

***Rapid carbon-exchange responses of
desert grassland to a simulated
rainfall pulse***

***ERIK HAMERLYNCK
USDA-ARS
SOUTHWEST WATERSHED
RESEARCH CENTER***



Southwest Watershed Research Center

Tucson - Tombstone, AZ





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TYPICAL PULSE APPROACH



WALNUT GULCH RAINFALL SIMULATOR



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RUNOFF PLOTS



PLOT CHARACTERISTICS

	<u>PLOT 1</u>	<u>PLOT 2</u>	<u>PLOT 3</u>	<u>PLOT 4</u>
TOTAL PERENNIAL COVER	26%	20%	56%	43%
GRASS COVER	22%	18%	53%	42%
RELATIVE GRASS DOMINANCE	85%	90%	95%	98%

2008 PULSE CHARACTERISTICS

<u>PLOT</u>	<u>RUN</u>	<u>RAIN</u> (mm)	<u>RUNOFF</u> (mm)	<u>INFILTRATION</u> (mm)
1	Dry	46	17	29
	Wet	142	102	40
	TOTAL	188	118	69
2	Dry	46	12	34
	Wet	158	116	42
	TOTAL	204	129	76
3	Dry	46	15	31
	Wet	142	92	50
	TOTAL	189	108	81
4	Dry	38	22	16
	Wet	128	109	19
	TOTAL	166	130	35



THREE QUESTIONS:

- 1) DOES PLANT COVER AFFECT ECOSYSTEM CARBON EXCHANGE PULSE RESPONSES?**
- 2) WHEN DO LEAF-LEVEL AND ECOSYSTEM-LEVEL PHOTOSYNTHESIS CONVERGE?**
- 3) HOW LONG CAN A BIG PULSE AFFECT SOIL MOISTURE?**

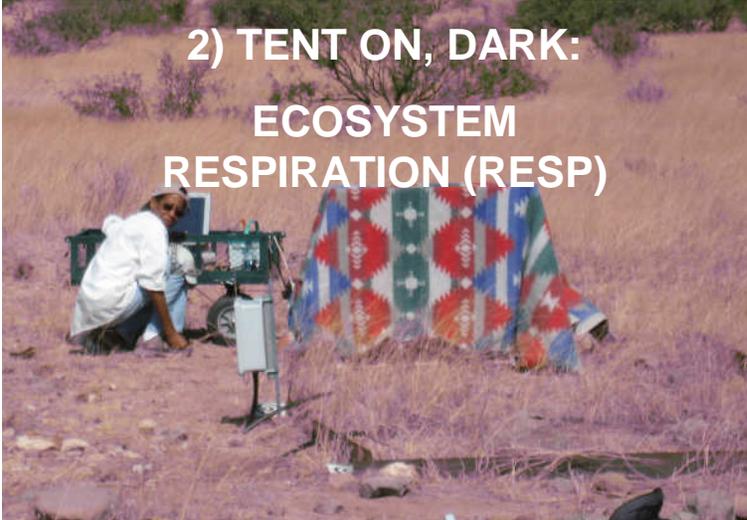


ECOSYSTEM PARAMETERS

1) TENT ON, FULL LIGHT:
NET ECOSYSTEM EXCHANGE
(NEE)



2) TENT ON, DARK:
ECOSYSTEM
RESPIRATION (RESP)



