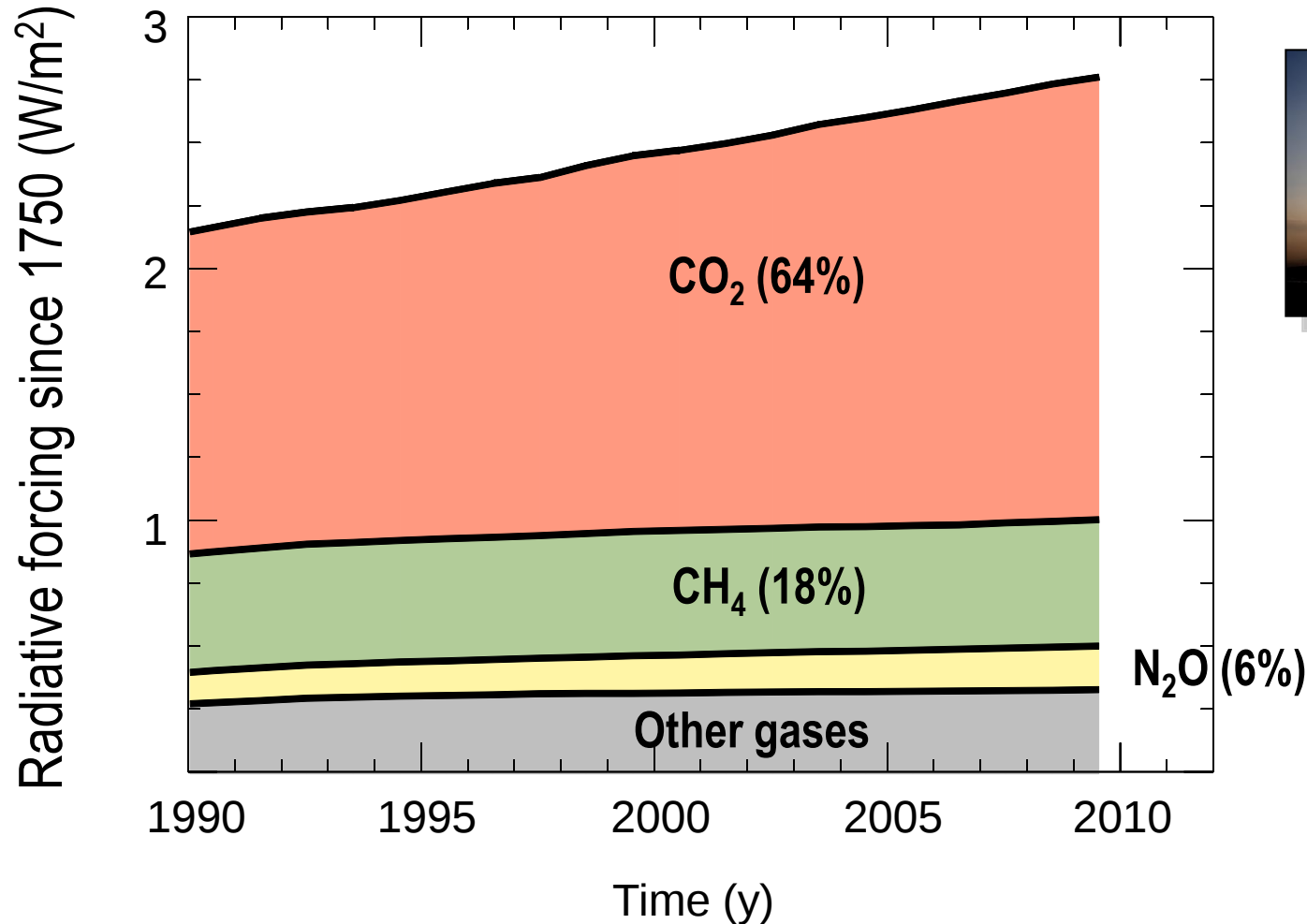

Scientific updates on current emissions and sinks of greenhouse gases and implications for future emissions pathways

Dr Richard A. Houghton,
Woods Hole Research Center

with contributions from the **Global Carbon Project**, C. Le Quéré,
G. Marland, J. Hackler, T. Boden, J. Canadell, P. Friedlingstein, T.
Conway, M. Raupach, P. Ciais and others.

slides available on www.globalcarbonproject.org/carbonbudget

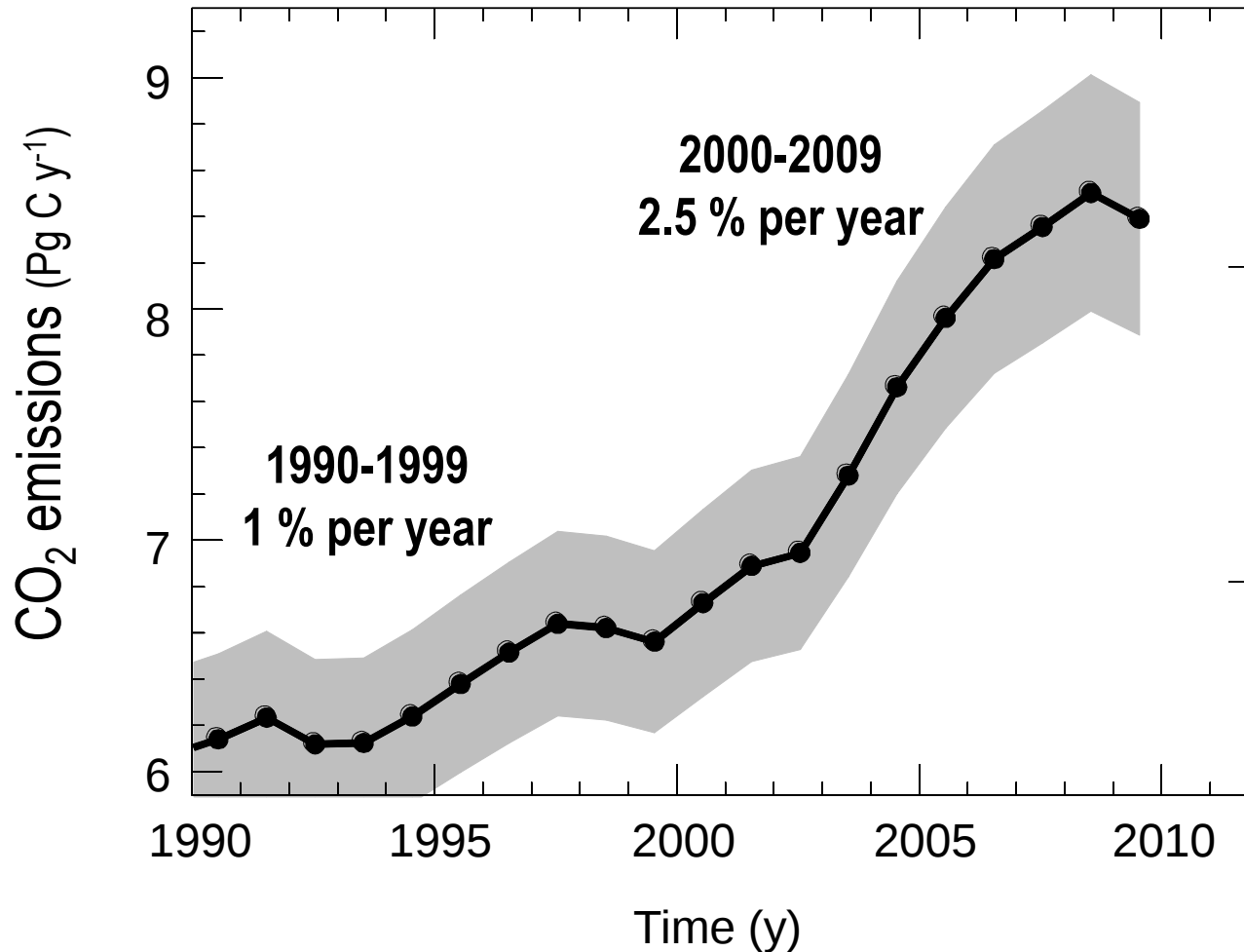
relative contribution of different greenhouse gases



