

Alternative Fumigants and Emissions Reduction

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Alternative Fumigants

Summary of Previous Research:

***Fumigant application rates
required to control soil-borne
fungal pathogens***

Summary

Methyl Bromide + chloropicrin (57%MeBr + 43%Pic)

- For control of *Verticillium dahliae*: **300 to 400 lb/a**
- Excellent control of *Phytophthora cactorum*, *Pythium* sp., and citrus nematode)

Midas (iodomethane + 50 to 67% Pic)

- For control of *Verticillium dahliae*: **250 lb/a** drip IM:Pic (33:67) or **300 lb/a** shank-applied IM:Pic (33:67)
- Excellent control of *Phytophthora cactorum*, *Pythium* sp., and citrus nematode

Summary

Telone C35 or Inline (62% 13-D + 33% Pic)

- For control of *Verticillium dahliae*: 425 lb/a
- For *P. cactorum*, *Pythium* spp., and citrus nematode: 300 to 400 lb/a)

Chloropicrin (Pic)

- For control of *Verticillium dahliae*: 200 to 300 lb/a
- For control of *P. cactorum*, *Pythium* sp., and citrus nematode: 300 to 400 lb/a)

Summary

Pic-60 (65% chloropicrin plus 35% 1,3 D)

- For control of *Verticillium dahliae*: 250 to 350 lb/a
- For control of *P. cactorum*, *Pythium* sp., and citrus nematode: 300 to 400 lb/a)

Summary

MITC Generators

(metam sodium & metam potassium)

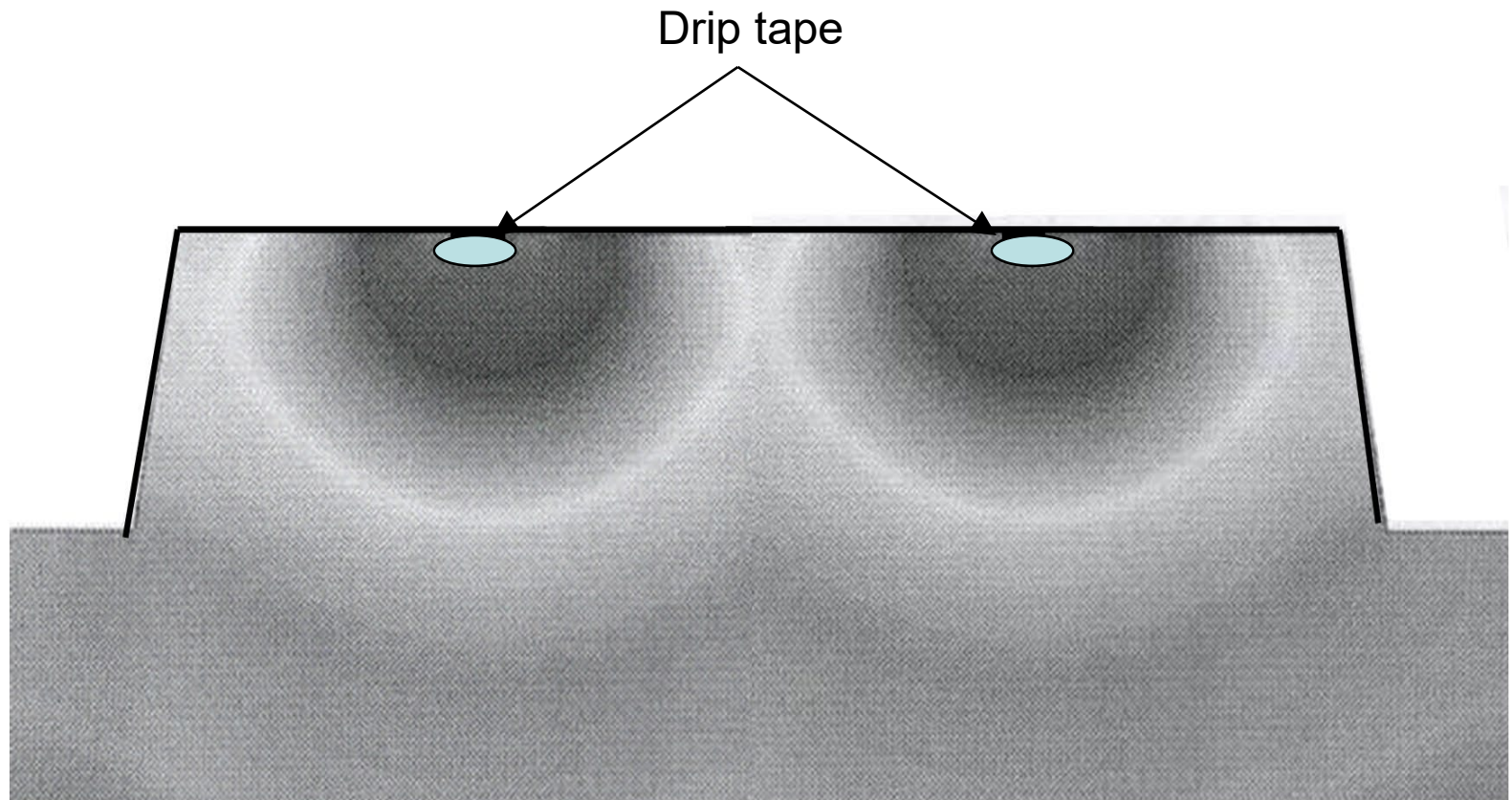
- For control of *Verticillium dahliae*: 300 to 400 lb ai/a
- For *P. cactorum*, *Pythium* spp., and citrus nematode: 200 to 300 lb ai/a
- Can provide enhanced efficacy of pest control when used in conjunction with other fumigants (sequential drip application)