NEE = PHOTOSYNTHESIS (GEE) + RESP

GEE = NEE – RESP

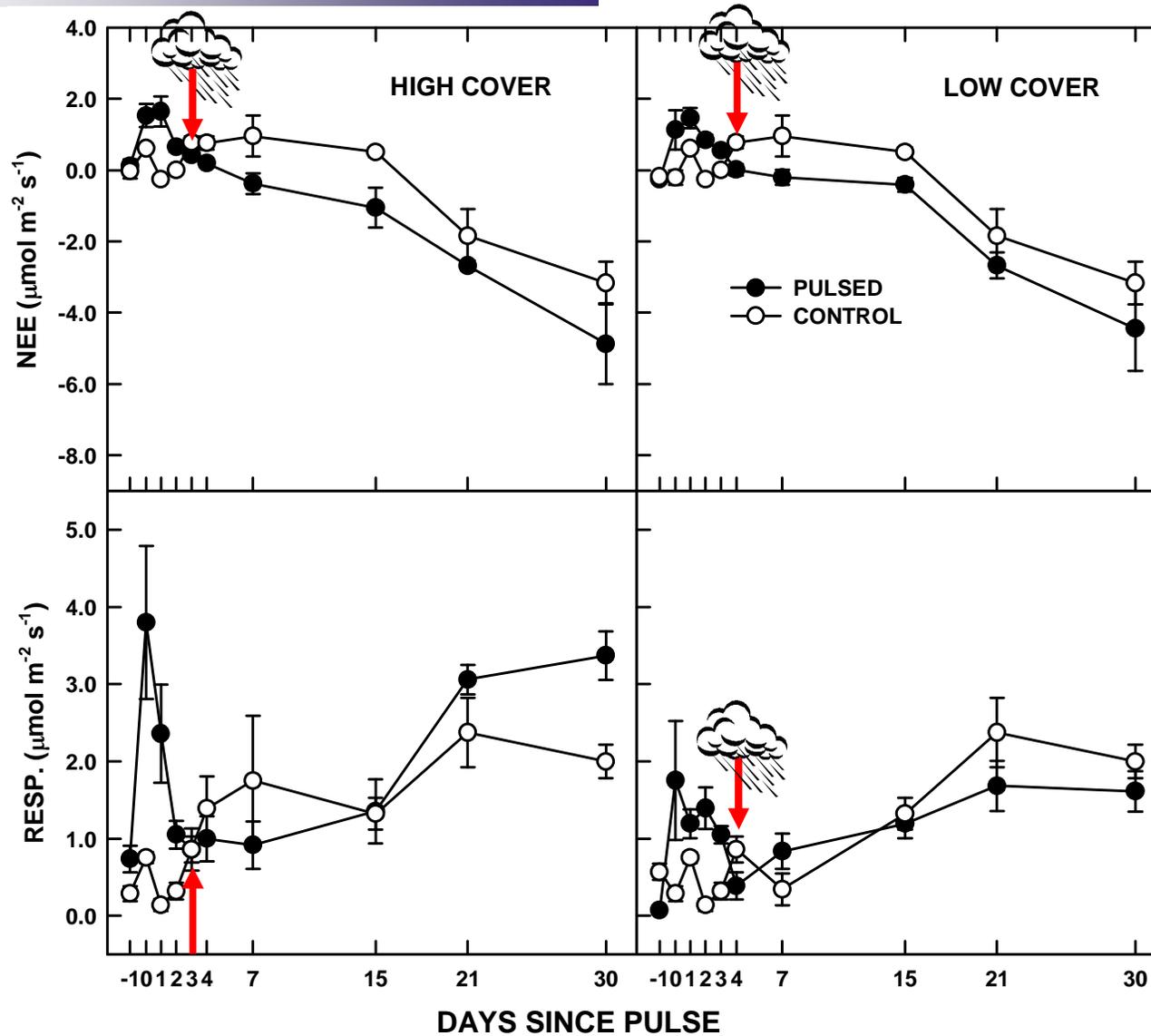
1) **PLOT-LEVEL GEE:**

**DIFFERENCES REFLECT
COVER**

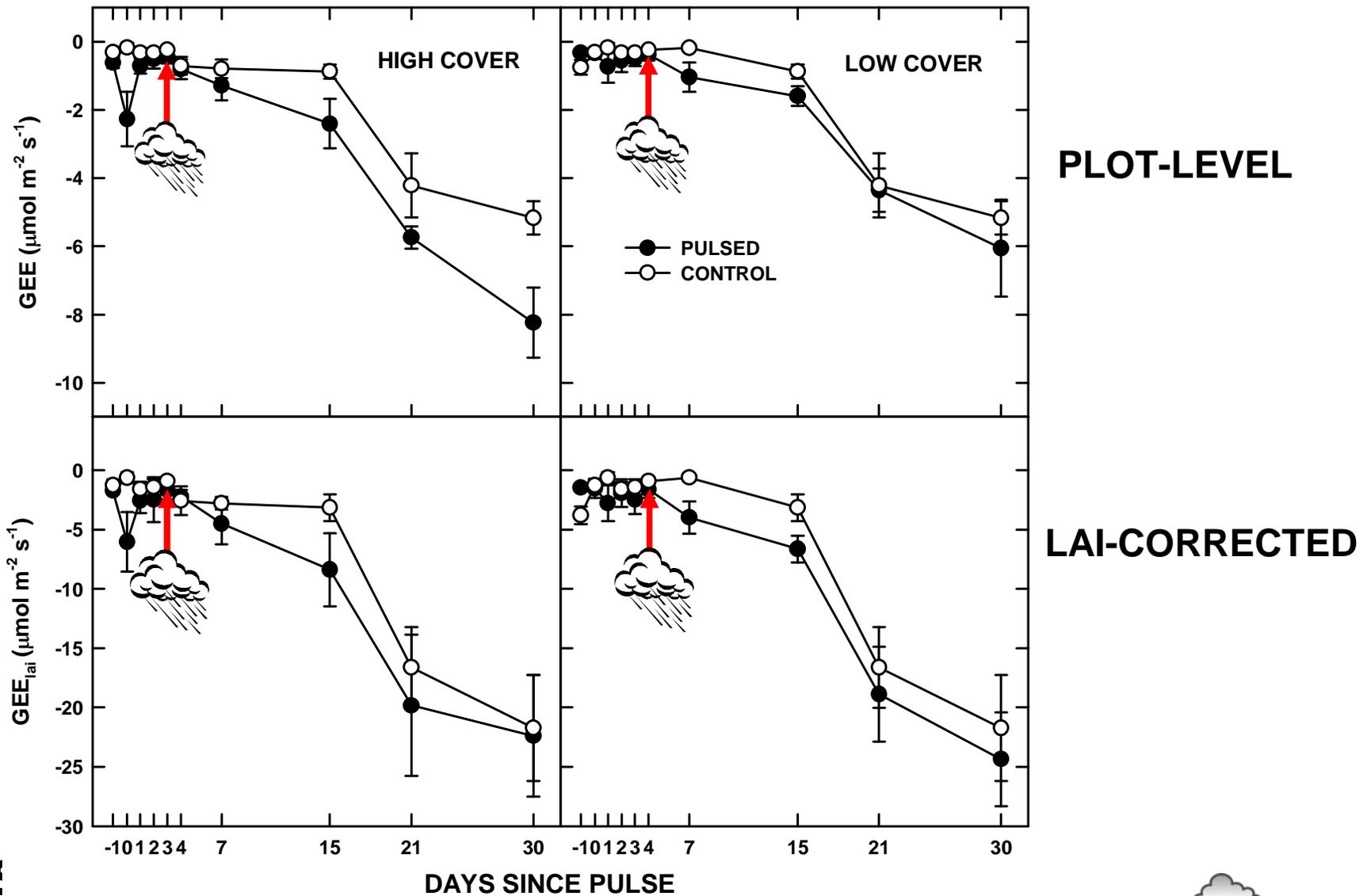
