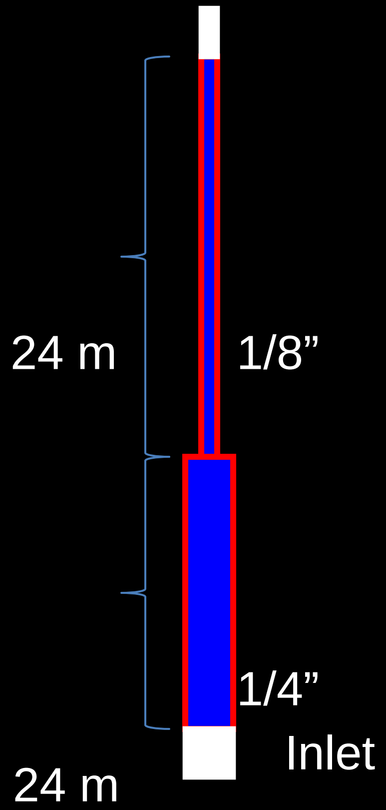
AirCore can sample 99% of the column for half the price of any aircraft system and at ¼ the error

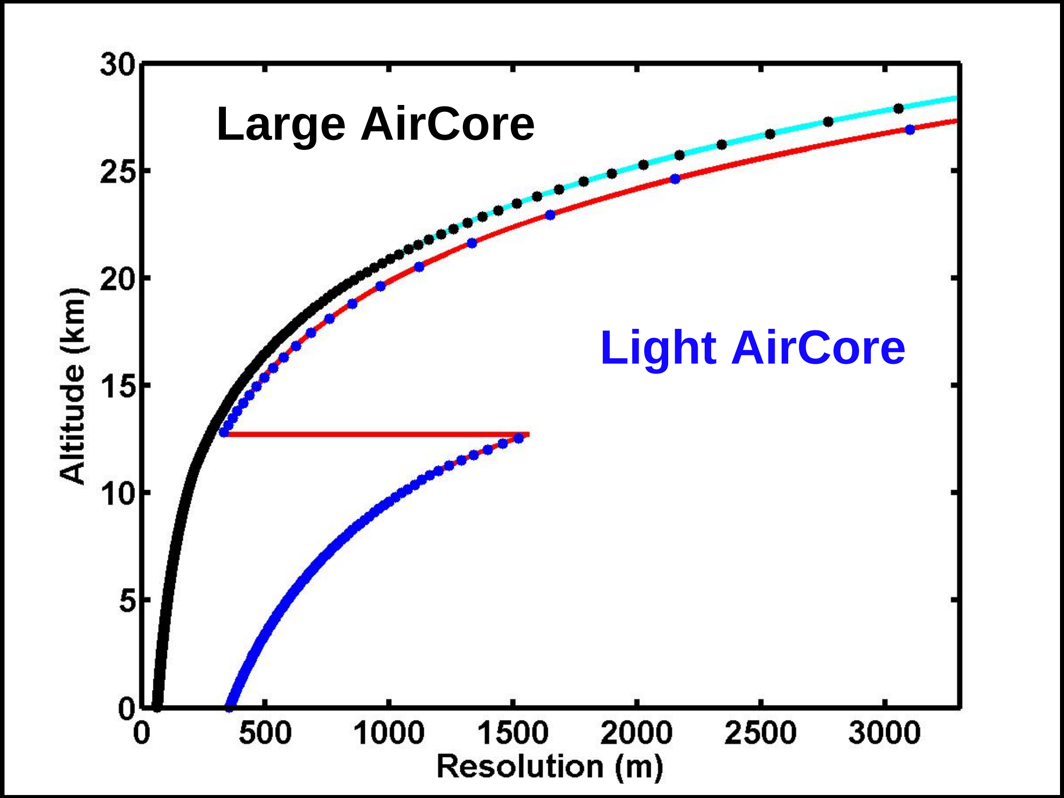
High altitude mixing tracer



Maximum altitude = 30,000 m (100,000 ft, 0.01 atm)
= 24,000 m (80,000 ft, 0.02 atm)

