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Constraining regional carbon fluxes in complex terrain: The Airborne Carbon in the Mountains Experiment 2007 (ACME07)

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Introduction

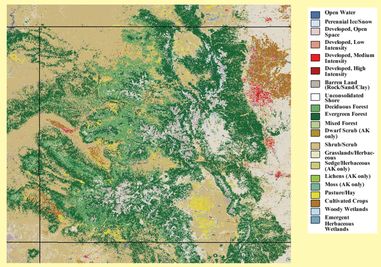


Figure 1. NLCD Land Cover 2001 (Source: USGS)

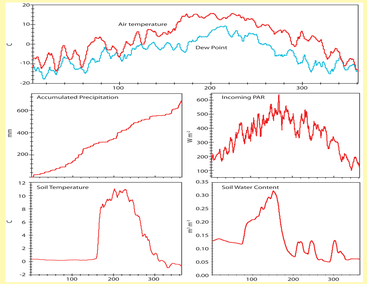


Figure 2. Niwot Ridge Meteorological data - roles of dryness, cloudiness, snow melt, and drought

Purpose of study CME / ACME04 / ACME07

Site description (land cover, domain)

NWR Met Data and variations and lack of good spatial data

Photos

Airborne Observations

Description of flights and measurements + particle models

Case Study 1

Case Study 2

Initial BL Budgets done the "wrong" way

Comparison of drawdown to Ecosystem Models and Niwot Ridge fluxes on those days

Motivation for a data assimilation approach

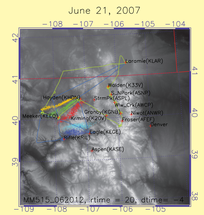


Figure 7. Case Study 1 - June 21 flight path on top, CO2 profiles on bottom

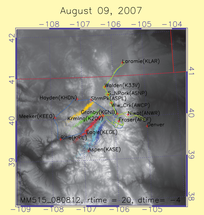


Figure 8. Case Study 2 - Aug 9 flight - role of large valley cold pools

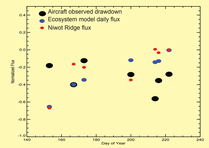
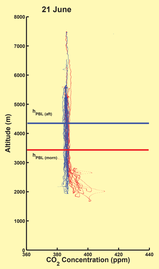
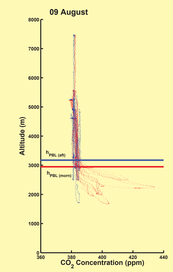


Figure 9. Comparison of normalized anomlies in aircraft drawdown, model flux, and NWR.

	Morning		Afternoon			
Day	Zi (m)	CO_2 (ppm)	Zi (m)	CO_2 (ppm)	Δ t (h)	Change (ppm m s-1)
1-Jun	2377	379.9	3301	375.2	4.21	-1.0
15-Jun	2754	383.5	3811	371.1	5.75	-2.3
21-Jun	3425	389.4	4348	386.2	5.59	-0.7
18-Jul	2674	383.2	3277	373.5	5.47	-1.6
1-Aug	2350	407.9	2861	384.9	5.76	-3.2
3-Aug	2659	396.6	3214	385.0	5.20	-2.0
9-Aug	2944	393.4	3175	383.3	5.64	-1.6

Table 1. Comparison of upwind and downwind mean CO2 and mean PBL depth from model output





Ecosystem Modeling

Model description and Forcing description (NARR + MODIS + NLCD)
Sipnet model - Niwot + Hardvard
+ ChEAS (Sacks et al, ChEAS/Harvard, SLA - Braswell)
LAI - remote sensing
Plant biomass and litter from relationships LAI from Bradford GCB 2008
NLCD - for land cover

NWR and Model 2007 NEE time series

Spatial map for May-August

Annual map - paterns

Elevation trends

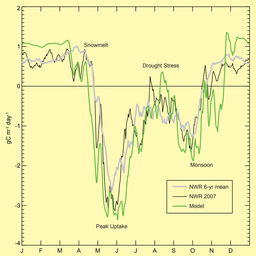


Figure 3. NEE time series

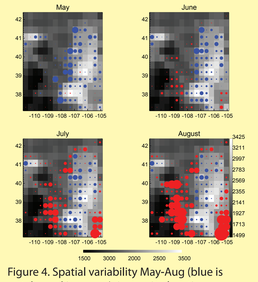


Figure 4. Spatial variability May-Aug (blue is uptake, red is source), image is elevation

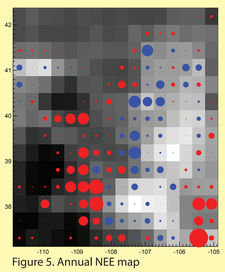


Figure 5. Annual NEE map

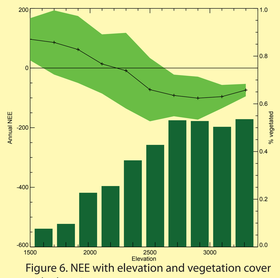


Figure 6. NEE with elevation and vegetation cover with elevation

Disturbance and Climate Change

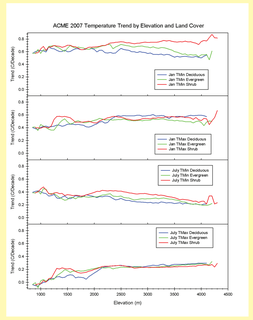


Figure 10. 1970-2007 trends in max and min monthly temperature with elevation and land cover. PRISM

Climate change is happening faster at high elevations - affecting Winter min temps the most

Bark Beetles innfestation is particularly bad - partially due to clim change. CO2 data from RACCOON network shows effect

Future work with ACME07 data to look at climate and distrubance sensitivty of fluxes

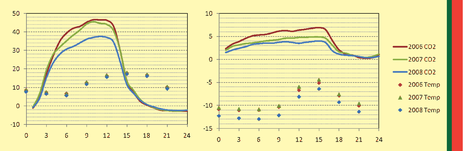


Figure 11. Comparison of normalized anomlies in aircraft drawdown, model flux, and NWR

References

Sacks
Braswell,
Schimel
Bradford

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