The contribution of CO_2 to total anthropogenic greenhouse gases is growing

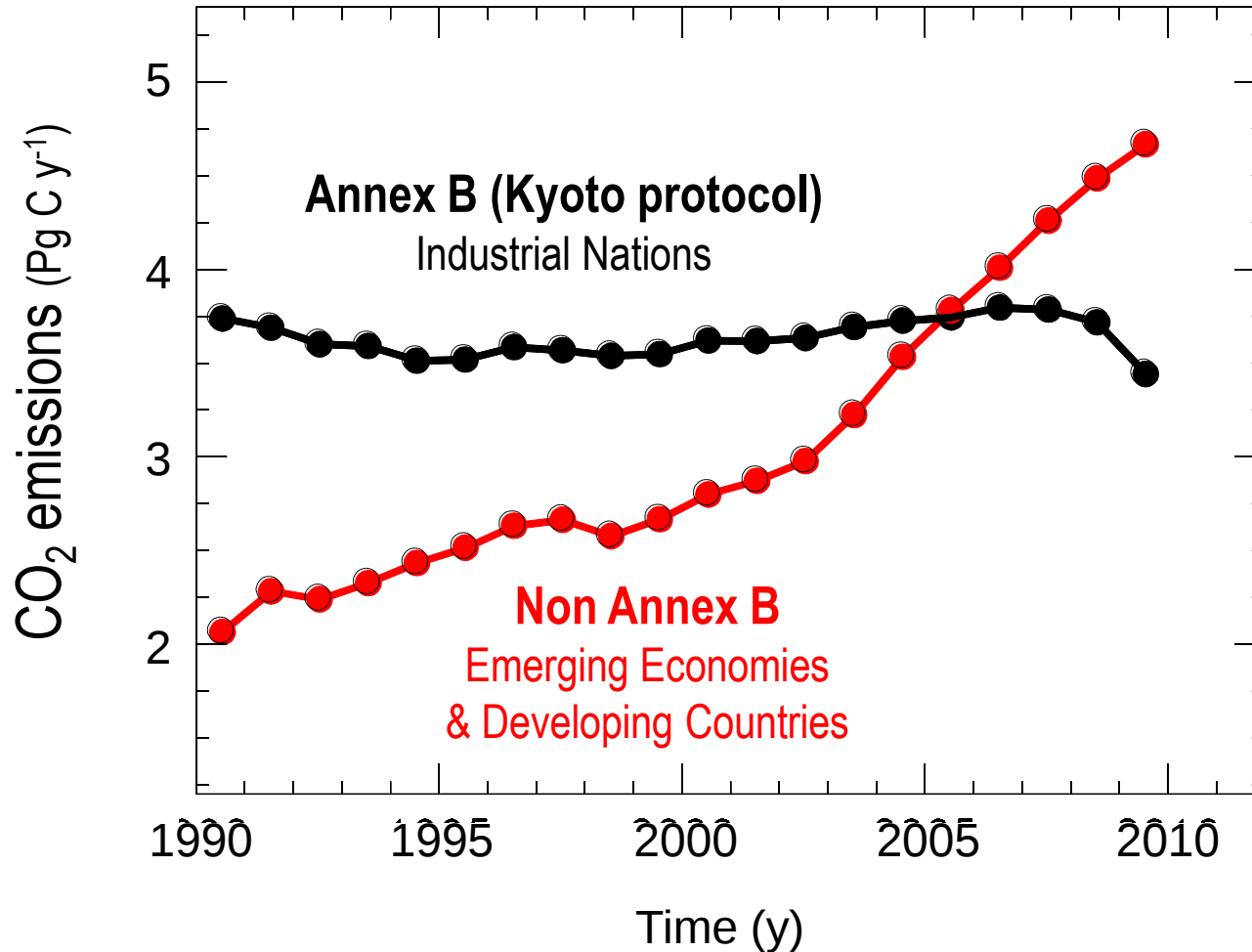
Emissions of carbon dioxide (CO₂) from fossil fuel burning