Low cost/light weight AirCore



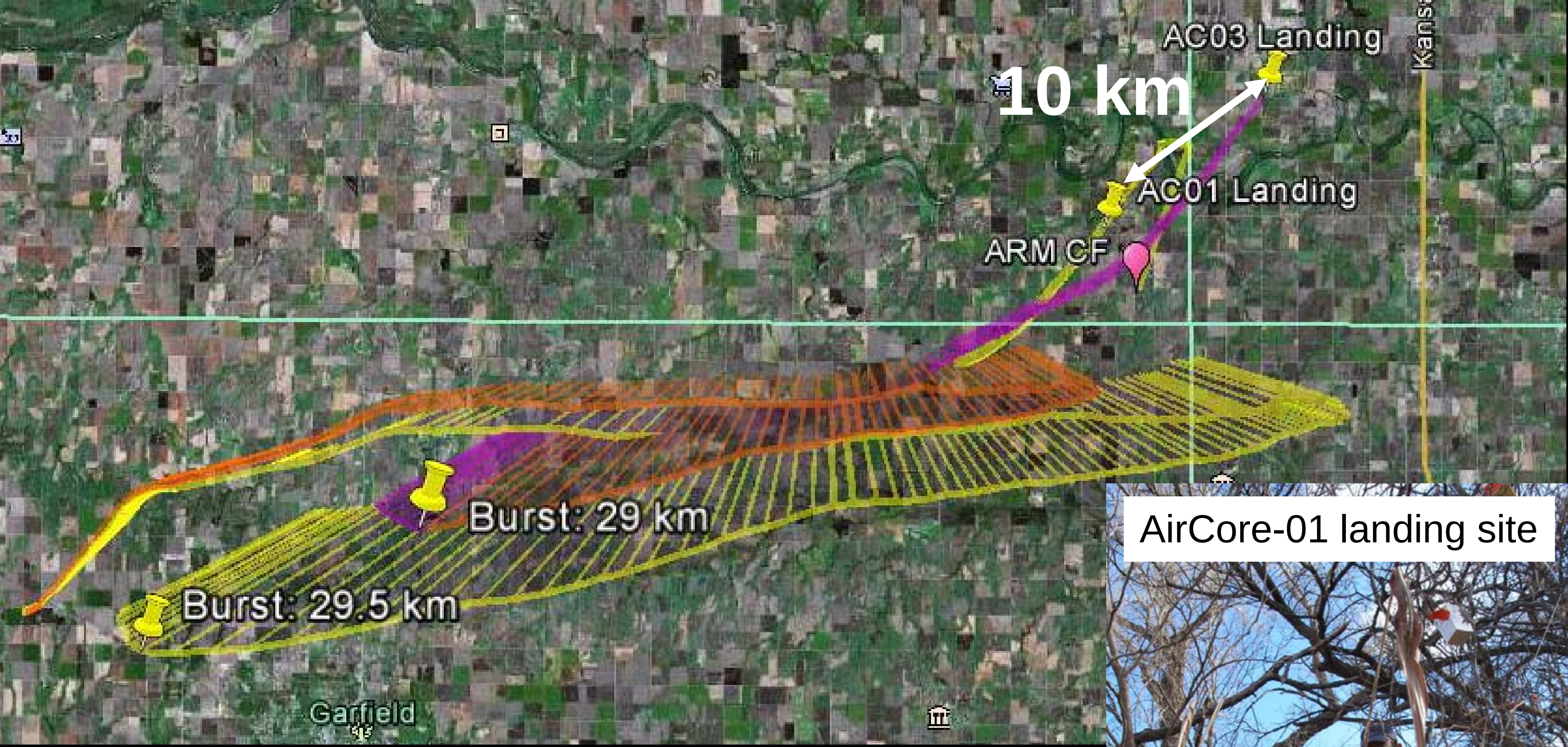


Tubing weight = 4 lbs
Volume of tube = 0.8L

Light weight
- No reporting to FAA
- potential to package in return vehicle
