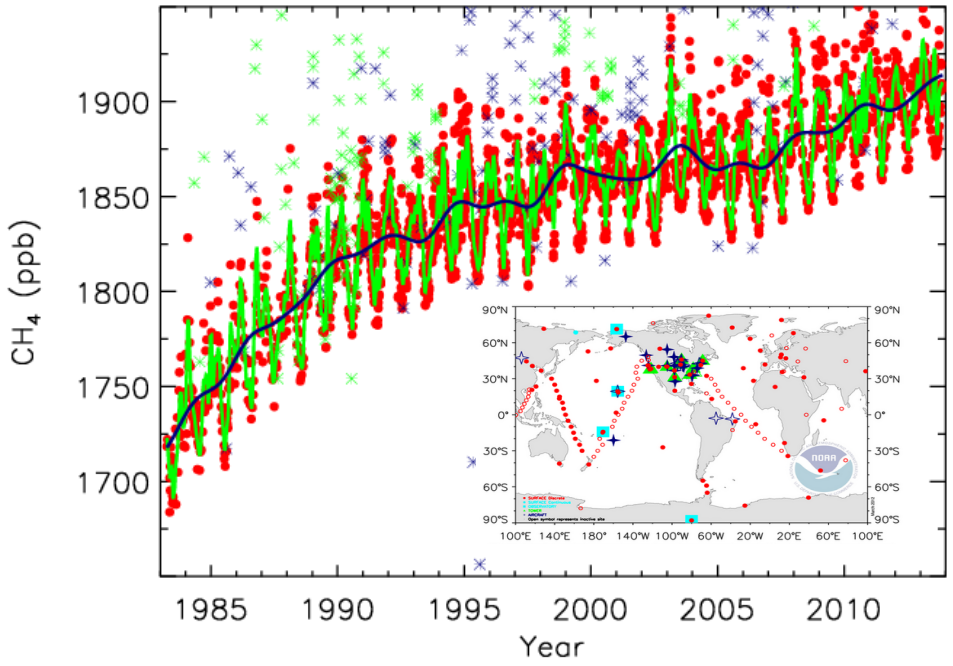
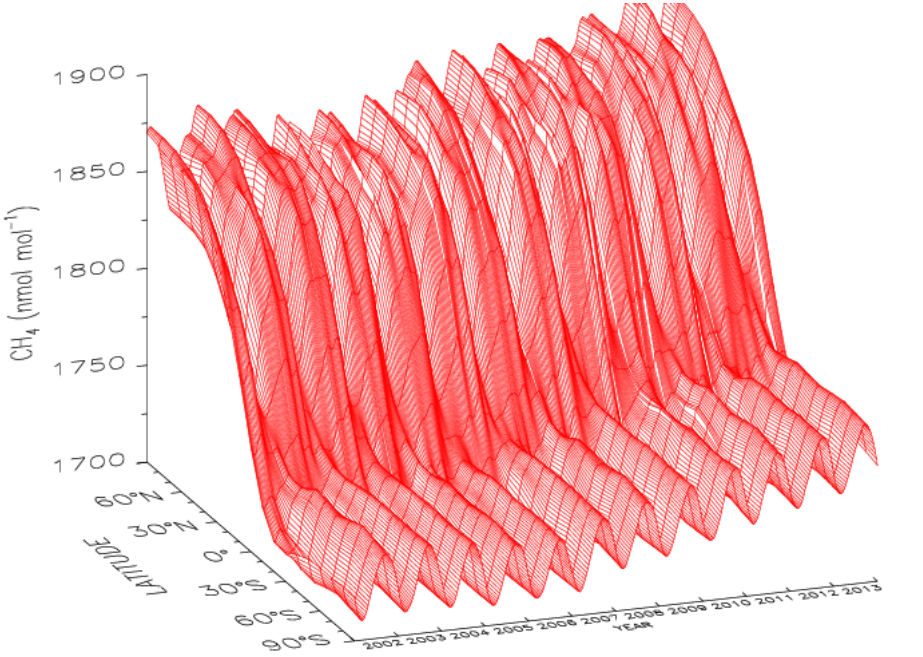
Constraining Methane Emissions with Atmospheric Observations