Alternative Fumigants

Summary of Previous Research:

Amount of water or number of drip tapes needed to distribute fumigants in the raised beds

Wide bed – 4 plant rows

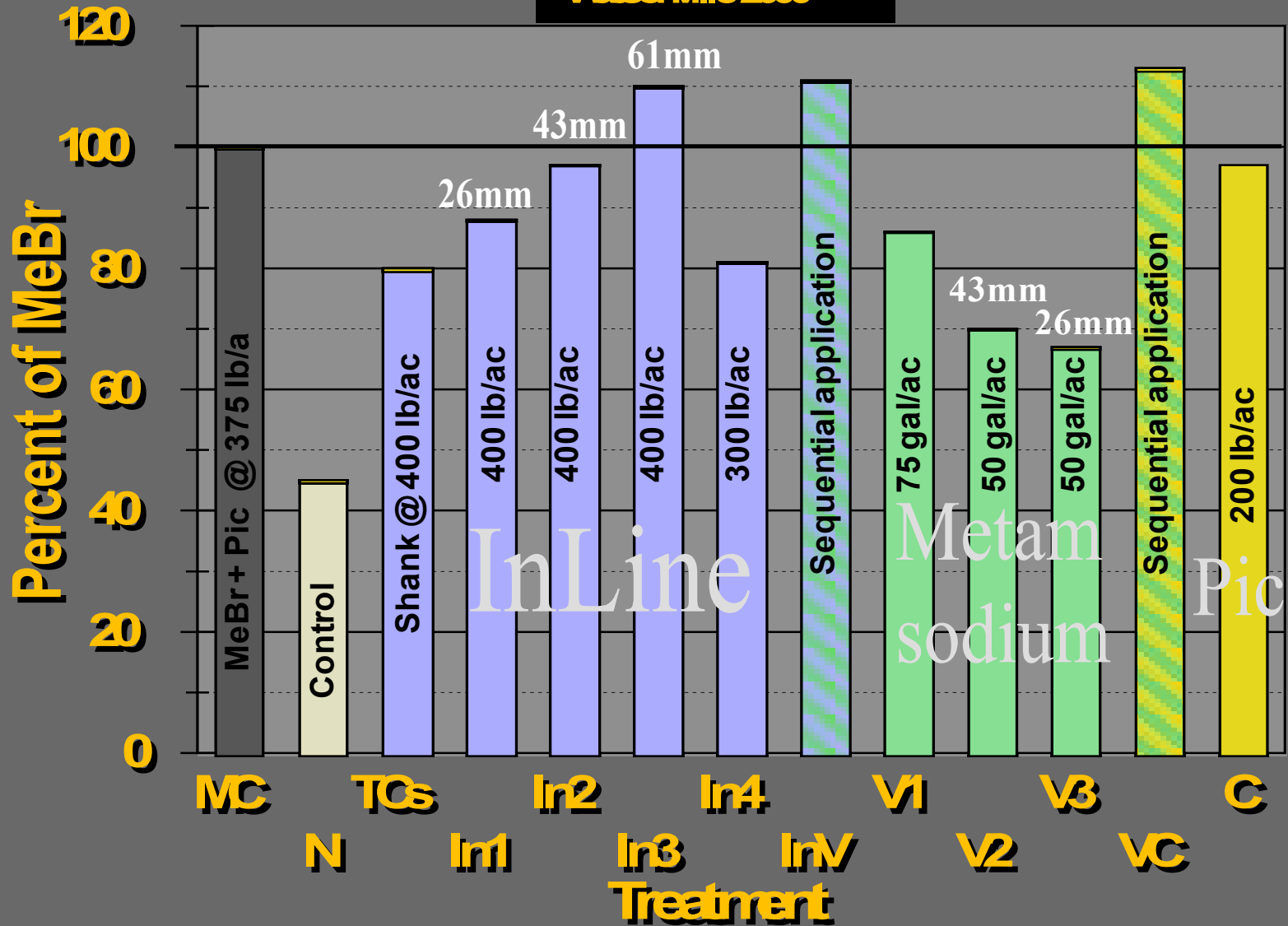






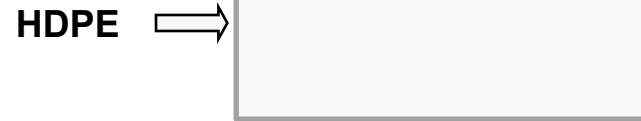
Strawberry Yield

Watsonville 2000



Agricultural Film Types

“Standard” HDPE