- simple logistics
- slightly reduced resolution

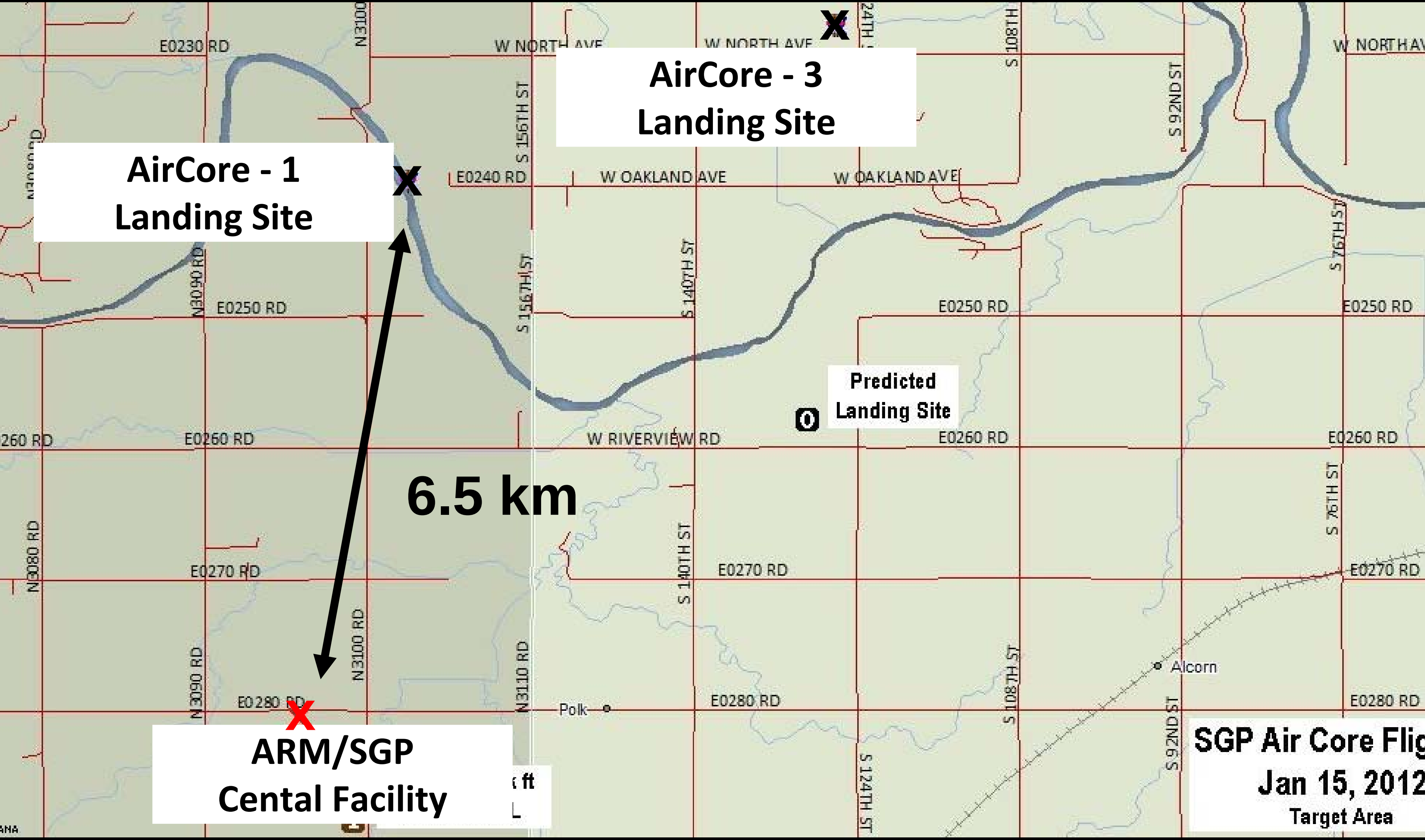
Southern Great Plains (SGP) Field Test
January 14, 2012
January 15, 2012