Fossil Fuel CO₂ Emissions



2009:
Emissions: 8.4 PgC
(30.5 Gt CO₂)
Growth rate: -1.3%

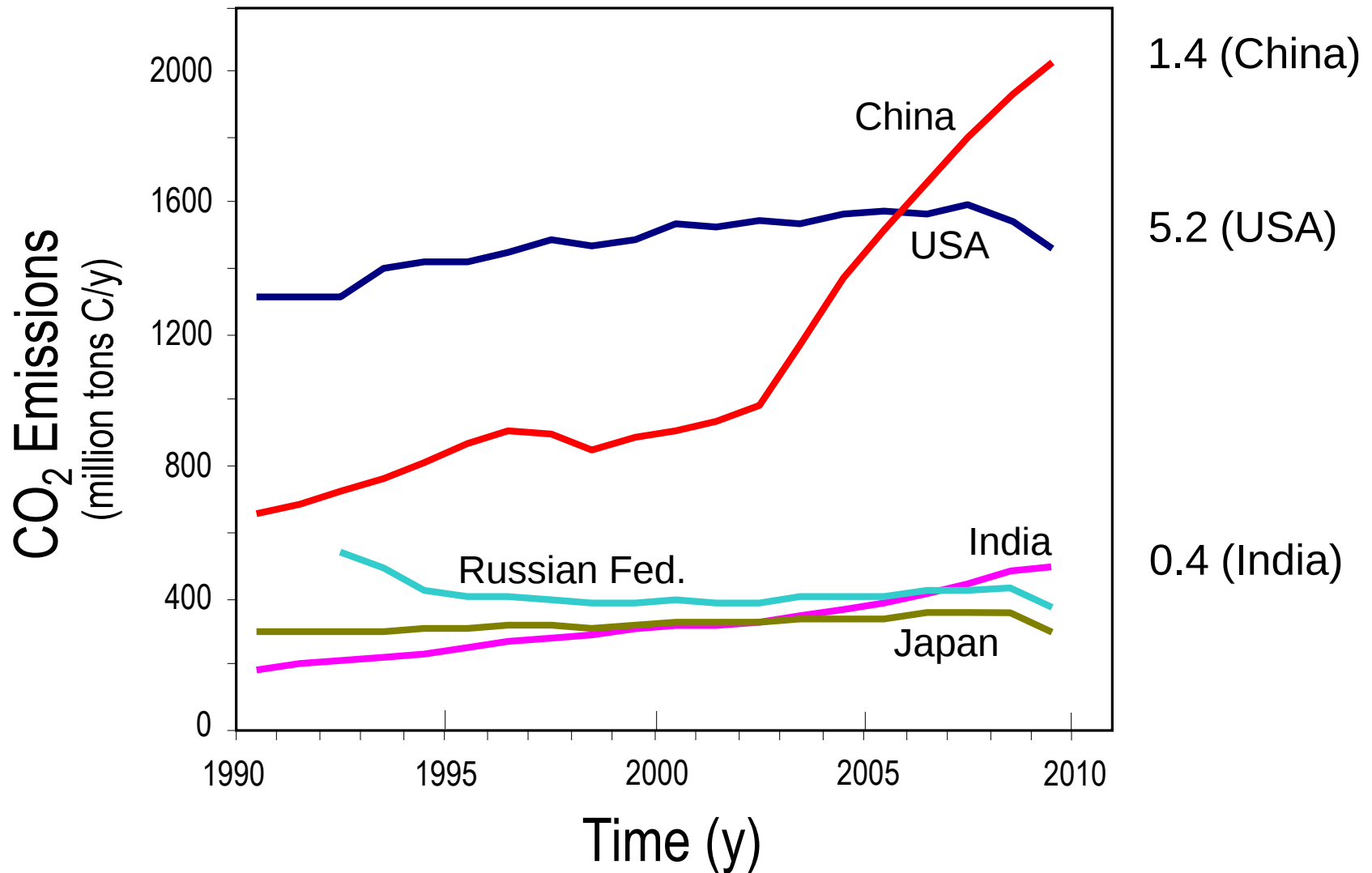
Fossil Fuel CO₂ Emissions



most of the growth
in global emissions
originates from
emerging economies

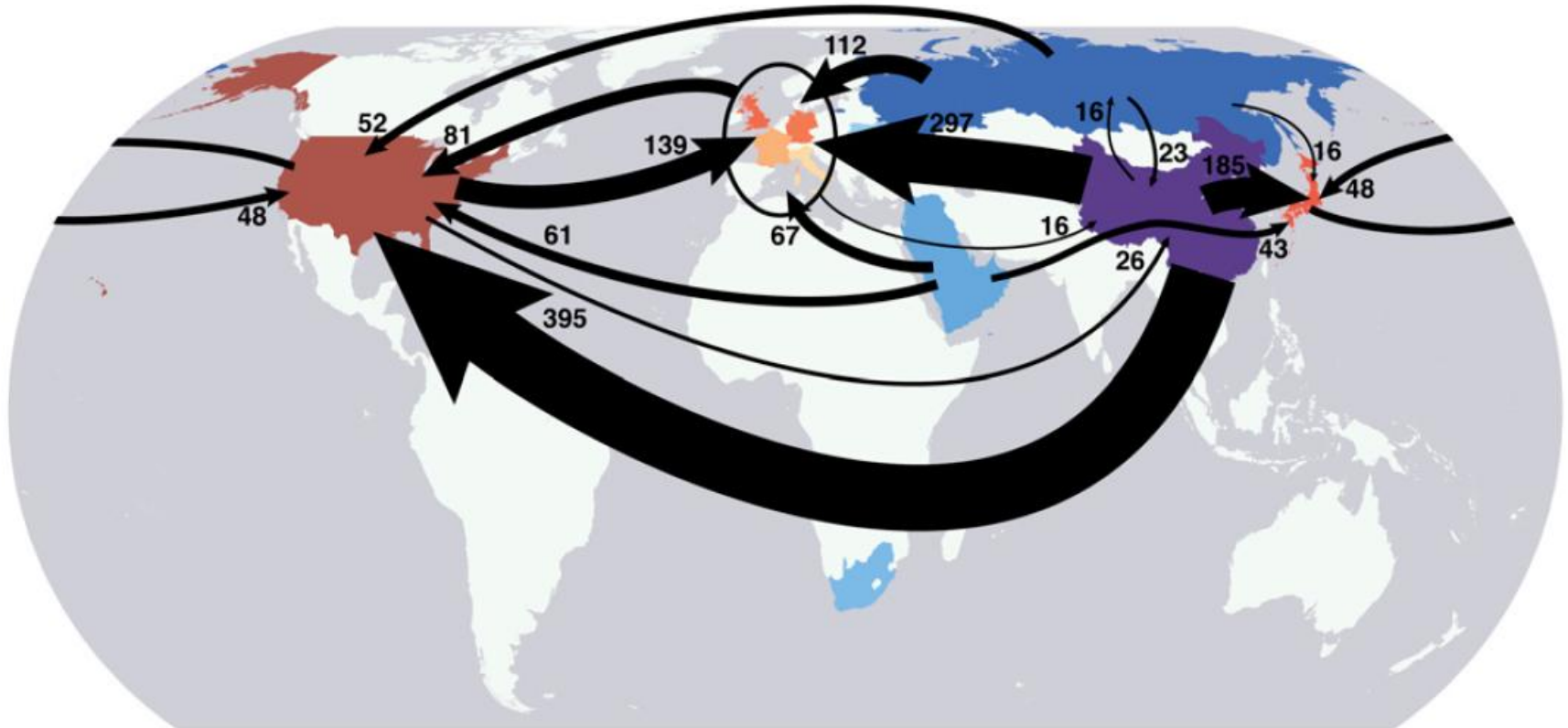
Top Emitters

per capita (2007)
ton C per person



Fluxes of Emissions Embodied in Trade (Mt CO₂ y⁻¹)