**“Semi-impermeable”
Tri-extruded LDPE**



**“Virtually impermeable (VIF)”
LDPE + Nylon barrier**



**“Totally impermeable (TIF)”
5-layer EVOH resin barrier**



Plastic Permeability Measurement

Plastic film is mounted between two chambers.

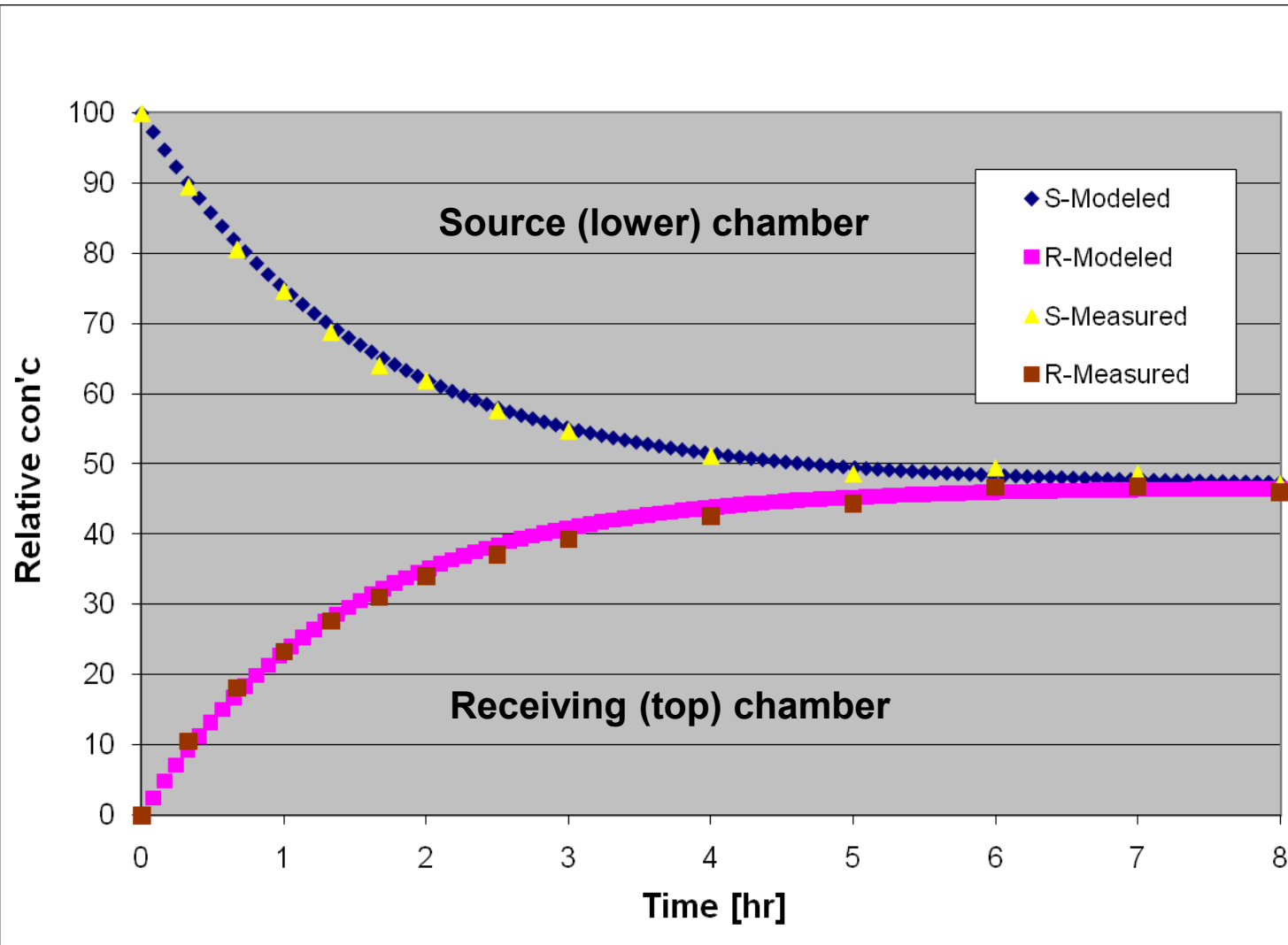
Fumigant is applied to the lower chamber.