ARM-SGP Jan 14, 2012
Medicine Lodge, KS



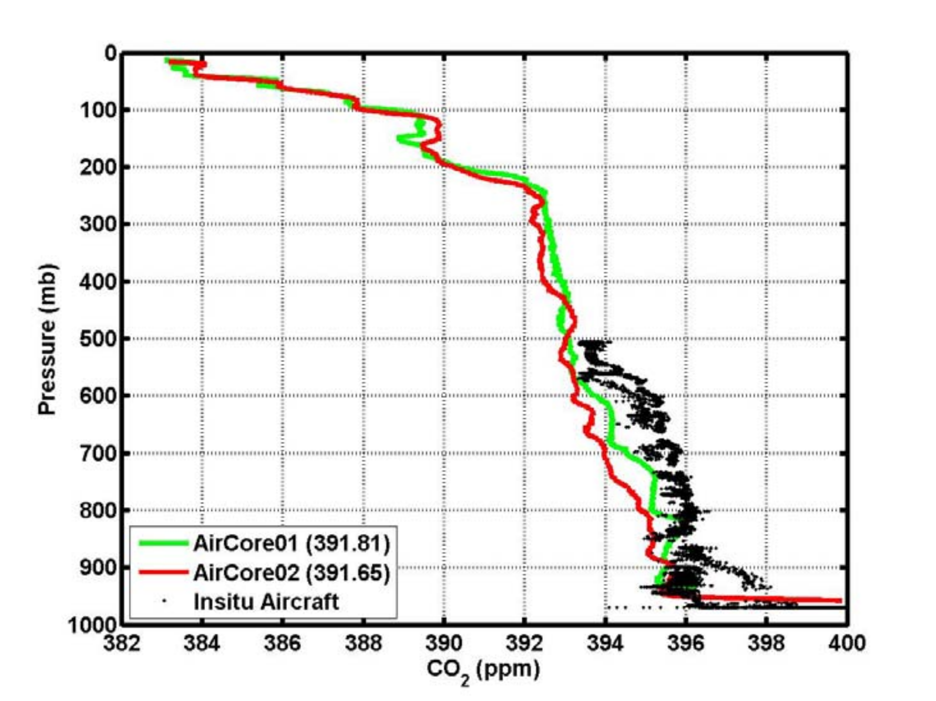
ARM-SGP Jan 15, 2012, Carrier, OK

Jan 15 landing locations

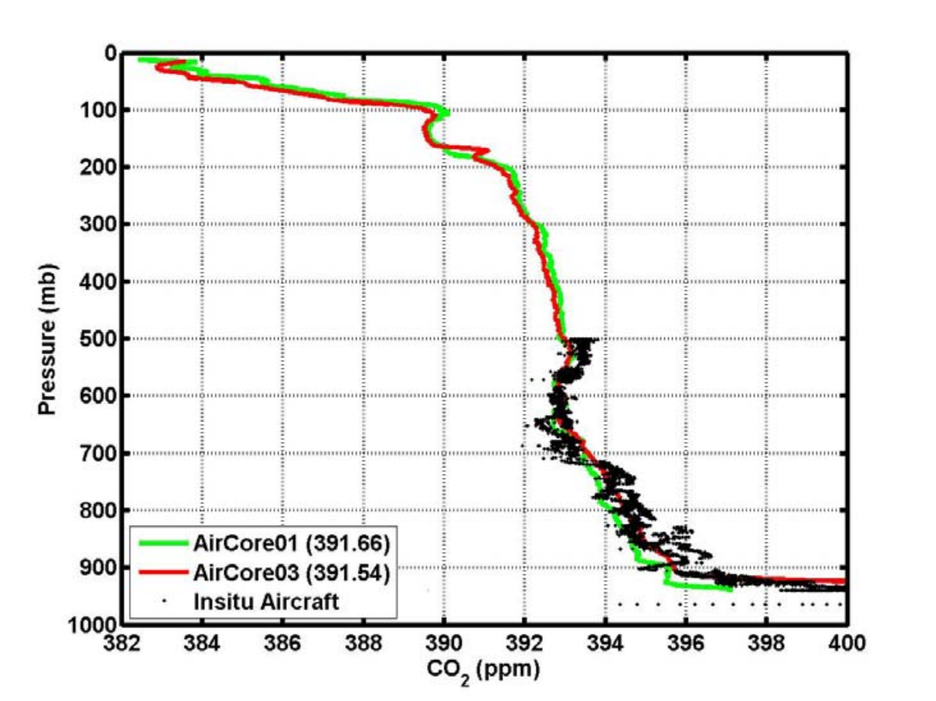


CO_2