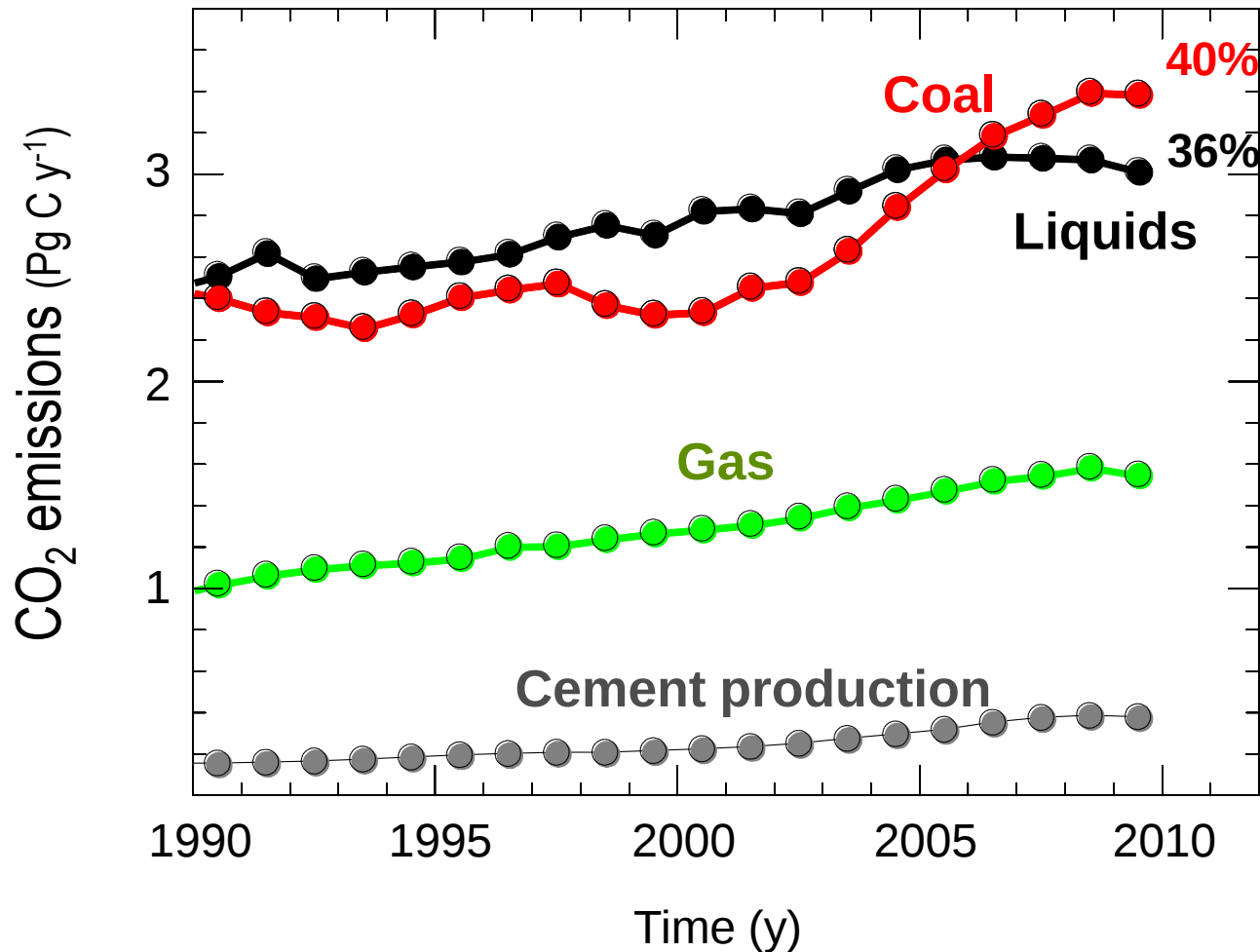
Year 2004



From dominant net exporting countries (blue) to dominant net importing countries (red).

Davis & Caldeira 2010, PNAS; See also Peters & Hertwich 2008, Environ, Sci & Tech.