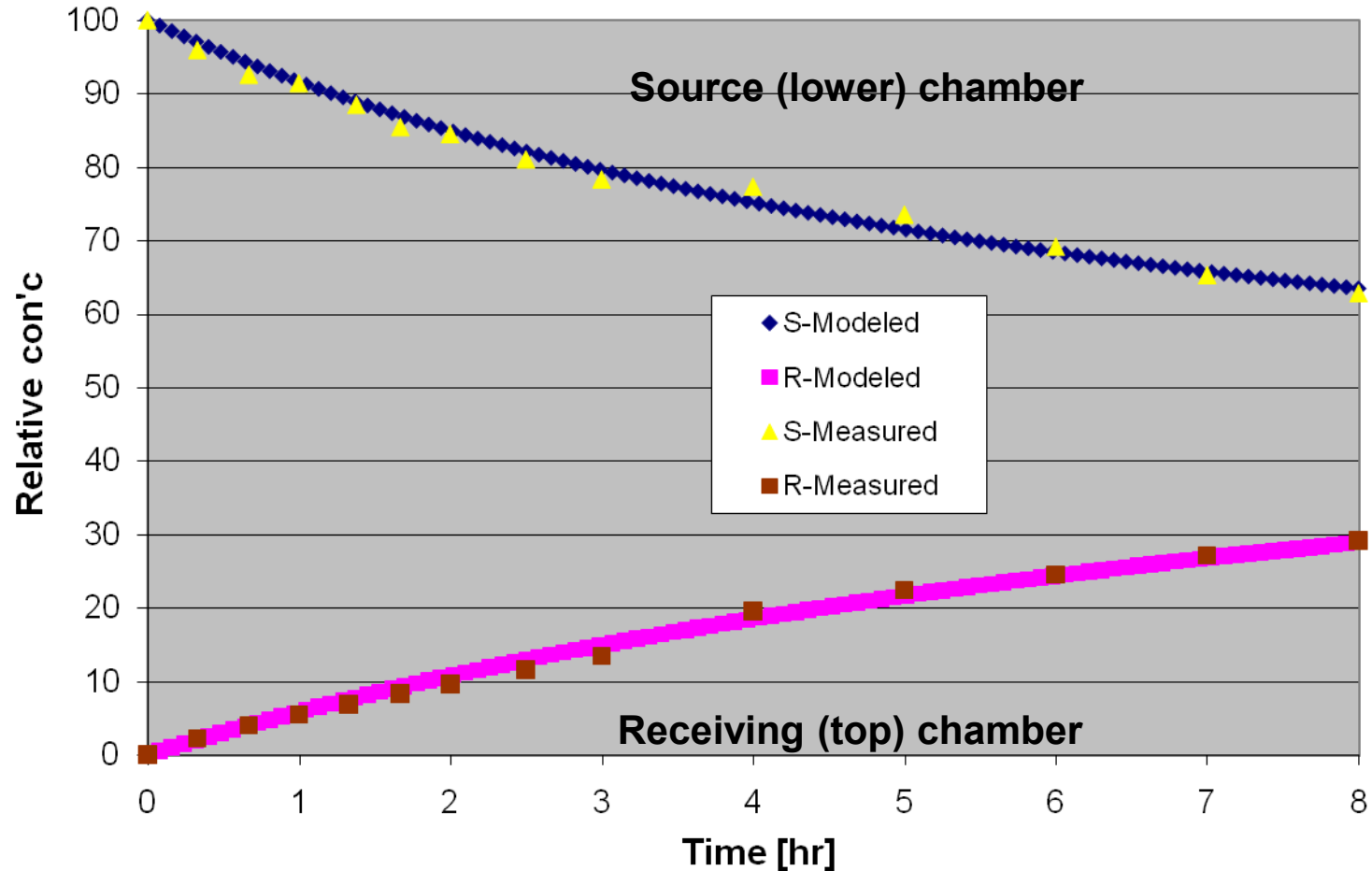


**Fumigant is measured by GC in both chambers.
The Mass Transfer Coefficient (MTC) was calculated.**

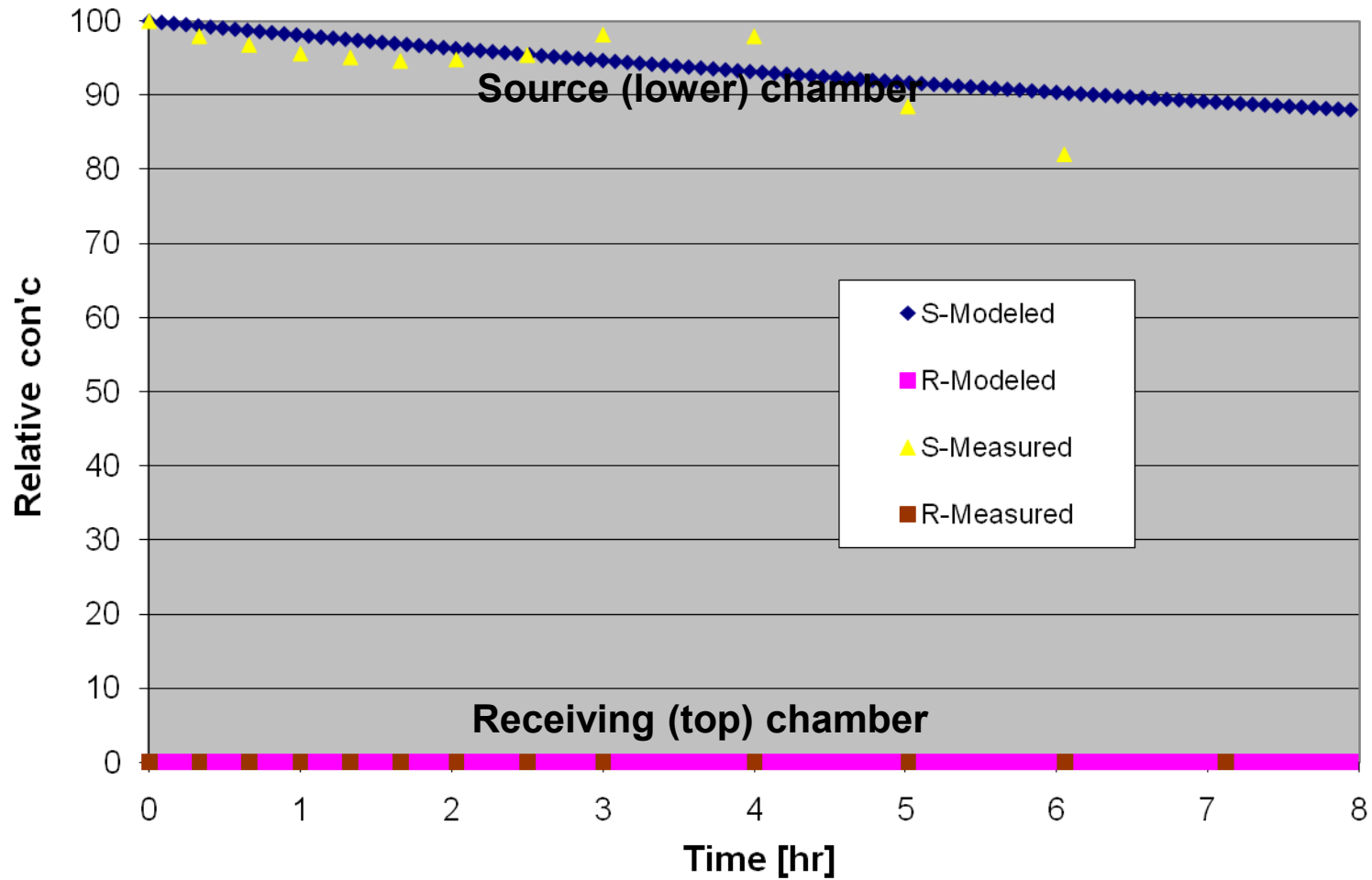
Diffusion of MB through standard LDPE



Diffusion of MB through metalized film



Diffusion of MB through Bromostop VIF



Mass Transfer Coefficients (cm/h) (Before and After Tarping)

Film type	Cis 1,3-D		Cis 1,3-D		Chloropicrin	
	Before	After	Before	After	Before	After
Pliant embossed, 1.25 mil	14.61	16.38	17.32	18.22	9.04	9.98
PolyPak Std, 1.5 mil	3.23	3.79	5.15	5.65	1.49	1.70
PolyPak SIF, 2.0 mil	1.42	1.53	1.51	1.71	0.67	1.71
Blockade, 1.25 mil	0.86	0.88	1.65	1.74	0.11	0.17
Bromostop VIF, 1.38 mil	0.07	0.27	0.09	0.42	0.02	0.18
Eval/Mitsui TIF, 1.38 mil	0.00	0.02	0.001	0.07	0.001	0.01