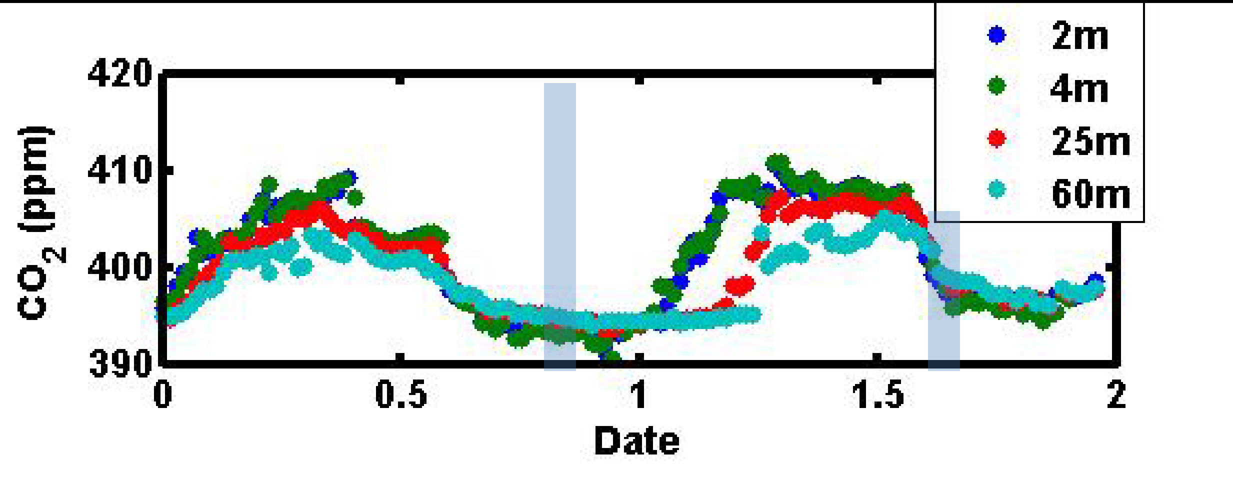
Jan. 14, 2012



Jan. 15, 2012

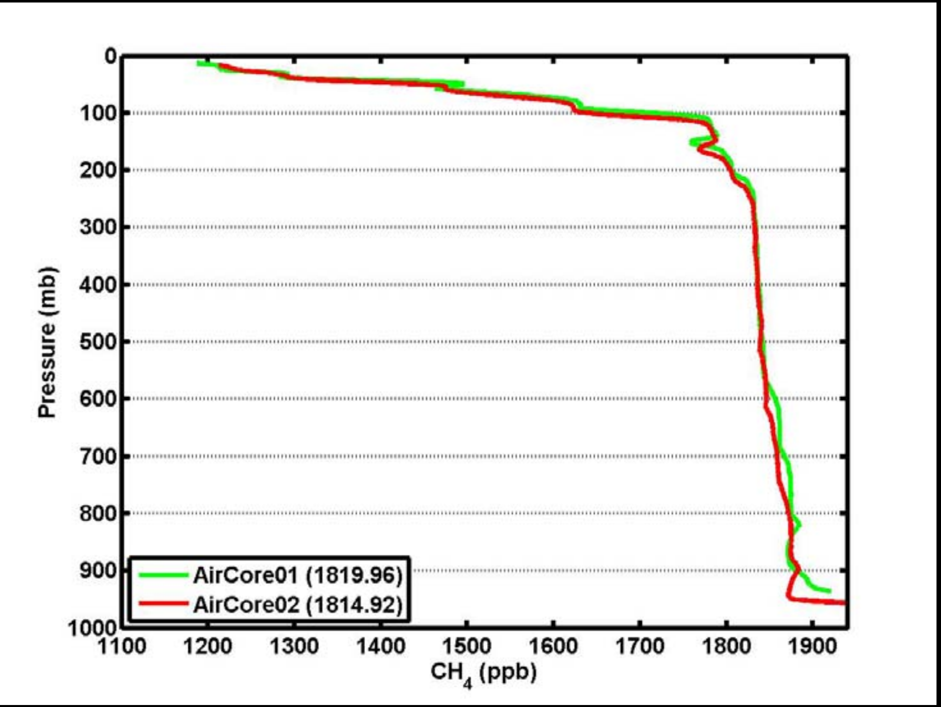


SGP Tower

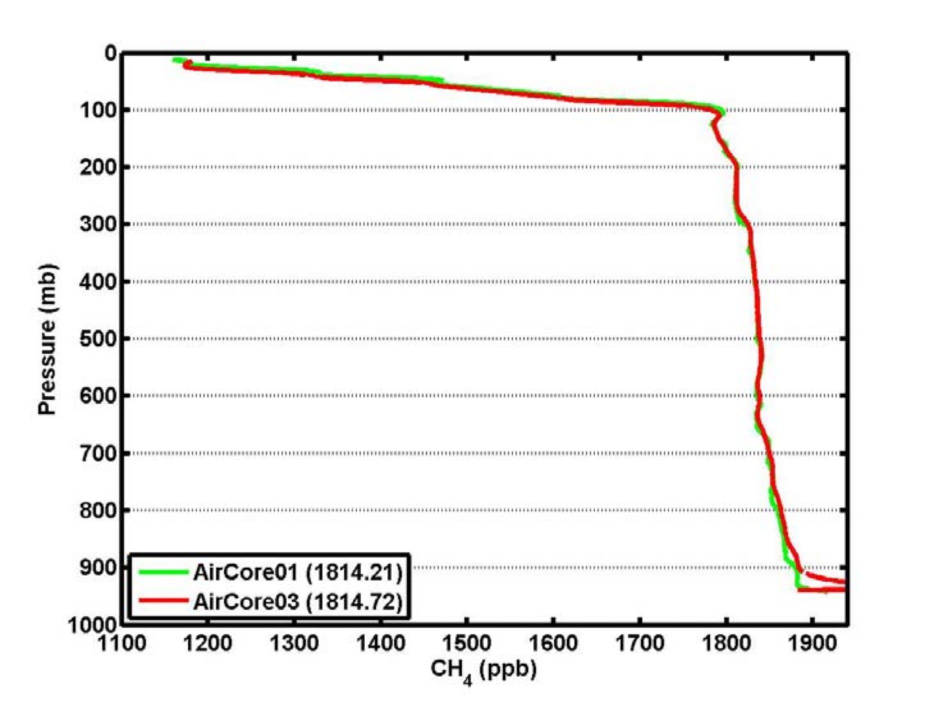


CH_4

Jan. 14, 2012