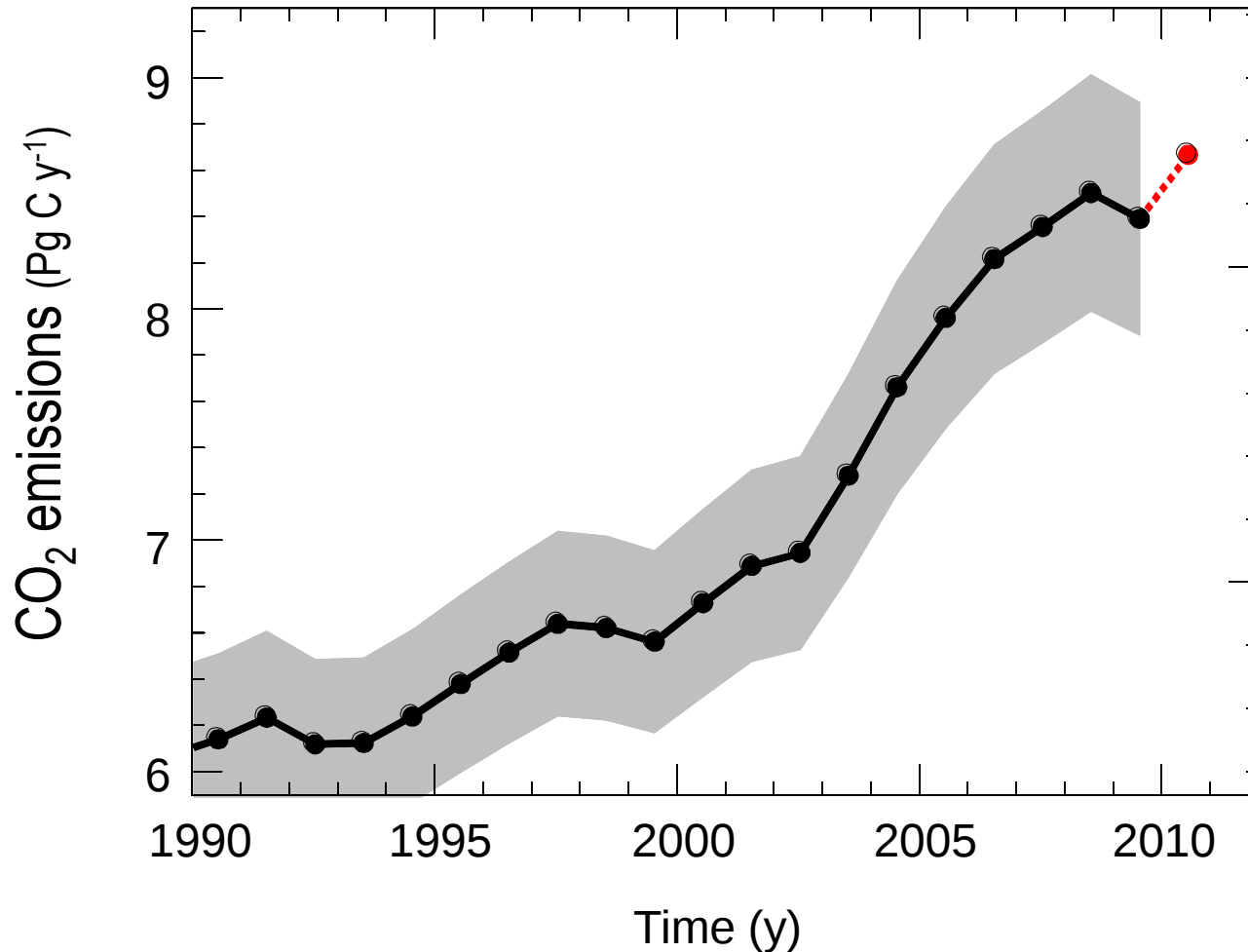
CO₂ Emissions by Fossil Fuel Type



Global CO₂ emissions
now dominated by coal

Coal emits more CO₂
than liquids or gas

Fossil Fuel CO₂ Emissions

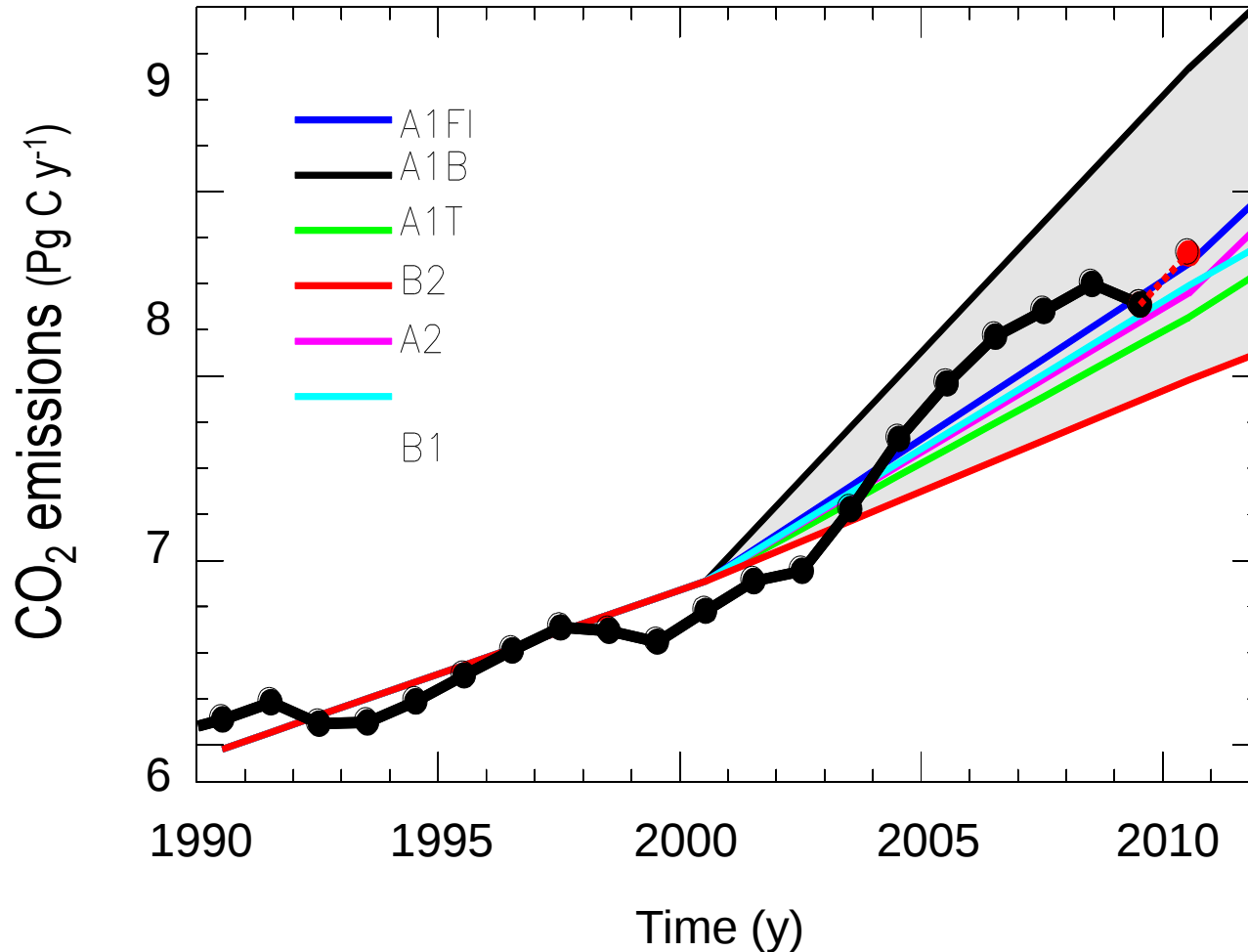


2010:

Projected
growth rate: >3 %

Based on 4.8 %
projected growth in
GDP by the IMF,
and -1.7 % improvement
in carbon intensity
of the economy.

Fossil Fuel CO₂ Emissions compared to IPCC Marker scenarios used for climate projections

