Monthly global emissions of anthropogenic CO_2: Atmospheric CO_2 transport calculations based on NASA data assimilation

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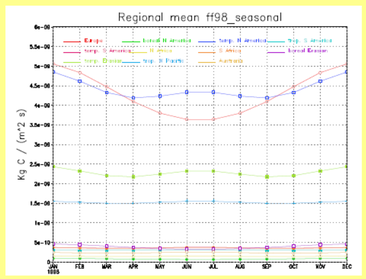
Use a 1st and 2nd harmonic approach dependent on latitude

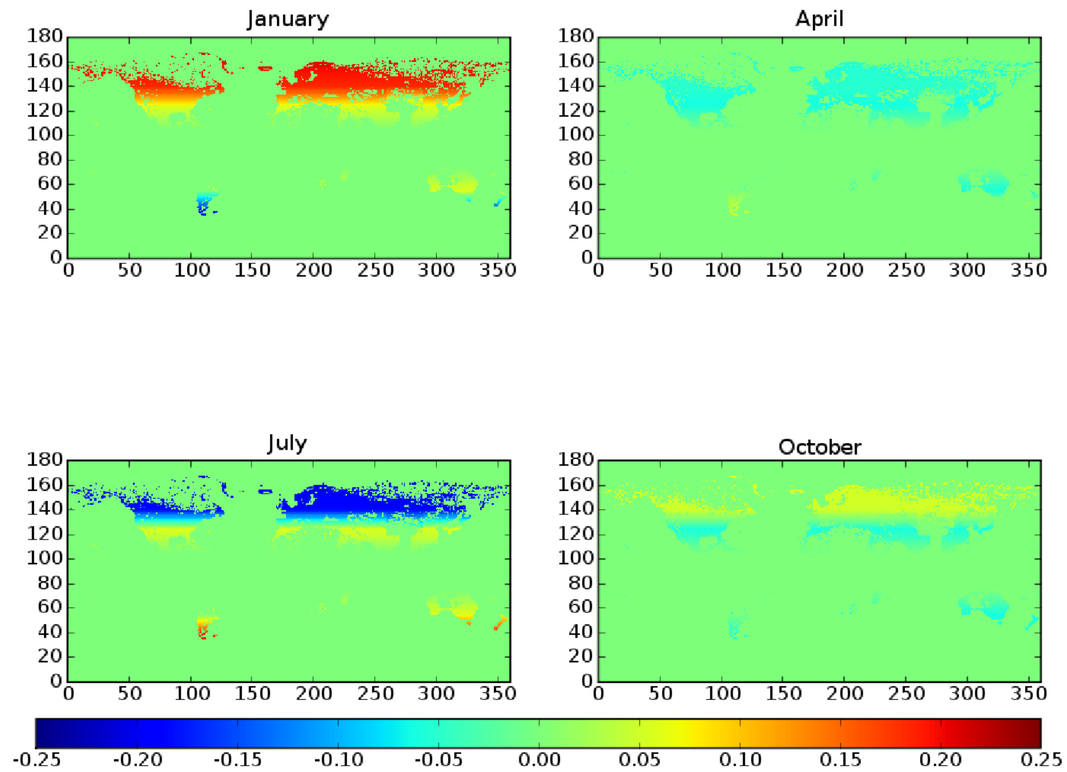
flux(t) = (Annual flux)/12 + 0.01*[A1*cos(t+shift) + A2*cos(2t+shift)]

phi > 50 : A1 = [2 - 0.01*(90 - phi)] * (Annual flux); A2 = 0
35 < phi < 50 : A1 = [1.6 - 0.1(50 - phi)] * (Annual flux)
A2 = 0.04 * (50 - phi) * (Annual flux)
15 < phi < 35 : A1 = 0; A2 = [0.6 - 0.03(35 - phi)] * (Annual flux)
0 < phi < 15 : A1 = 0; A2 = 0

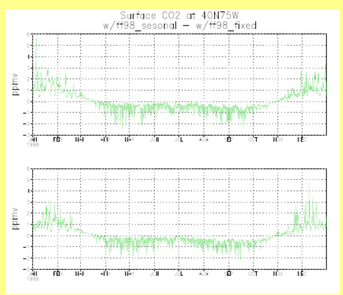
Regional fluxes of anthropogenic CO_2 over the seasonal cycle



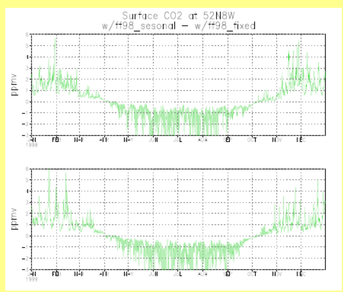
Monthly anthropogenic CO_2 Fluxes



Atmospheric CO_2 concentrations at 40N-75W



Atmospheric CO_2 concentrations at 52N-8W



Conclusions

Anthropogenic CO_2 emissions has significant seasonality and can contribute 1-6 ppm CO_2 to the amplitude of the seasonal cycle of atmospheric CO_2

This harmonic analysis can be applied to any 'annual' anthropogenic CO_2 flux

Implications for atmospheric CO_2 inversions

Erickson, D. J., III, R. T. Mills, J. Gregg, T. J. Blasing, F. M. Hoffman, R. J. Andres, M. Devries, Z. Zhu, and S. R. Kawa (2008), "An estimate of monthly global emissions of anthropogenic CO2: Impact on the seasonal cycle of atmospheric CO2", J. Geophys. Res., 113, G01023, doi:10.1029/2007JG000435, (2008).

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