Jan. 15, 2012



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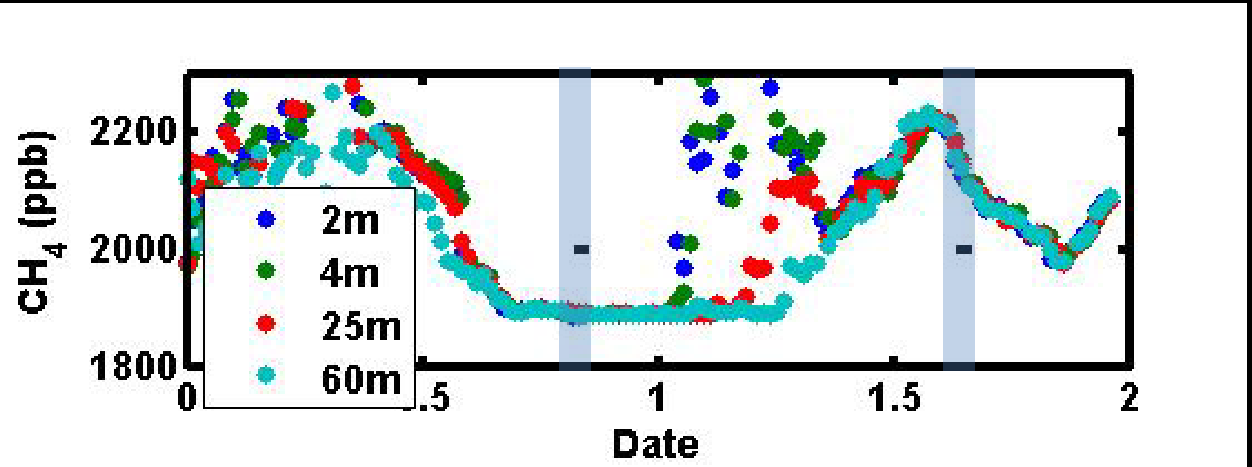
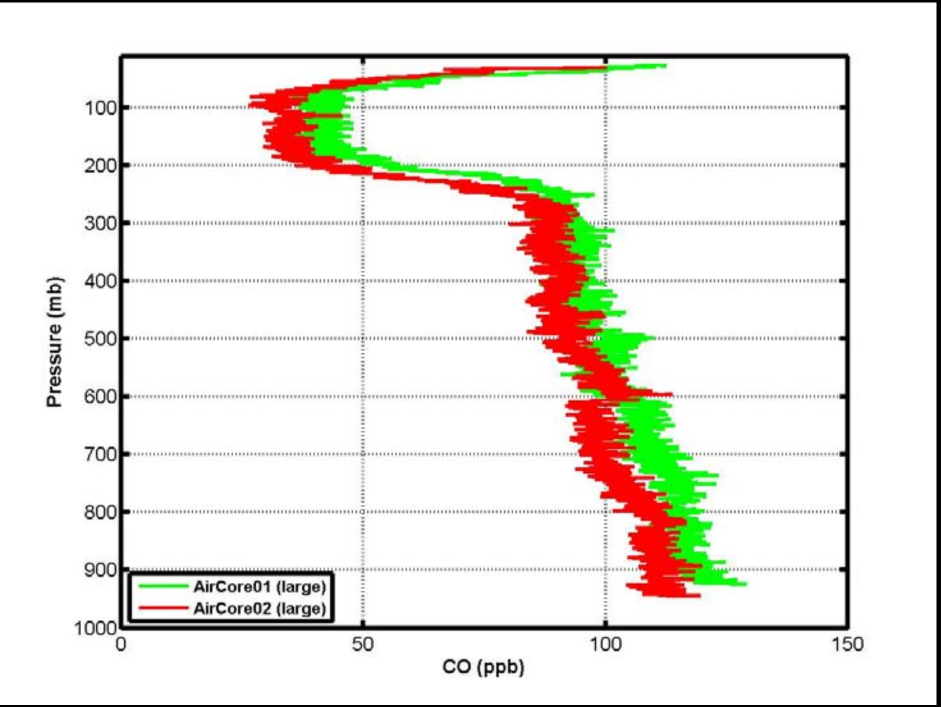
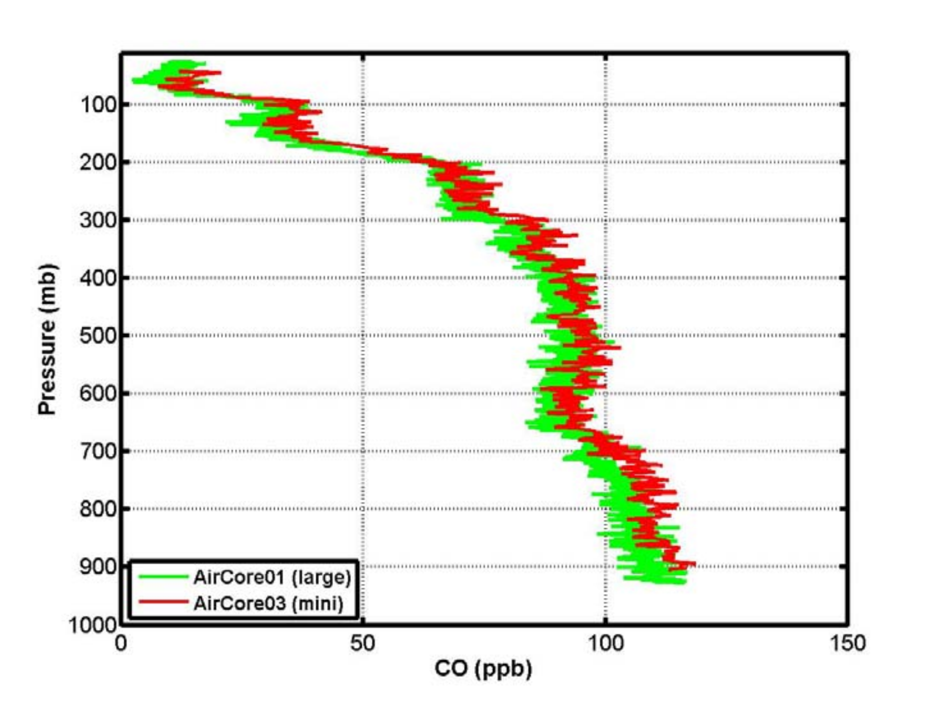