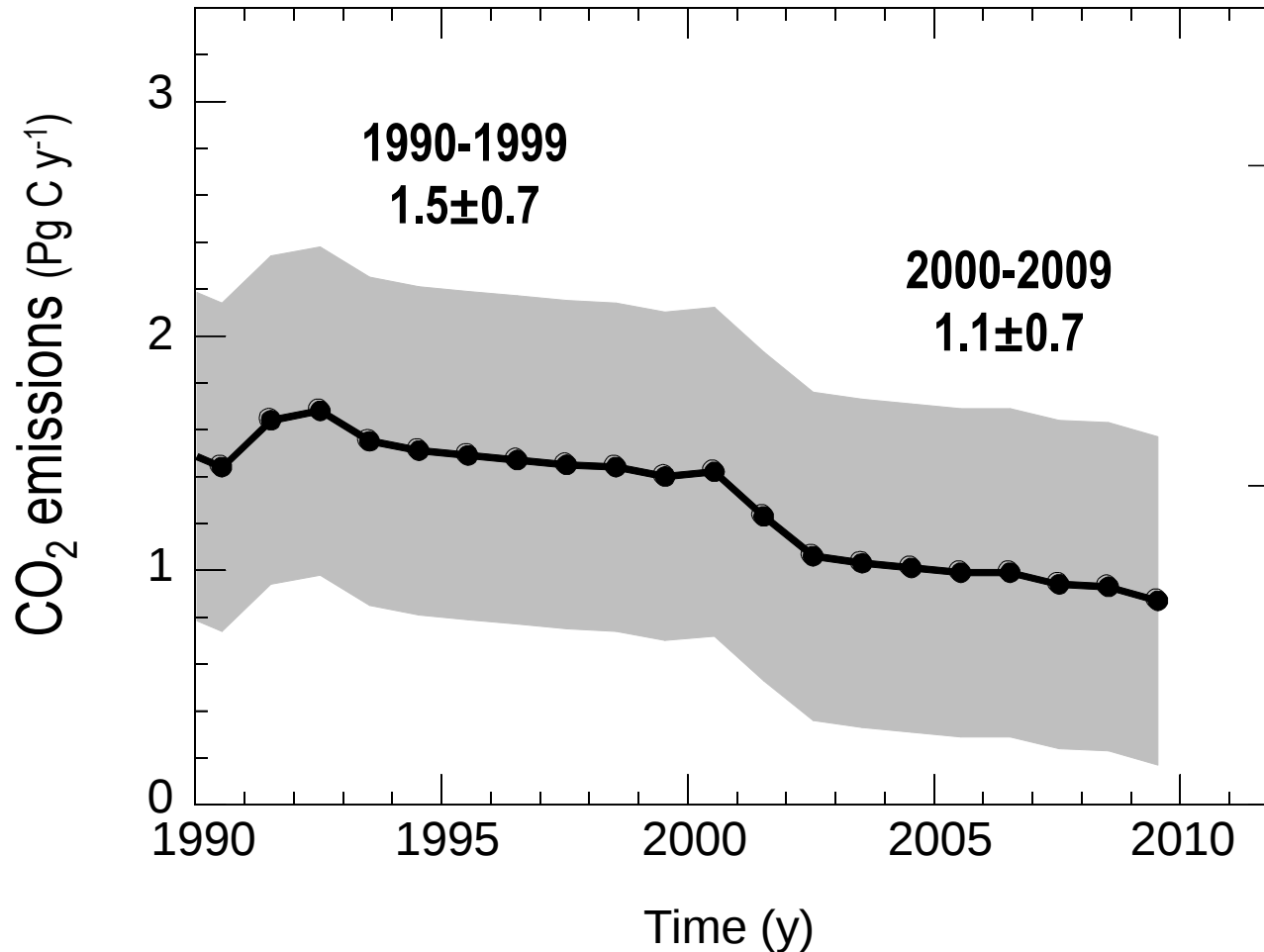


2000-2009 growth
rates are at the high end
of the emissions scenarios
used by the IPCC to project
climate change

IPCC range: 1.6 - 6.9 °C
above pre-industrial in 2100

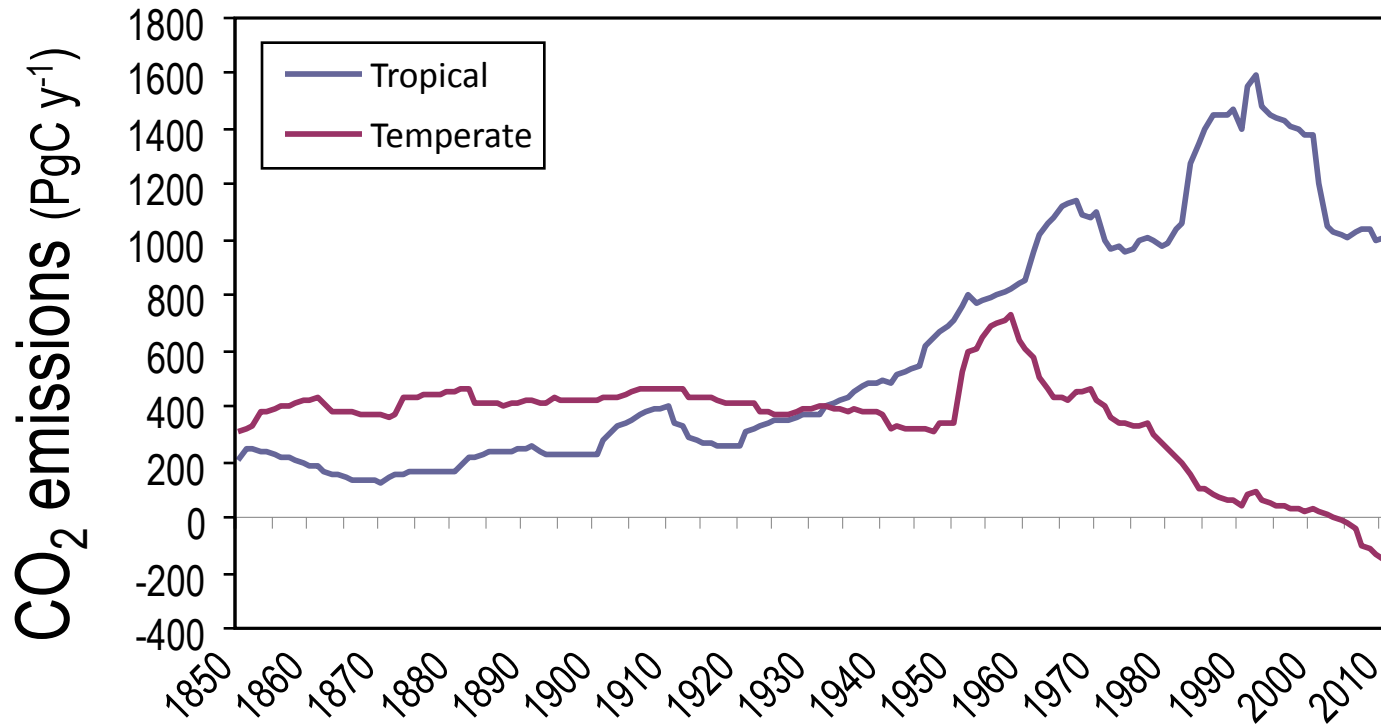
Emissions of CO₂ from deforestation and other Land Use Change (LUC)