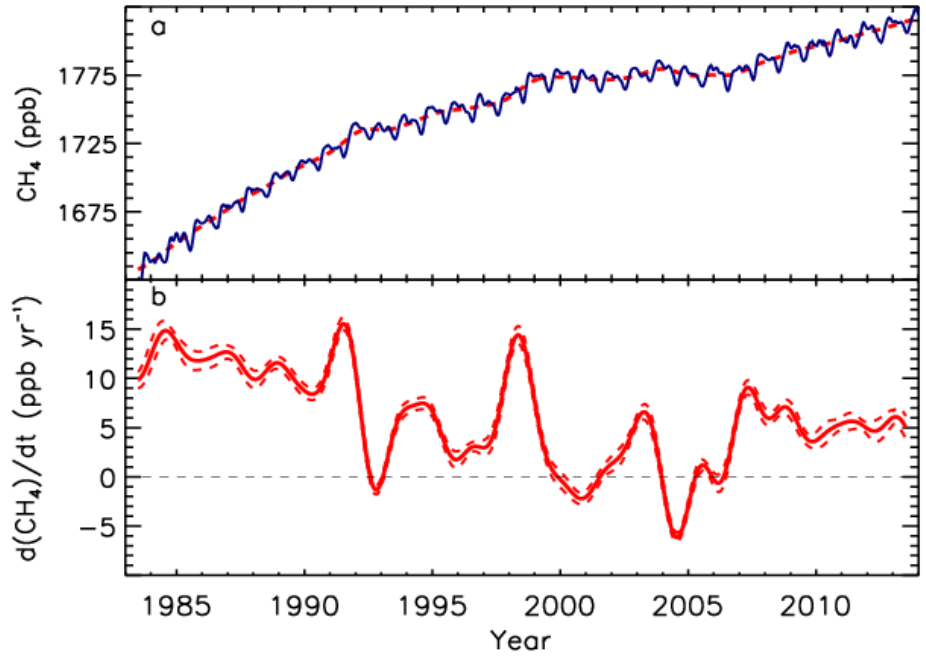
Ed Dlugokencky, Pat Lang, Ken Masarie, and Lori Bruhwiler

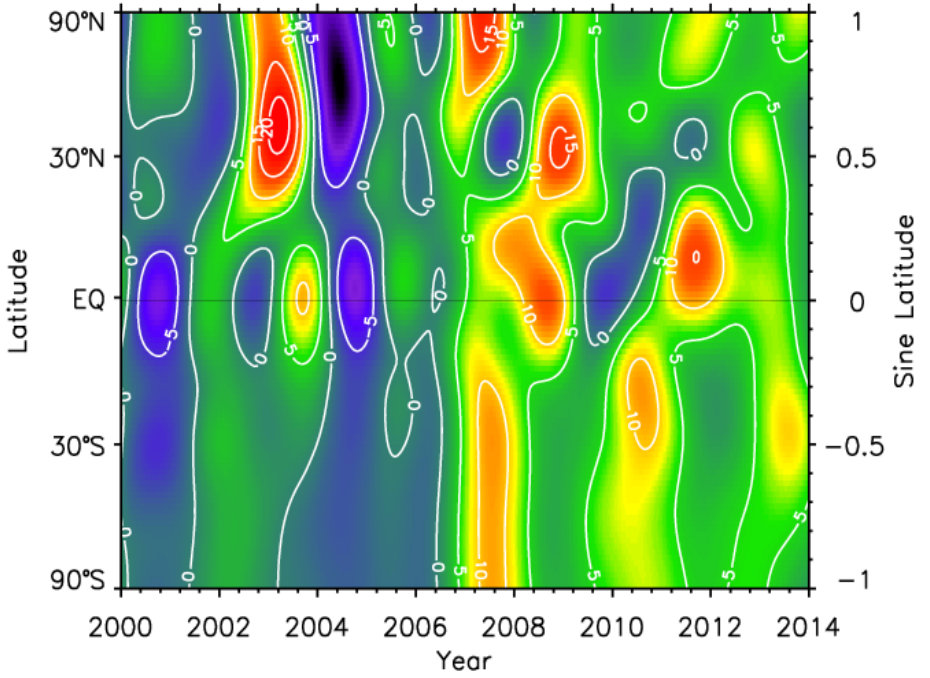
NOAA ESRL GMD CCG

Key Message:
Observational constraints are often over-looked in bottom up inventories

