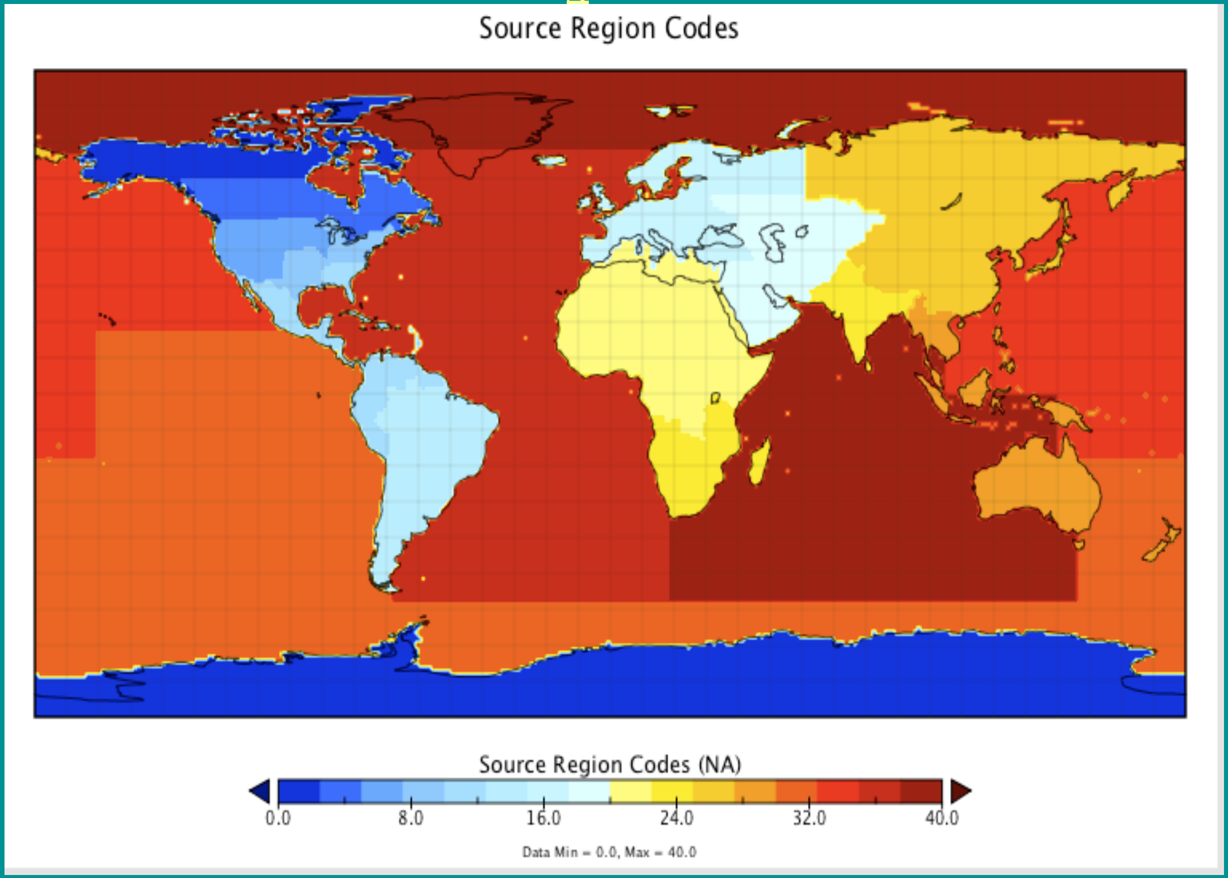
CarbonTracker-CH_4: Update

Prior Flux Estimates
EDGAR 3
GFED
Wetland Fluxes (from P. Bergamaschi)

12 land regions, 1 ocean region (TransCom 3 land source regions)
11 Source Processes: Oil/Gas, Coal, Animals, Rice, Waste, Wetlands, Soil Uptake, Termites, Biomass Burning, Wild Animals, Ocean

Southern Hemisphere Bias:
Previous posterior results were low by ~ 20 ppb in the deep SH, New results show no significant bias. The cause was an apparent "misuse of a parameter" that multiplied the model-data mismatch (I don't want to talk about it!…..).

CarbonTracker-CH_4: The Next Version



<u>Prior Flux Estimates</u>
EDGAR 4
GFED
Wetland Fluxes
To be Determined

28 land regions, aligned with political boundaries, 12 ocean regions (instead of TransCom 3source regions)

4 Source Processes: Fossil Fuels, Agricultural/Waste
Natural (Wetlands, etc.), Biomass Burning
(instead of 11 source processes)

Wetland Simulations (in progress)

Forward Simulations to evaluate various wetland emissions such as:

- Matthews and Fung
- Kaplan Parameterization
- DLEM
- CASA
- Bloom et al. 2009

Which provide the best prior flux estimates?