CO₂ Emissions from deforestation and other Land Use Change



Estimated ~25% decrease between the two decades with large uncertainty

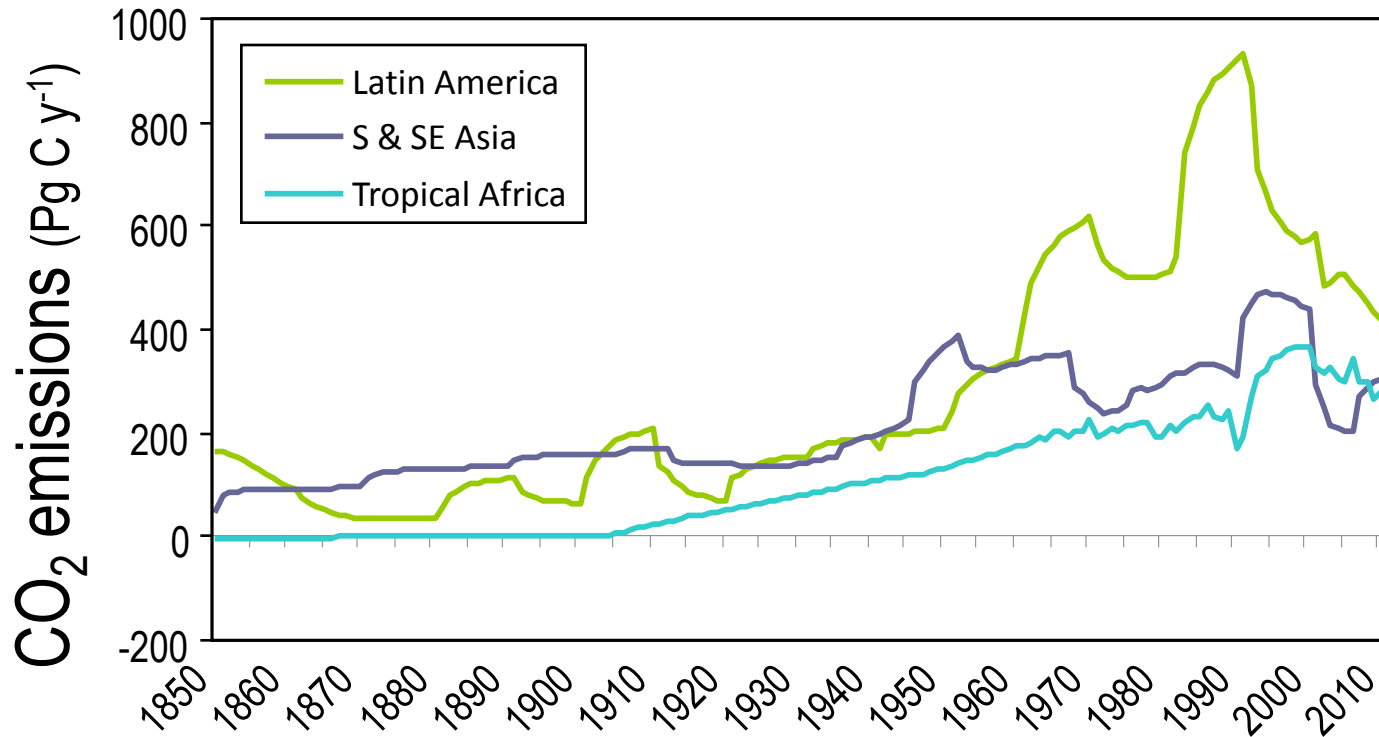
Regional Emissions from Land Use Change



Both tropical and temperate LUC recently decreasing

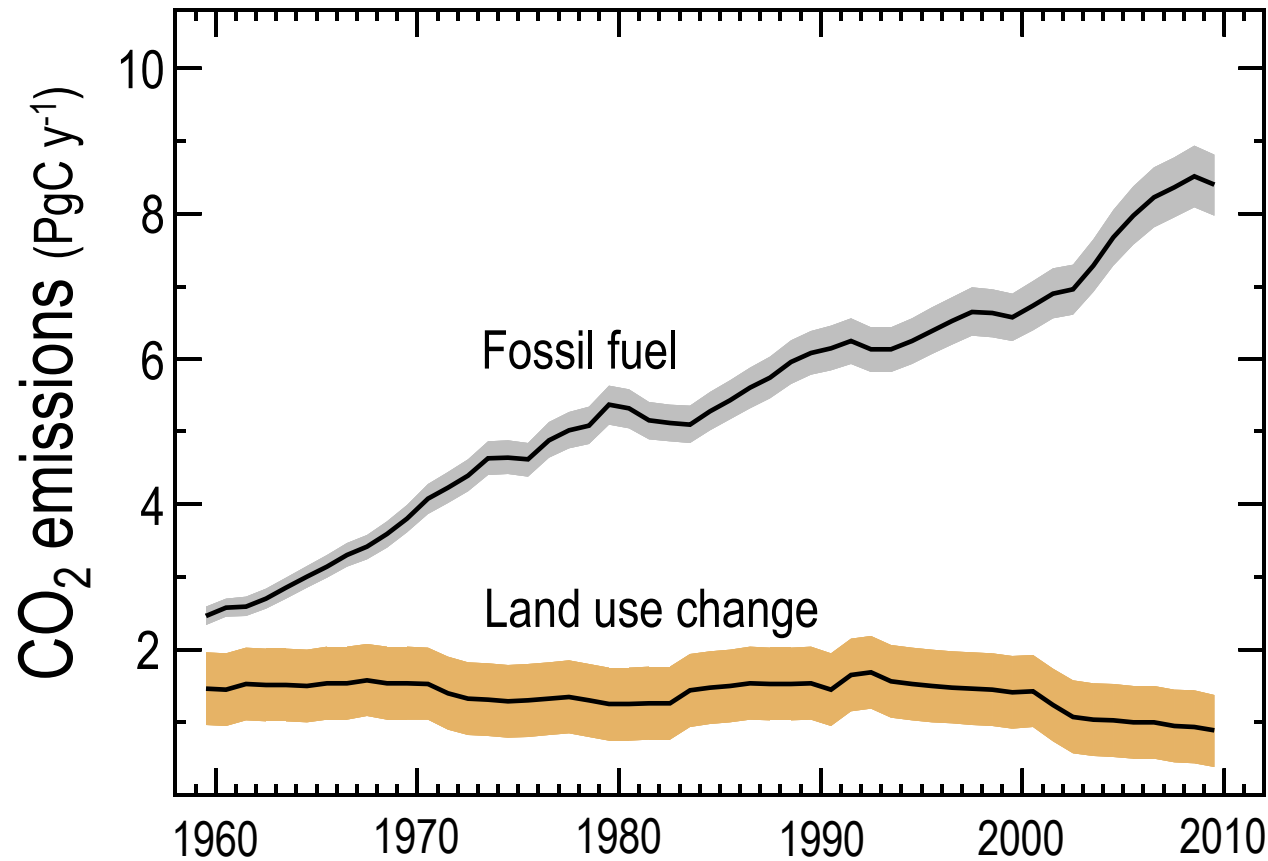
Temperate LUC could now be a small CO₂ sink

Regional Emissions from Land Use Change



Satellite data
for Brazil and
Indonesia support
recent LUC trends

Total CO₂ Emissions (1960-2009)



LUC emissions now
~10% of total CO₂ emissions

Fate of CO₂ emissions

Fate of Anthropogenic CO₂ Emissions (2000-2009)