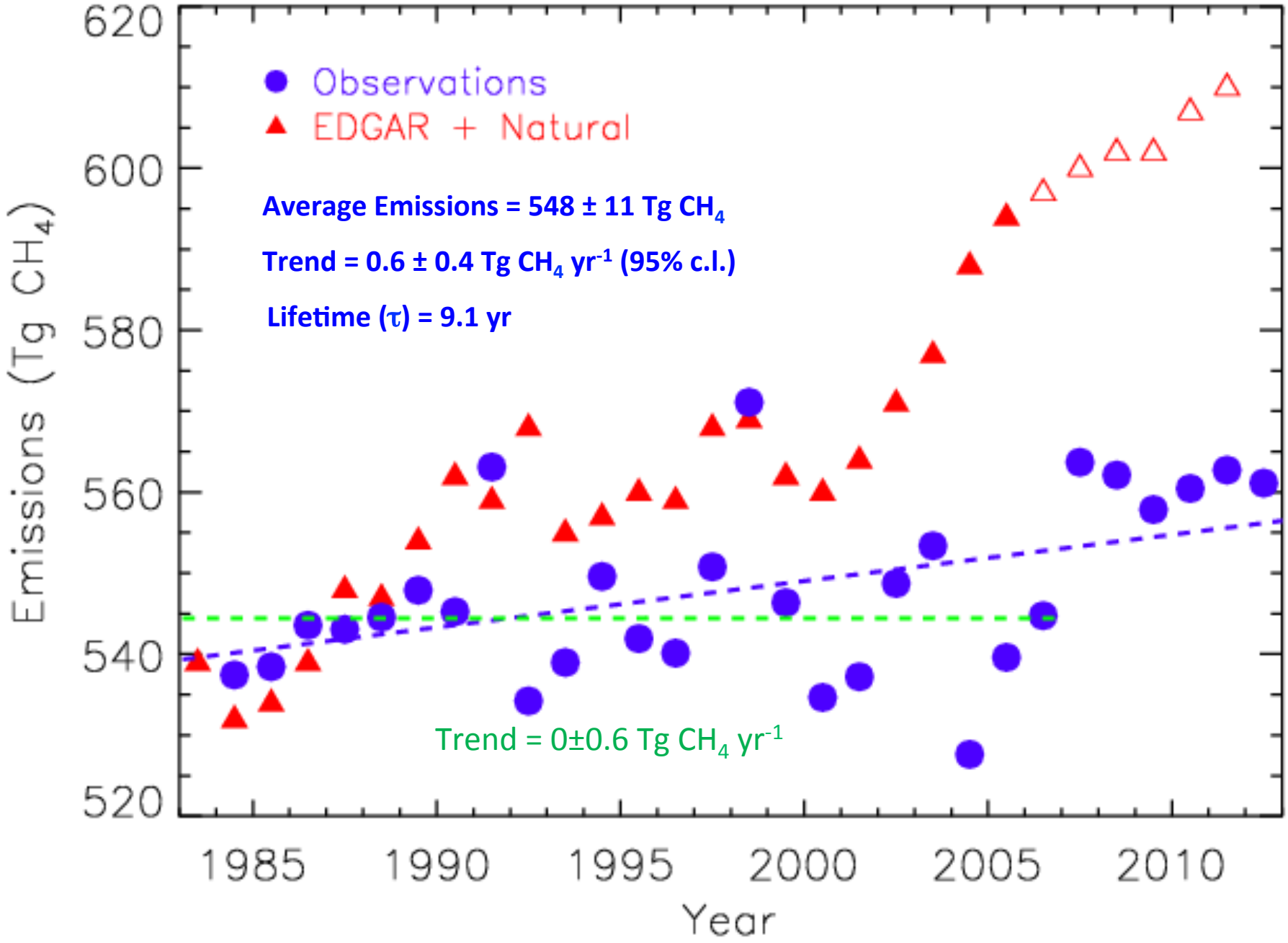

CH4 (ppb)
1900
1850
1800
1750
1700
1985
1990
1995
2000
2005
2010
Year
90°N
60°N
30°N
0°
30°S
60°S
90°S
100°E 140°E 180° 140°W 100°W 60°W 20°W 20°E 60°E 100°E