Mass Transfer Coefficients (cm/h) (Before and After Tarping)

Film type	Methyl bromide		Iodomethane	
	Before	After	Before	After
Pliant embossed, 1.25 mil	4.33	4.55	3.79	4.51
PolyPak Std, 1.5 mil	4.50	5.67	0.93	1.11
PolyPak SIF, 2.0 mil	0.82	0.88	0.32	0.43
Blockade, 1.25 mil	2.34	2.71	0.02	0.03
Bromostop VIF, 1.38 mil	0.09	0.44	0.02	0.08
Eval/Mitsui TIF, 1.38 mil	0.01	0.20	0.001	0.005

**CHLOROPICRIN AND 1,3-D EMISSIONS
REDUCTION BY USING TOTALLY
IMPERMEABLE FILM**

Objective

- v **Determine volatilization losses from soil after application of a mixture of chloropicrin and 1,3-dichloropropene by shank injection under totally impermeable film (TIF).**

Credit for using VIF or TIF

VIF and TIF reduce emission rates (buffer zone credit) and total emissions (VOCs credit) in bed drip fumigation.

Question: would retentive films reduce total emissions in broadcast fumigation?



CHLOROPICRIN AND 1,3-D FLUX FROM ROADCAST SHANK INJECTION UNDER TIF

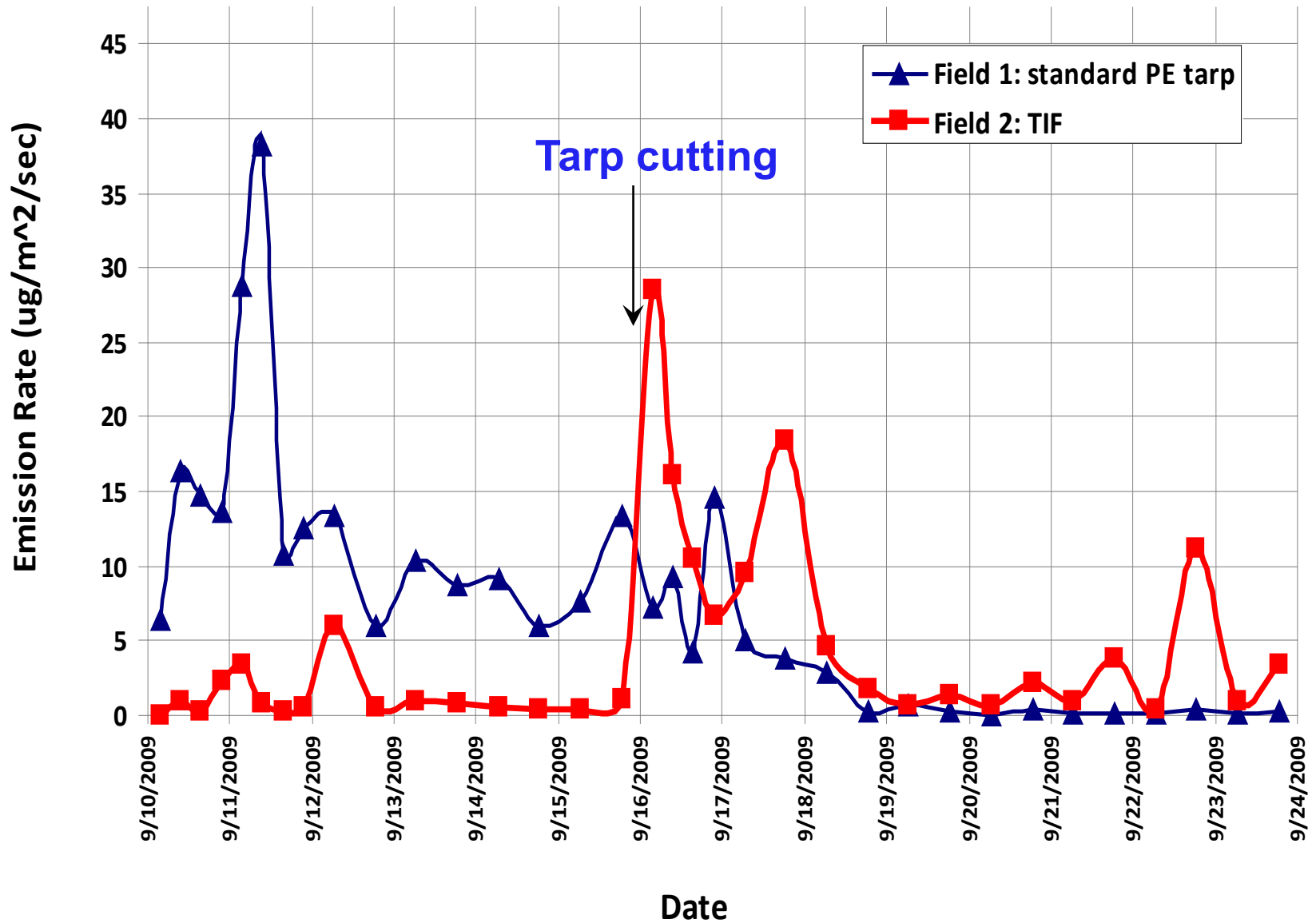
Description of the Treatments

Field #	Shank Application Method	1,3-D/Pic (50/50) Application Rate (lbs/acre)	Soil Sealing Method
1	Broadcast Tarped 12" deep	280	Polyethylene tarp
2	Broadcast Tarped 12" deep	280	EVAL-resin barrier tarp

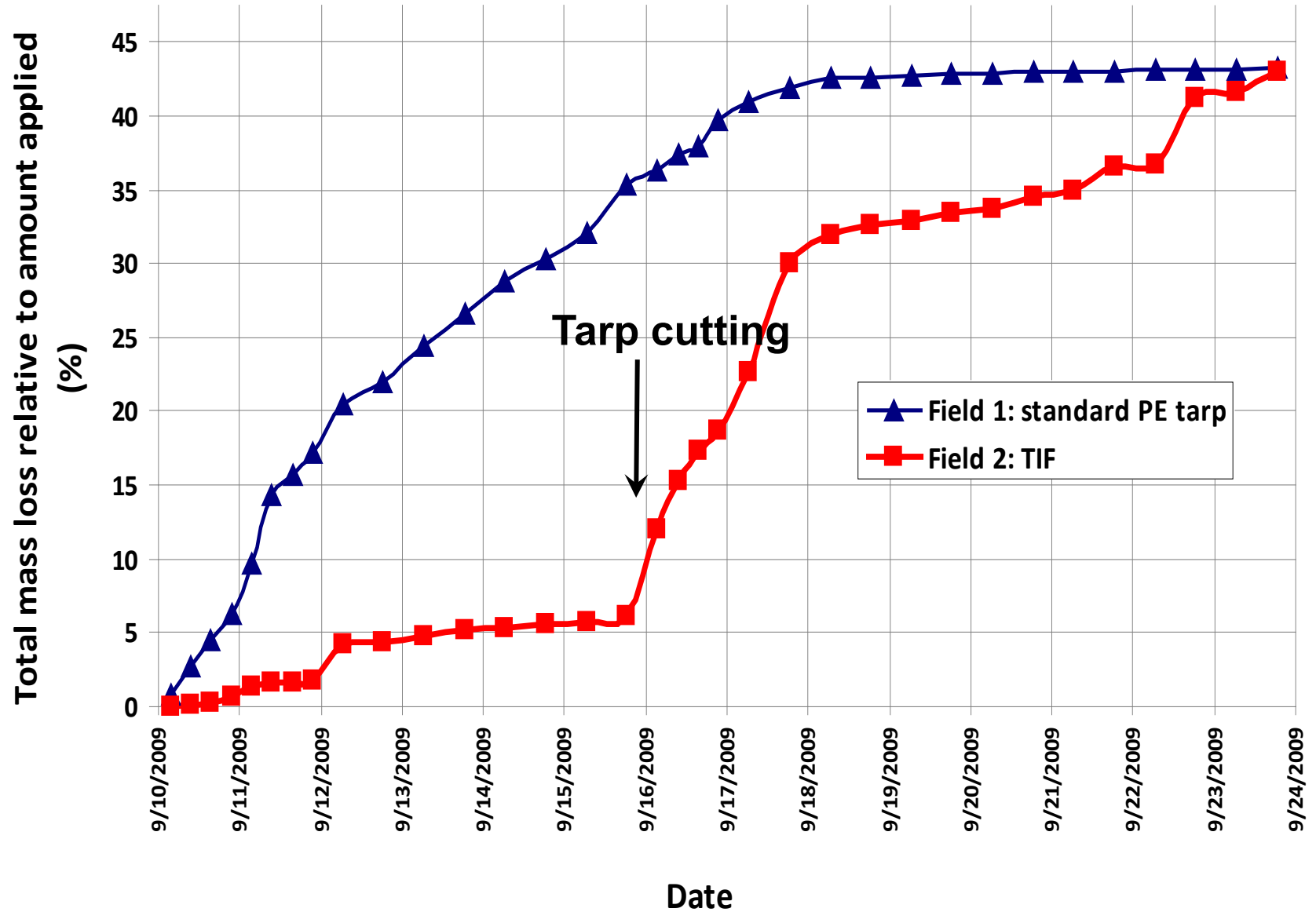


Holes were made in Field #2 (TIF) on September 12, 2010, by someone walking or running over the tarp. Holes were found and patched using duct tape.