CO

Jan. 14, 2012



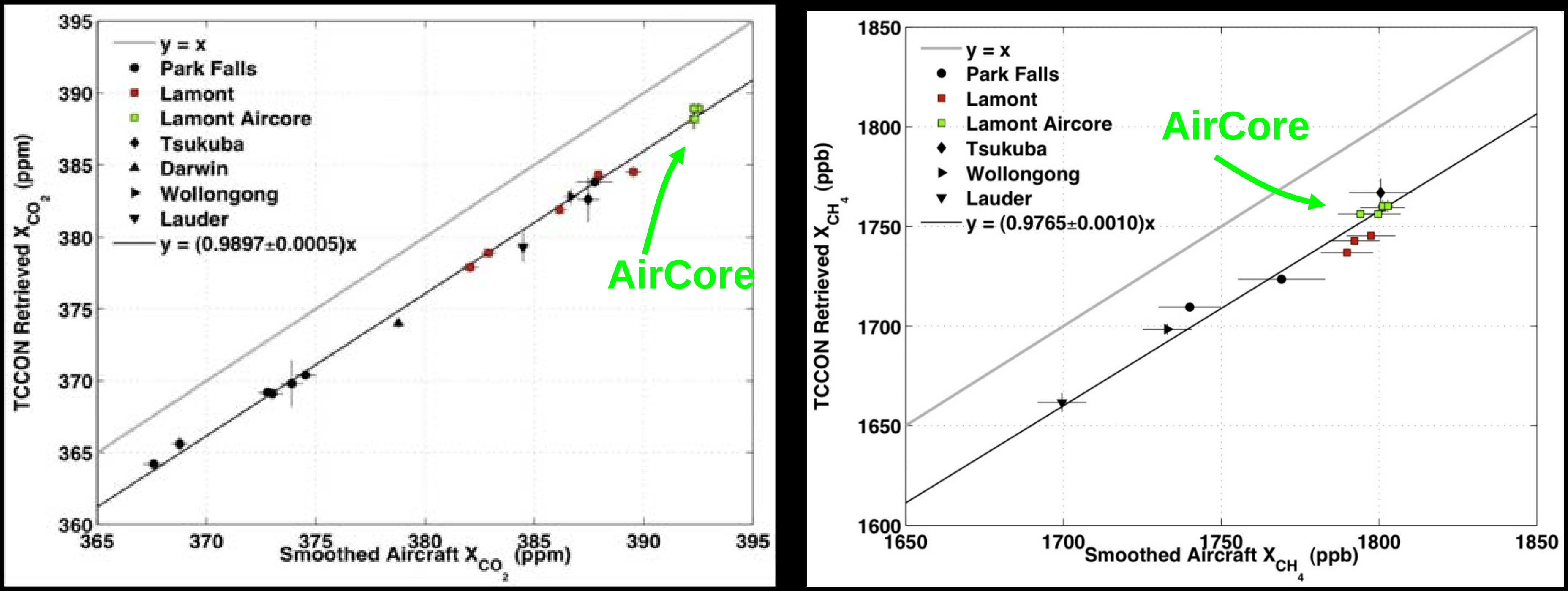
Jan. 15, 2012



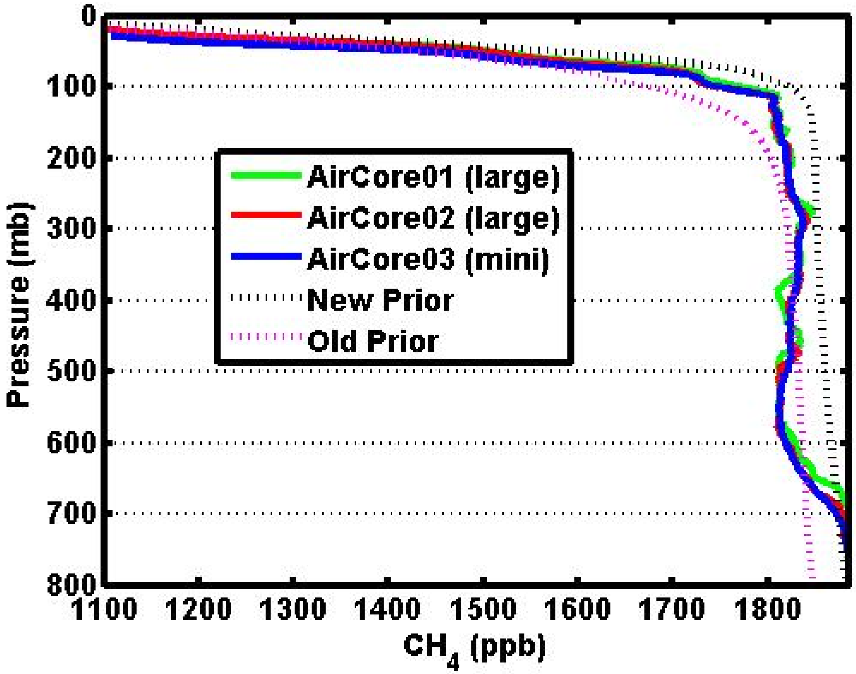
- CO is a valuable mixing tracers to get near-ground and high stratosphere mixing ratios
- Organic layer in AirCore Sulfurinert is creating CO in high ozone environments

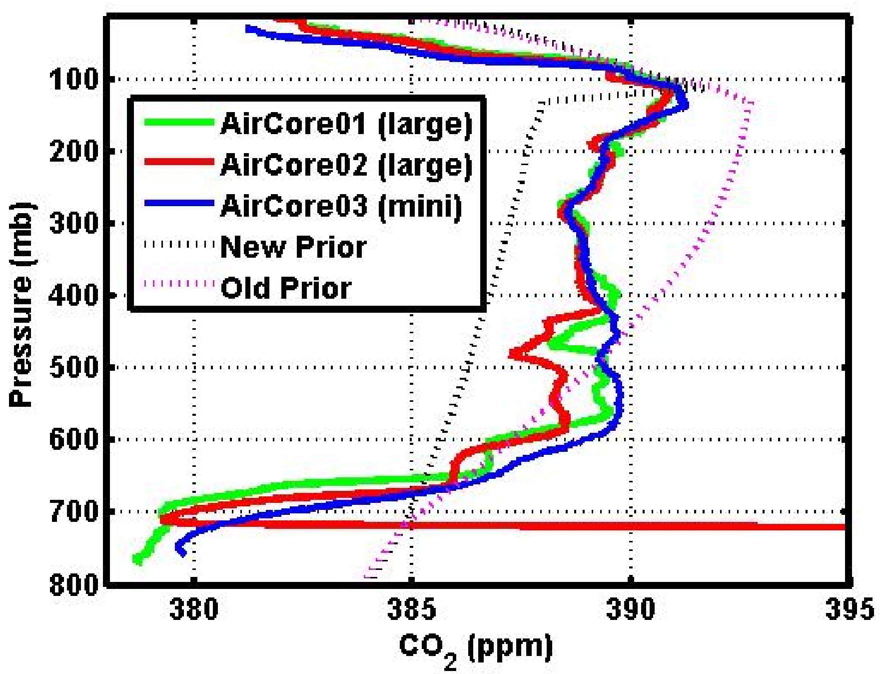
Calibrating TCCON CO_2 Across Multiple Sites

