

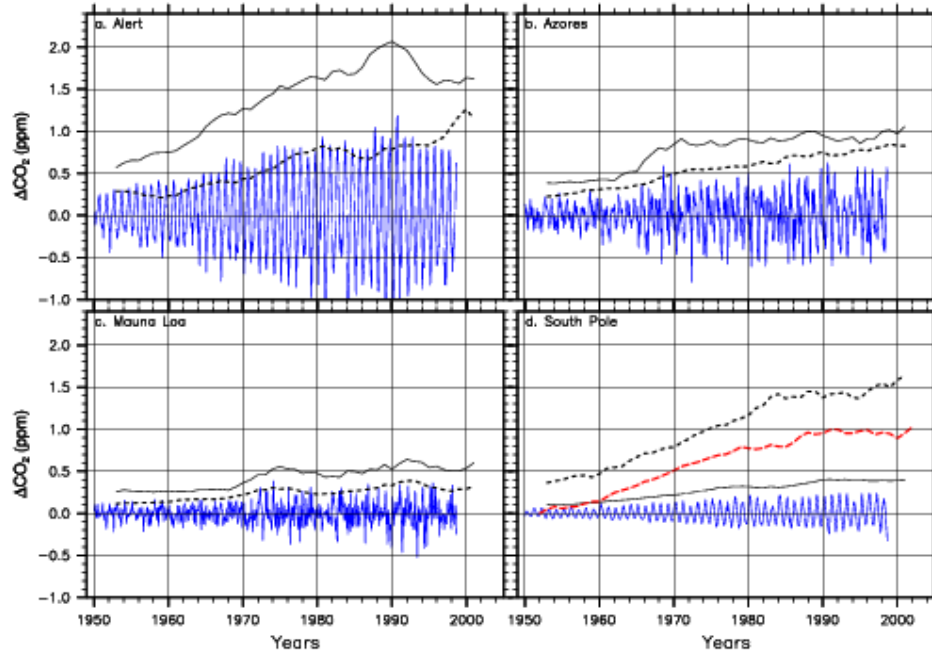
Constraining terrestrial biosphere CO₂
exchange via anthropogenic CO₂
emission seasonality

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1950 - 1999



Station	Lat. deg. N	Lon. deg. E	Observed (ppm)	Simulated (Fossil Fuel Only; ppm)	Ratio
Barrow, AK	71.32	203.4	15.75 (± 2.52)	2.30 (± 0.59)	0.15
	38.77	332.6	9.35 (± 3.2)	1.36 (± 0.72)	0.15
Ascension Is.	-7.92	345.5	2.64 (± 2.05)	0.83 (± 0.15)	0.31
Baring Head	-41.41	174.87	1.97 (± 2.88)	0.33 (± 0.19)	0.17
(IT)	44.18	10.7	10.49 (± 2.07)	2.58 (± 1.07)	0.25
Key Biscayne	25.67	270.84	7.08 (± 2.41)	3.14 (± 1.03)	0.44
South Pole	-89.98	335.2	1.62 (± 2.58)	0.51 (± 0.08)	0.31
(AK)	76.25	240.65	14.94 (± 2.1)	2.19 (± 0.66)	0.15
	19.54	204.42	7.15 (± 1.95)	0.65 (± 0.42)	0.09
Niwot Ridge	40.05	254.42	10.42 (± 2)	0.8 (± 0.43)	0.08
.	-64.92	296	2.2 (± 1.43)	0.48 (± 0.07)	0.22
Schauinsland ()	48	8	12.92 (± 2.07)	2.39 (± 1.32)	0.18
Tatula,	-14.25	189.44	1.48 (± 1.5)	0.89 (± 0.33)	0.60
(Nor)	66	2	14.88 (± 2.11)	2.5 (± 1.34)	0.17
Sable Is. (CAN)	49.93	299.98	13.37 (± 2.08)	1.74 (± 0.89)	0.13
Mariana Is. ()	13.43	144.78	5.83 (± 1.67)	2.3 (± 0.5)	0.39
Is.	-37.95	77.53	1.65 (± 1.2)	0.36 (± 0.15)	0.22
Christmas Is.	1.7	202.83	3.11 (± 3.5)	1.07 (± 0.3)	0.34
	45.48	236.43	10.12 (± 2.84)	1.41 (± 0.54)	0.14
Shemya Is. (AK)	52.72	174.1	16.86 (± 4.6)	2.99 (± 0.48)	0.18
BBSR	32.37	295.35	8.67 (± 5.78)	2.3 (± 0.66)	0.27
Fraserdale (CAN)	49.88	278.43	20.19 (± 2.16)	3.53 (± 0.92)	0.17
()	36.29	100.9	10.42 (± 3.26)	2.01 (± 0.57)	0.19
	-19.28	147.06	2.16 (± 2.58)	0.98 (± 0.57)	0.45
Grim	-40.68	144.69	1.81 (± 1.93)	0.5 (± 0.32)	0.28
()	-46.45	51.85	6.7 (± 3.08)	0.38 (± 0.13)	0.06
Easter Is.	-27.15	250.55	2.19 (± 4.58)	0.71 (± 0.31)	0.32
Estevan Pt. (CAN)	49.58	233.63	13.02 (± 4.36)	1.59 (± 0.56)	0.12
Gosan (KOR)	33.28	126.15	14.85 (± 3.76)	6.27 (± 1.98)	0.42
Hateruma Is.	24.05	123.8	7.64 (± 2.18)	4.56 (± 0.91)	0.60
Hegyhatsal (HUN)	46.95	16.65	27.41 (± 6.64)	3.81 (± 1.66)	0.14
Storhofdi (ICEL)	63.4	339.71	13.92 (± 2.78)	2.04 (± 0.89)	0.15
	35.35	282.62	20.37 (± 2.05)	5.34 (± 1.59)	0.26

Climate change impacts on Energy Infrastructure (US)

- **26,500 substations/6,000 power plants (T85 grid at the moment....)**
- **Ensembles of heat waves 2000-2050-2100**
- **Populations shifts**
- **How do energy requirements change?**
- **Positive feedback from energy-climate-energy**
- **How would different energy generation portfolios alter energy requirements and CO₂ emission?**

Preliminary Conclusions

Seasonality on anthropogenic CO₂ emissions can contribute 5-40% of measured amplitude on atmospheric CO₂

Amplitude of fossil fuel CO₂ emissions and atmospheric concentrations has been increasing 1950-2010

Implications for inversions seeking source/sink estimates (Carbontracker)

Implications for tuning terrestrial biosphere models to observed CO₂ seasonal cycles

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