2) **LEAF-AREA CORRECTED GEE:**

**CAN DETERMINE CO-
ORDINATION OF LEAF-LEVEL
AND ECOSYSTEM
PHOTOSYNTHESIS**

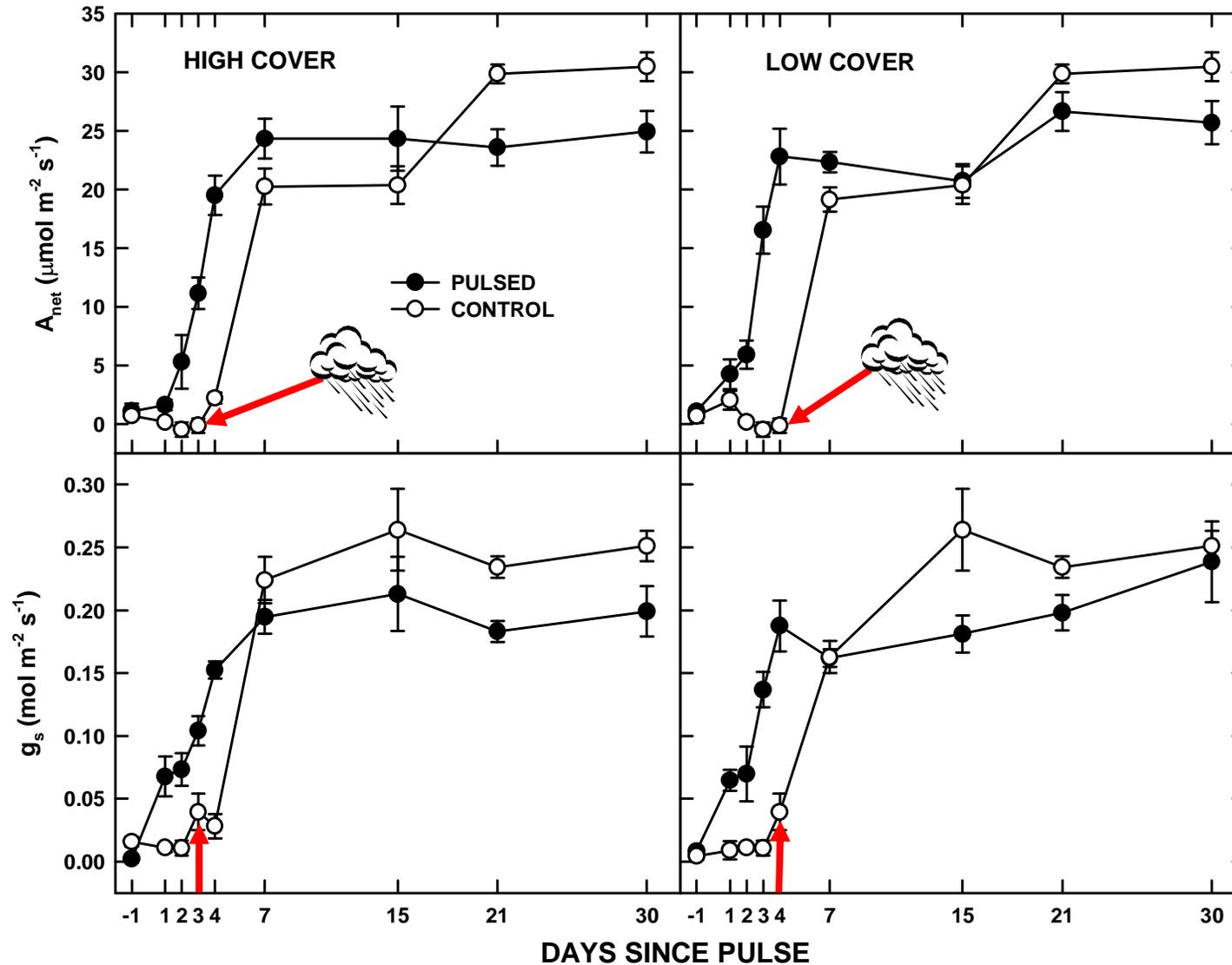