- Lamont (ARM-SGP) Aircore consistent with previous results
- Additional work required on uncertainty budget



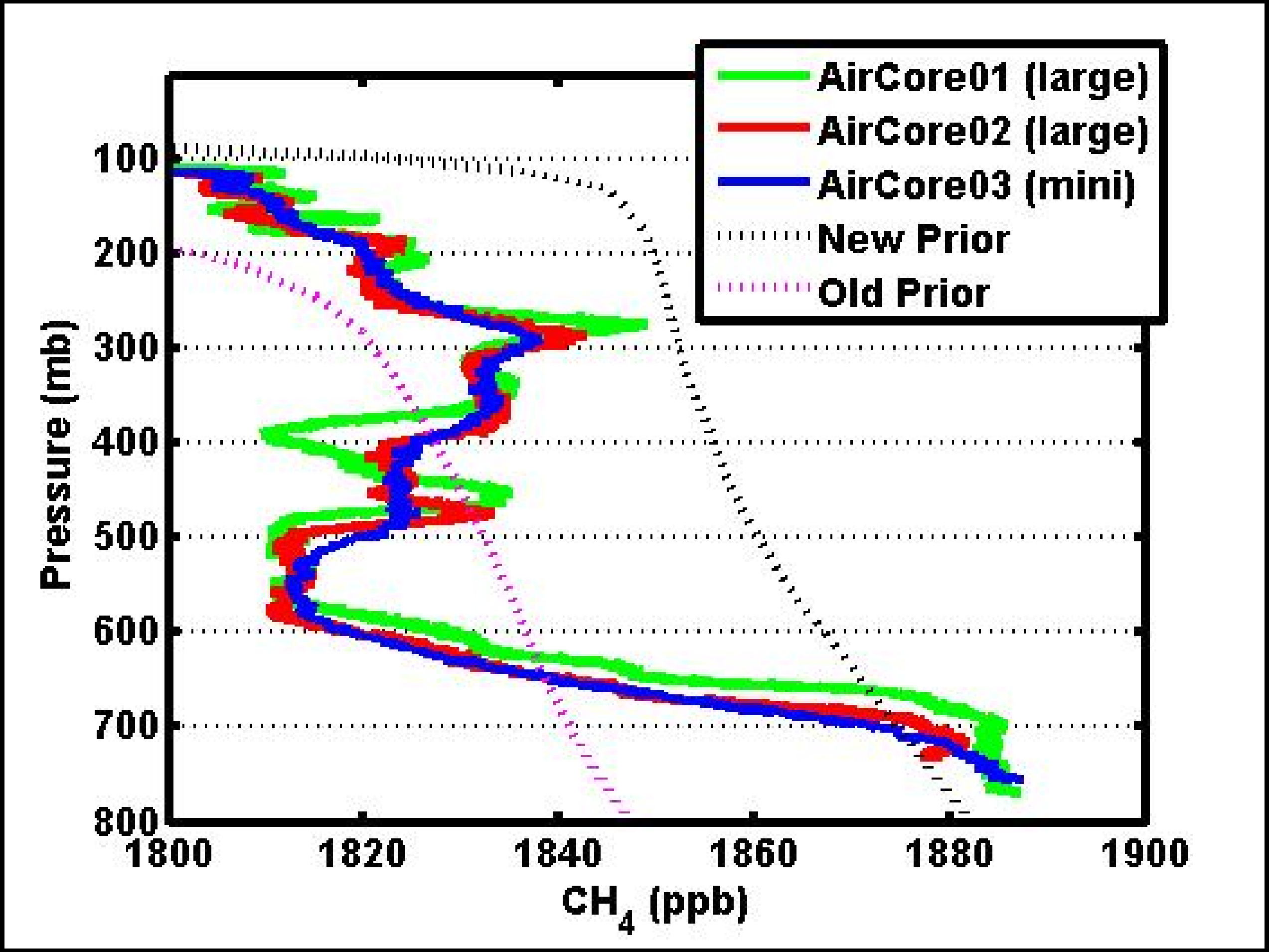
2-D structure of a profile





CH_4 CO_2

2-D structure of a profile

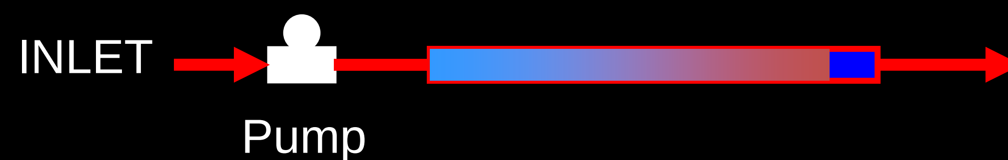


CH_4

Glider

Putting AirCore where you want

Actively pumping AirCore



Active Pumping AirCore

The tape recorder

Goals for Passive AirCore:

Logistics – Launching

Logistics – Retrieval

Logistics – Data analysis

Science – improved priors

Science – stratospheric age model

Science – provide direct tie to WMO