The Kaplan Parameterization

$$E_{CH4} = Pl*T_{floodplain} + (1-Pl)*T_{peat}$$

$$T_{floodplain}=HR*M_s*W_f$$

$$T_{peat}=HR*E_f*W_f$$

Where:

$Pl=e^{(T-303/8)}$

M_S=0.19*soil moisture fraction of saturation

W_f=wetland fraction

E_f=emission factor

HR=heterotrophic respiration as calculated by LPJ

The Kaplan Parameterization

$E_{CH4} = Pl*T_{floodplain} + (1-Pl)*T_{peat}$

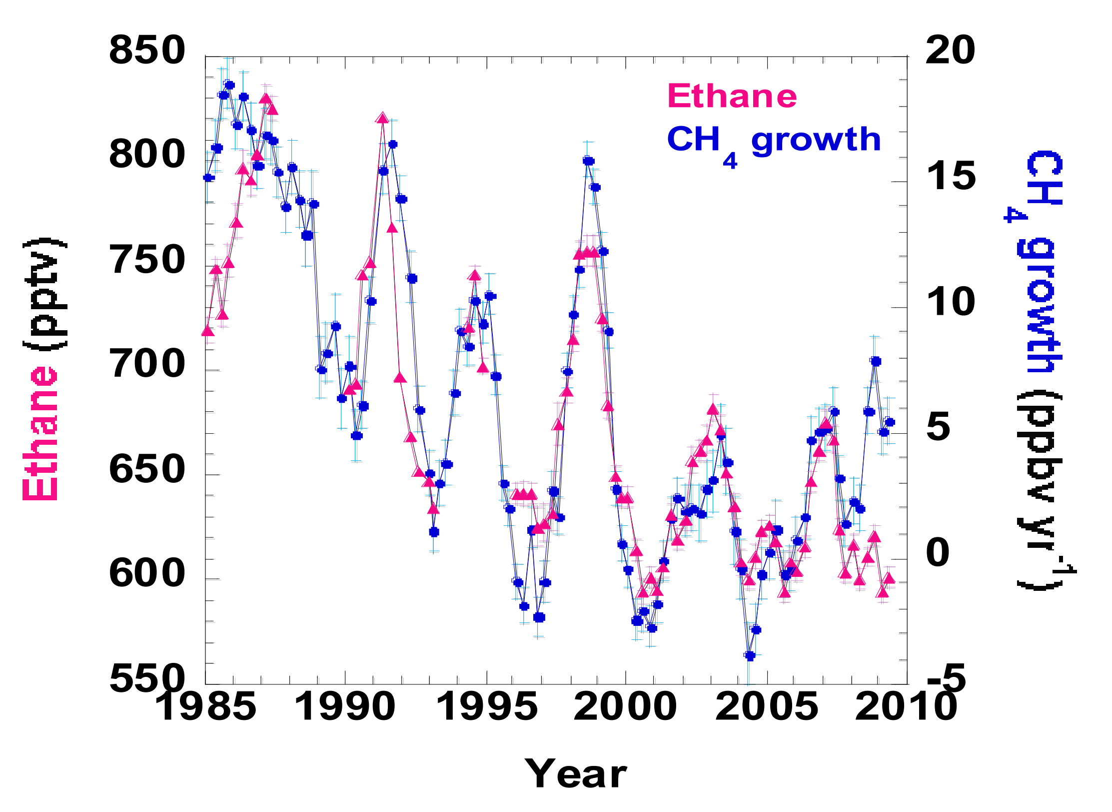
Parameters going into E_{CH4} are tuned in order agree with Melack in the tropics and Worthy in the high latitudes.

The peat part is mainly sensitive to T, while

The flood part is sensitive to soil moisture.

This parameterization could be improved, and more field measurements could be used .

Ethane Simulations



C_2H_6-CH_4 variability is highly correlated, until very recently: Why? And is something changing recently?

Can C_2H_6 help to constrain the CH_4 budget (or vice-versa)?

Does this figure imply that CH4 variability is controlled by fires and/or OH with little contribution from wetlands?

- **Figure 1.** Global annual C_2H_6 mixing ratio (pink triangles) and CH_4 growth rate (blue circles) from September 1984 – September, 2009. The data are plotted as running global annual averages at the temporal mid-point of the year from which the average was calculated (e.g. May 1, 2009 for [Dec. 2008 to Sep. 2009]).

Figure courtesy of I. Simpson, UC Irvine

The Ethane Budget (Tg/yr)

(all fluxes rough estimates, source Xiao et al. ,2008)

	C_2H_6	CH_4
Global Source	15	520
Oil/Gas	9	50
Coal	?	20
Biomass Burning	3	10-20
Biofuel	3	10-20 (?)
Biogenic/Oceans/ Agriculture	Probably Small *	410
Loss via Reaction with OH	~ Months	~ Decade

*If true then C_2H_6 could provide a constraint on biogenic emissions of CH_4.

TM5 Forward Ethane Simulation (in progress)

Fossil Fuels: IPCC or EDGAR emissions with
Emission ratios that vary over continental scales.
(Emission ratios for oil/gas may vary spatially by ~50%)

Biofuel emissions from Yevich and Logan (2003)

GFED biomass burning emissions scaled using
Andreae et al.

Small biogenic and oceanic emissions from POET.

OH from M. Krol

How well can the simulations match the observations?
Do the simulated C_2H_6/CH_4 ratios agree with observations?