ECOSYSTEM CARBON EXCHANGE



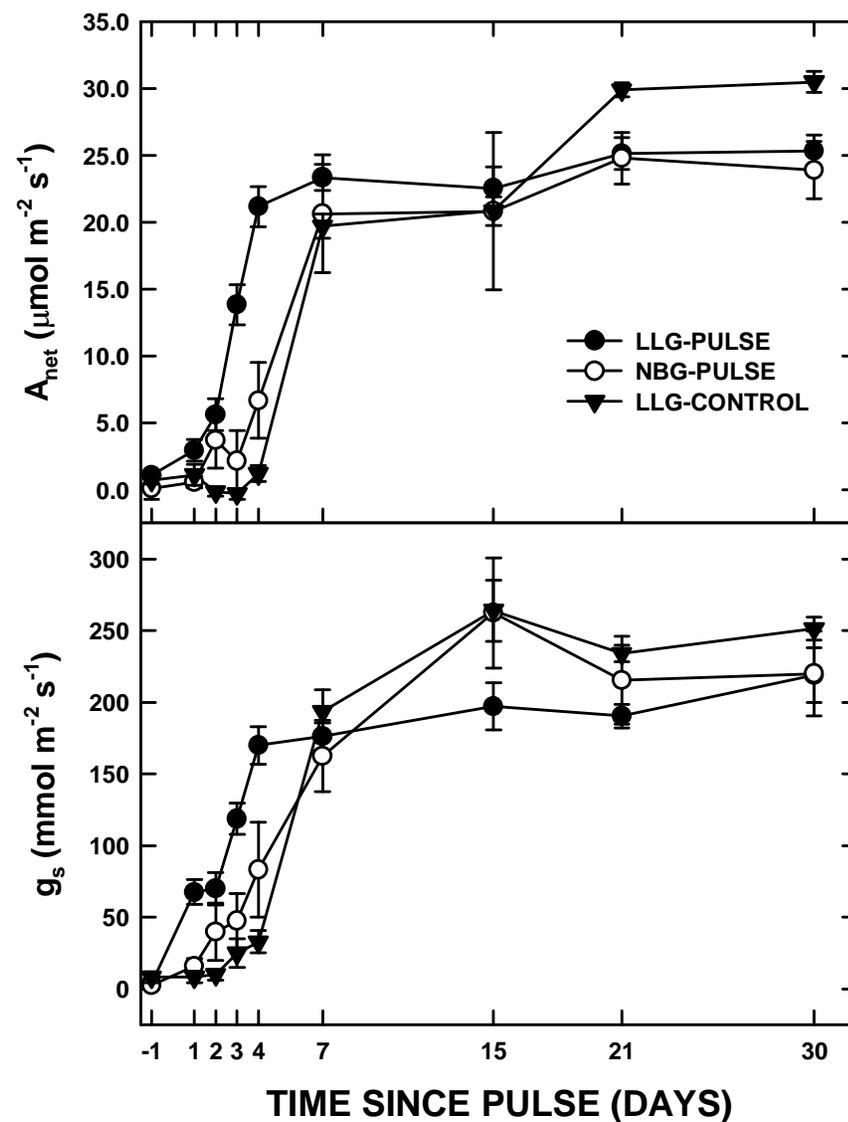
GROSS ECOSYSTEM EXCHANGE



LEAF-LEVEL: LEHMANN'S LOVEGRASS



LEAF-LEVEL: NATIVES VS. EXOTICS!