1.1 PgC y⁻¹



7.7 PgC y⁻¹ +



4.1 PgC y⁻¹

47%



2.4 PgC y⁻¹

27%



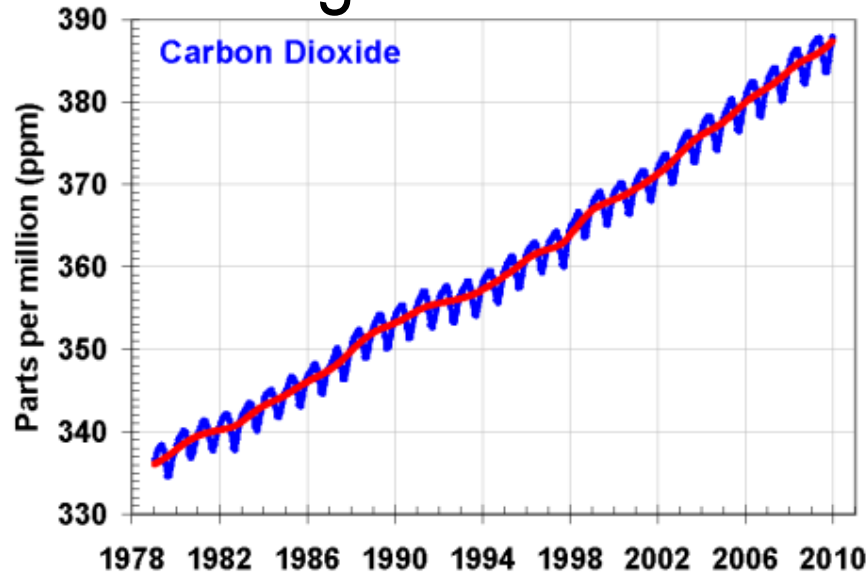
26%

2.3 PgC y⁻¹



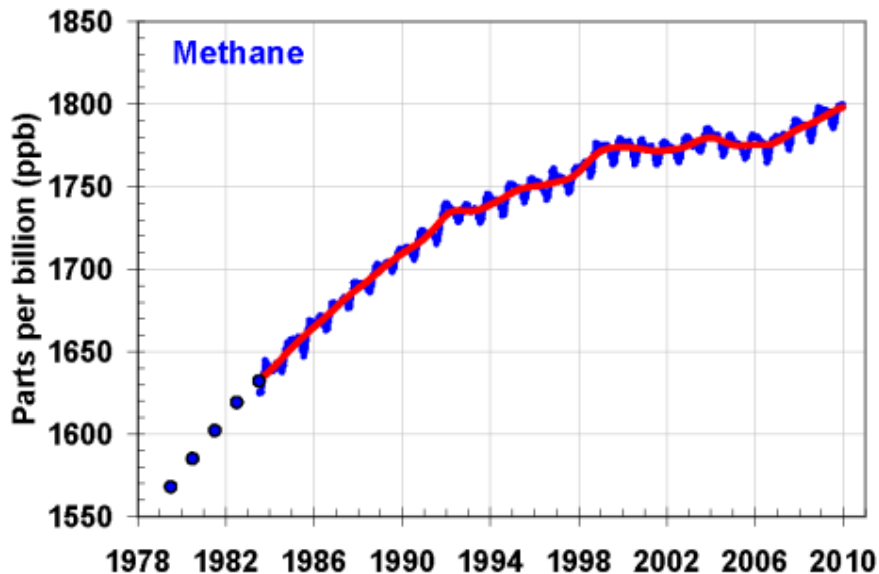
Greenhouse gas concentration (1978-2010)

CO_2
(ppm)



Atmospheric CO₂
concentration in Sept
2010: 389.2 ppm

CH_4
(ppb)



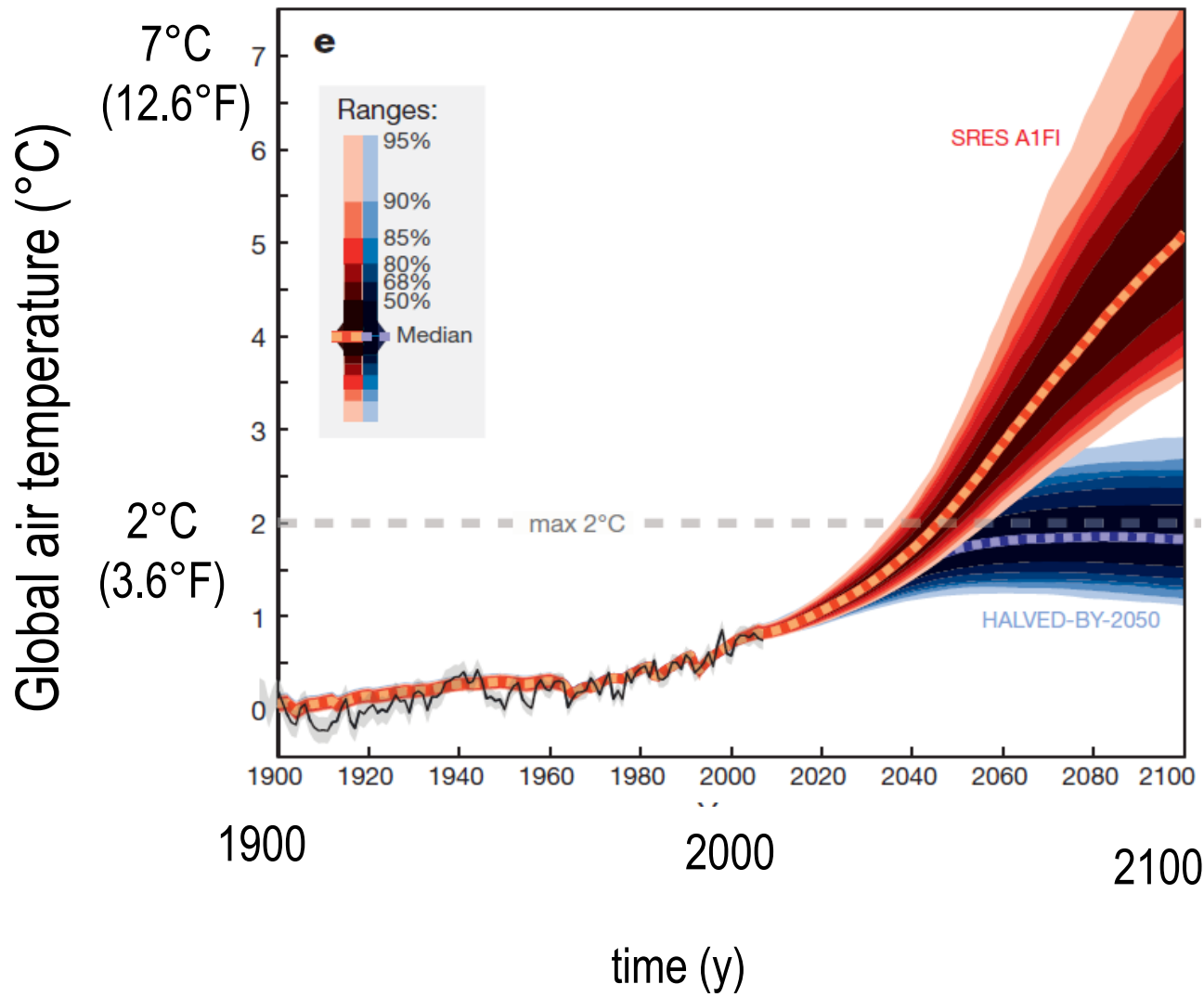
Atmospheric CH₄
concentration increased for
the third year in a row after
being stable for 10 year.

The cause of the recent
increased is unknown.

Source: NOAA Earth System Research Laboratory

Implications of recent trends for future emissions pathways

Emission scenarios consistent with 2°C limit



25% probability of exceeding 2°C:

→ no more than 185 PgC
(677 billion ton CO₂)
emitted until 2050

50% probability of exceeding 2°C:

→ no more than 305 PgC
(1120 billion ton CO₂)
emitted until 2050

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