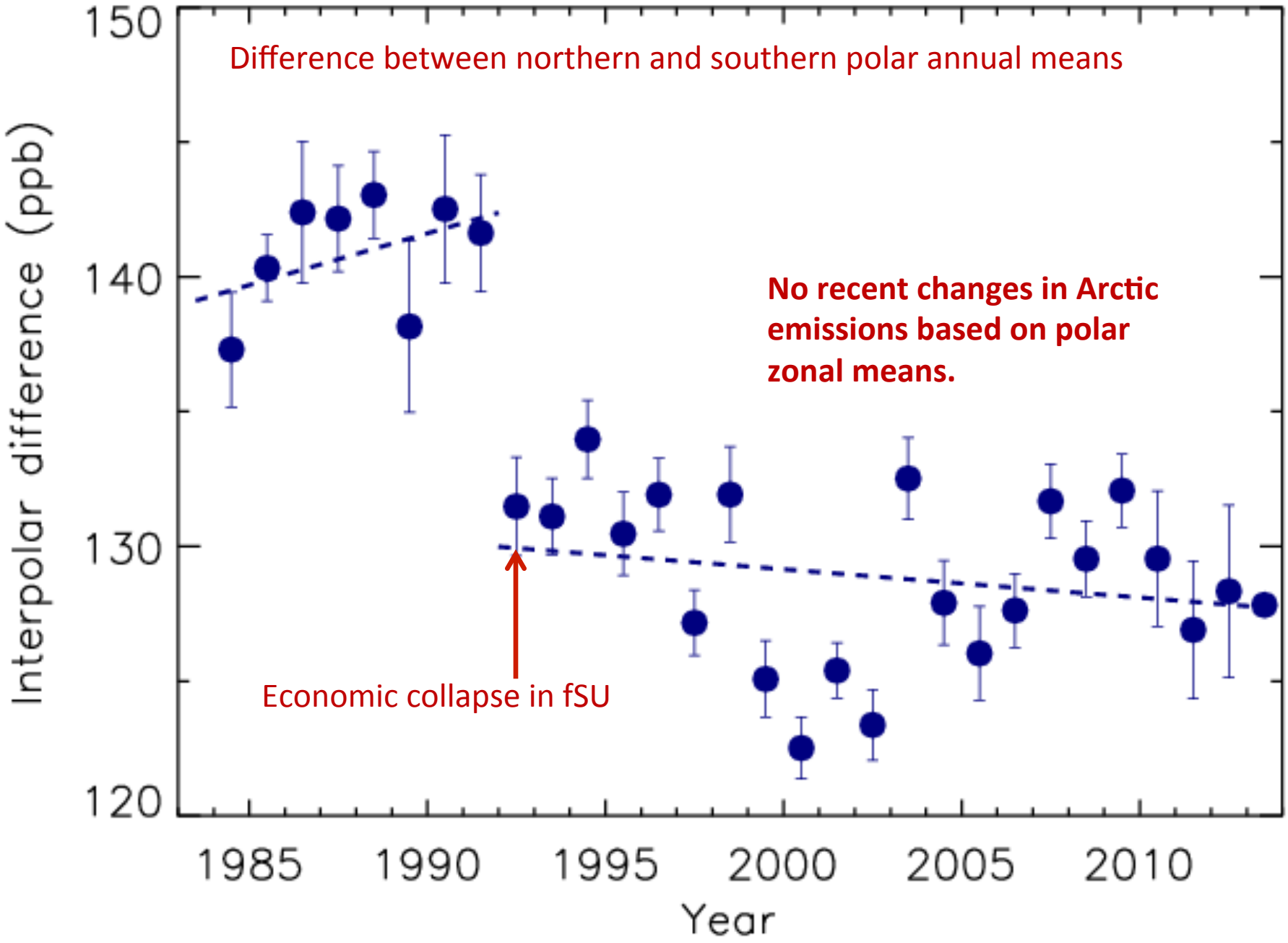

CH4 (nmol mol-1)
1900
1850
1800
1750
1700
LATITUDE
90°S
60°S
30°S
0°
30°N
60°N
2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
YEAR


a
CH4 (ppb)
1775
1725
1675
b
d(CH4)/dt (ppb yr-1)
15
10
5
0
−5
1985
1990
1995
2000
2005
2010
Year


90°N
30°N
EQ
30°S
90°S
Latitude
2000
2002
2004
2006
2008
2010
2012
2014
Year
1
0.5
0
−0.5
−1
Sine Latitude

Emissions = $d[CH_4]/dt + [CH_4]/\tau$




Difference between northern and southern polar annual means
No recent changes in Arctic emissions based on polar zonal means.
Economic collapse in fSU
Interpolar difference (ppb)
150
140
130
120
1985
1990
1995
2000
2005
2010
Year

High Latitude (60-90°N) Emissions (2000-2008) Calculated from 9 CTM Inversions

Source	Tg CH_4 yr^{-1}
Wetlands	**12.9 ± 1.1 (27.4)**
Biomass Burning	**0.5 ± 0.1**
Agriculture + Waste	**1.1 ± 0.4**
Fossil Fuel	**6.5 ± 3.0**
Other	**1.9 ± 2.3**
Total	**23.1 ± 2.0 (37.0)**

Source: Kirschke et al., *Nat. Geosci.*, 2013, DOI: 10.1038/NGEO1955.

NOAA Data Visualization:
http://www.esrl.noaa.gov/gmd/dv/iadv/

Data Archive: ftp://aftp.cmdl.noaa.gov/data/greenhouse_gases/