SOIL MOISTURE

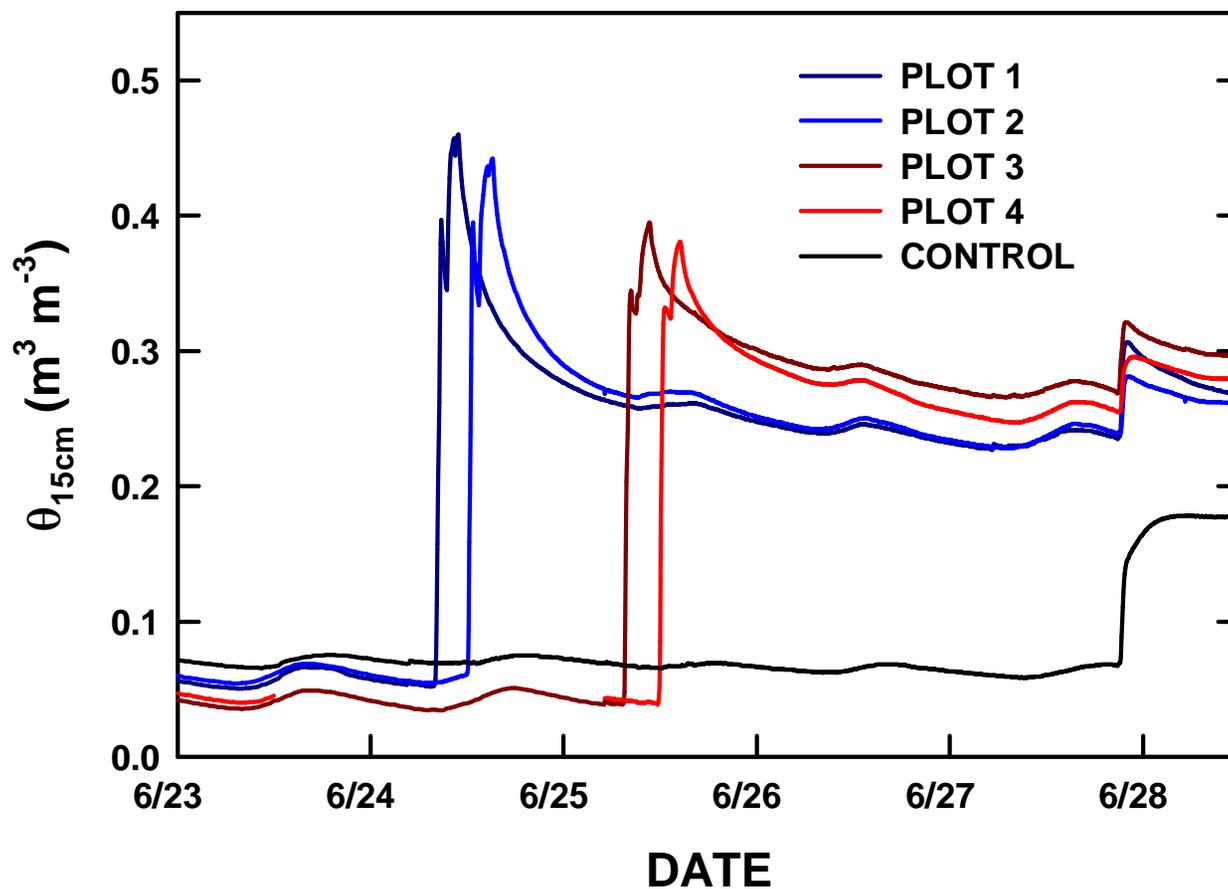


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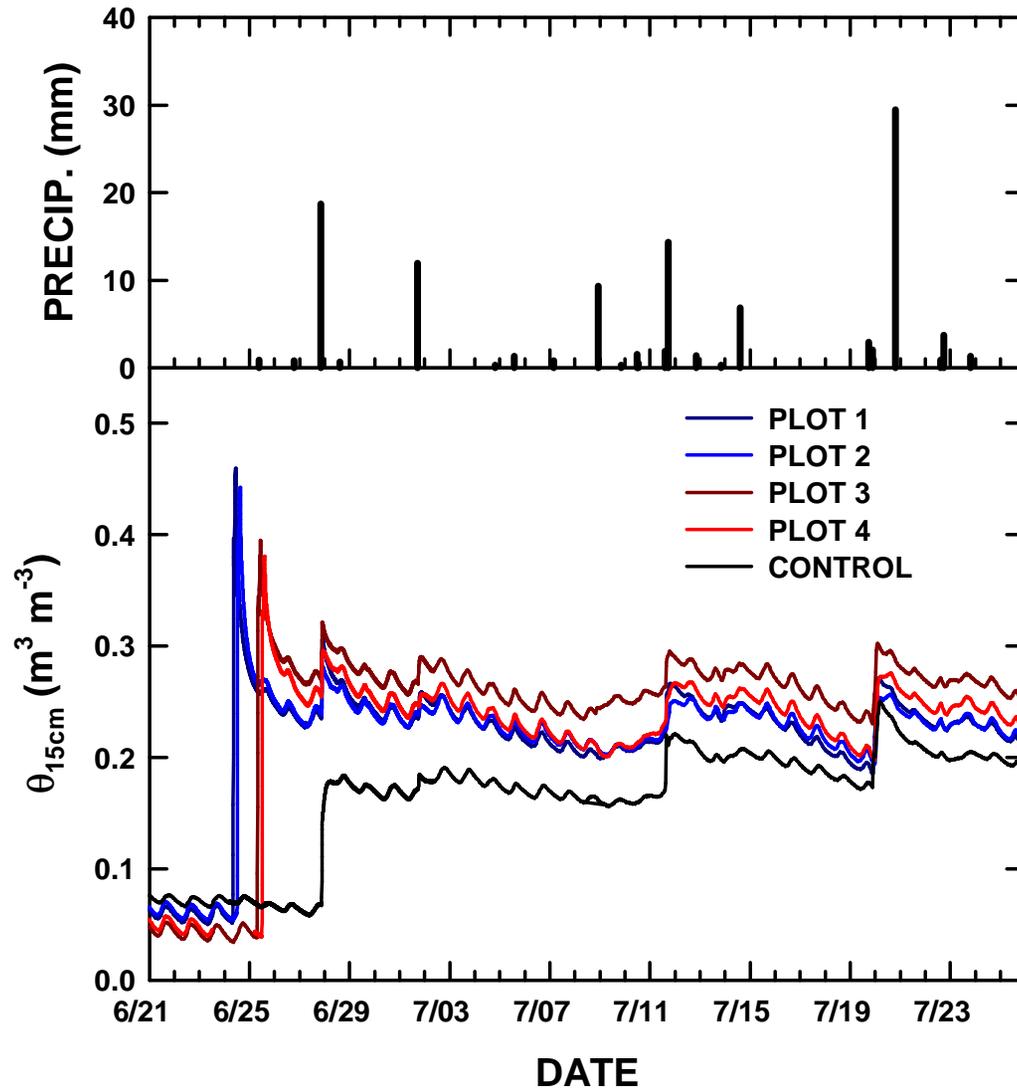
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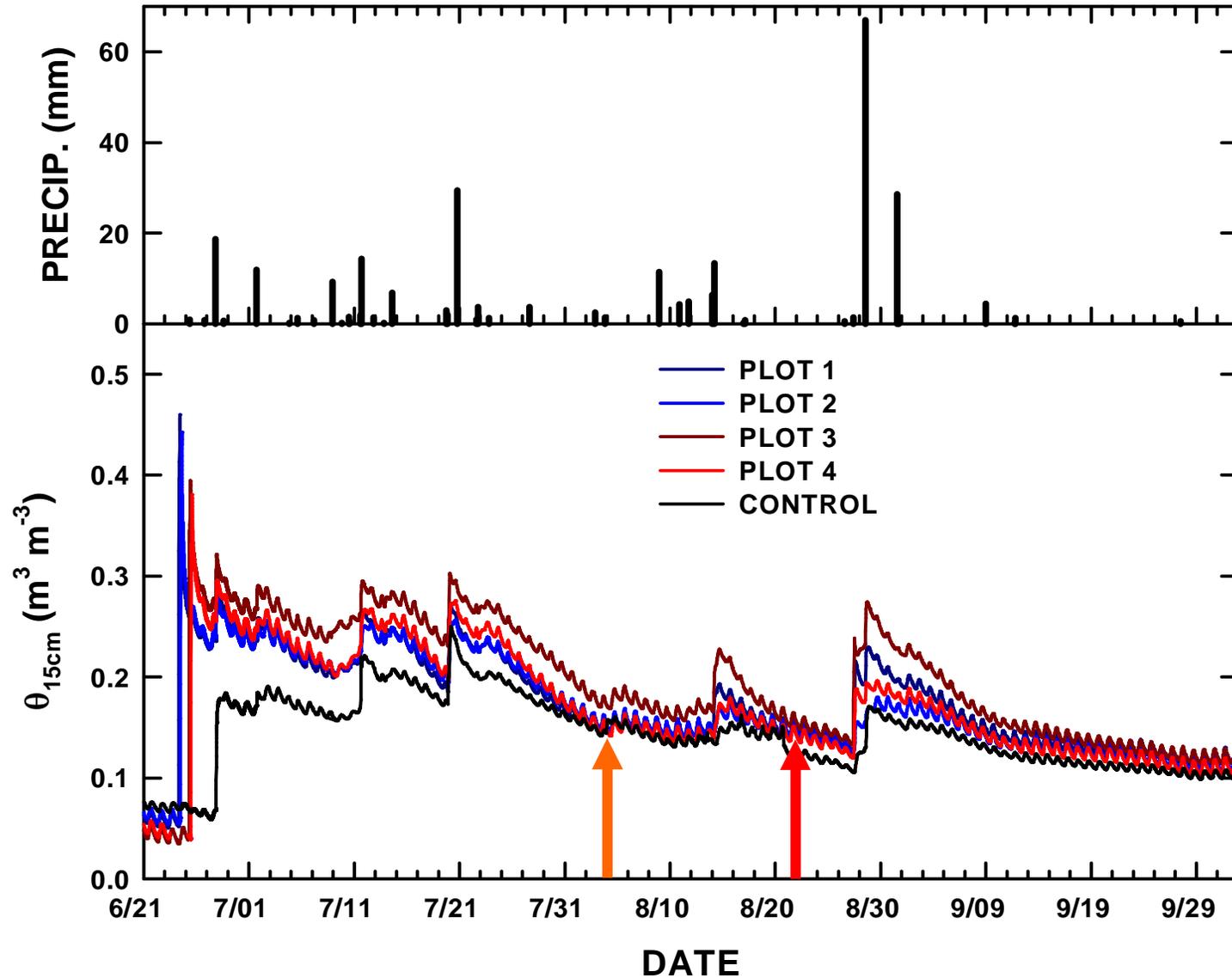
THE FIRST 3-4 DAYS...



...THE FIRST MONTH...



THE MONSOON SEASON



TAKE HOME MESSAGES:

- COVER HAD MODERATE EFFECT ON ECOSYSTEM CARBON EXCHANGE
- BIG PULSE = TRAJECTORY IS LOCKED
- 2 WEEK LAG BETWEEN LEAF- AND ECOSYSTEM-LEVEL PHOTOSYNTHESIS
- PULSED NATIVE GRASS = NON-PULSED EXOTIC
- ONE BIG RAIN STAYS AROUND FOR A LONG TIME