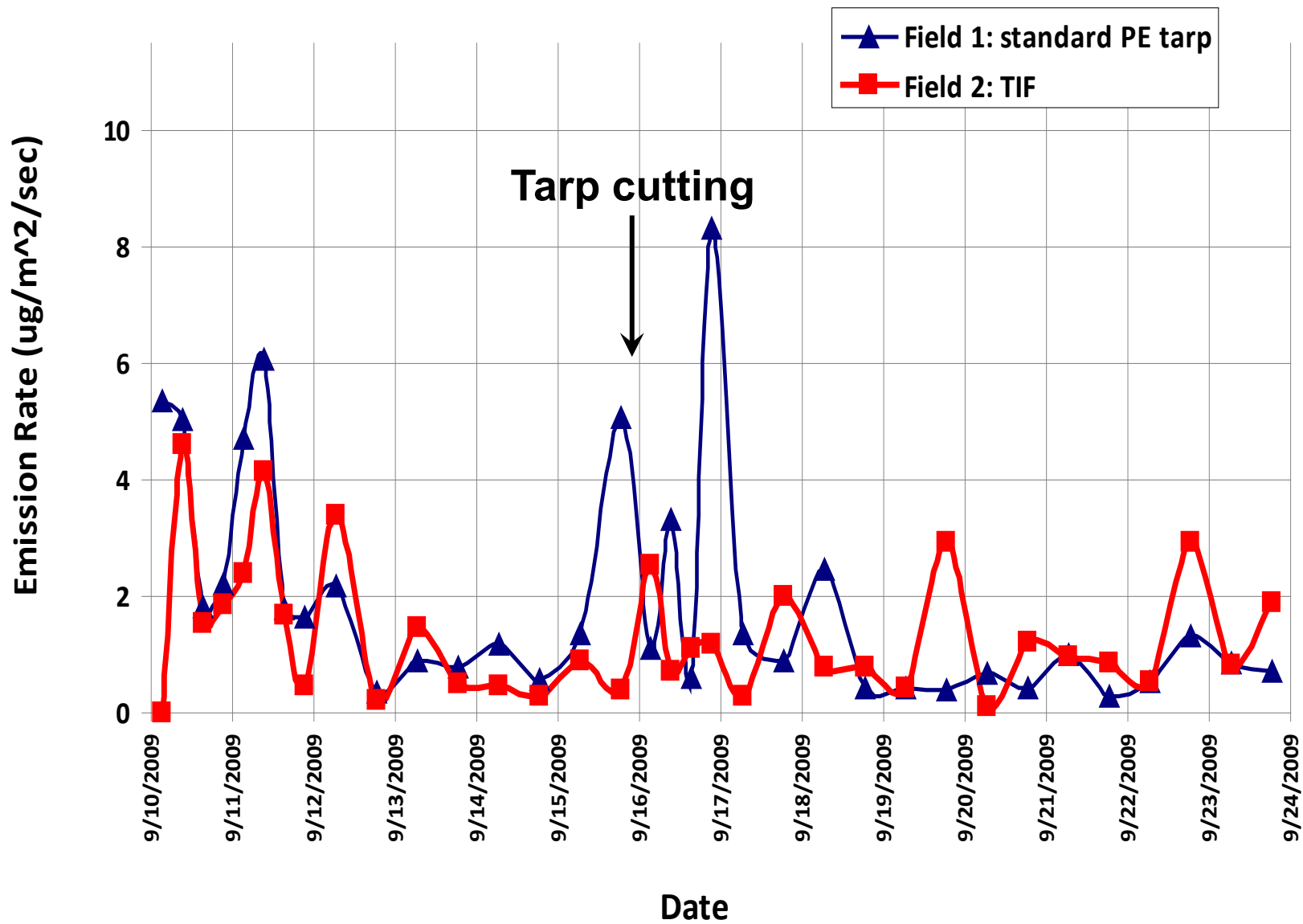
1,3-D Emissions Rates, Ventura, CA 2009



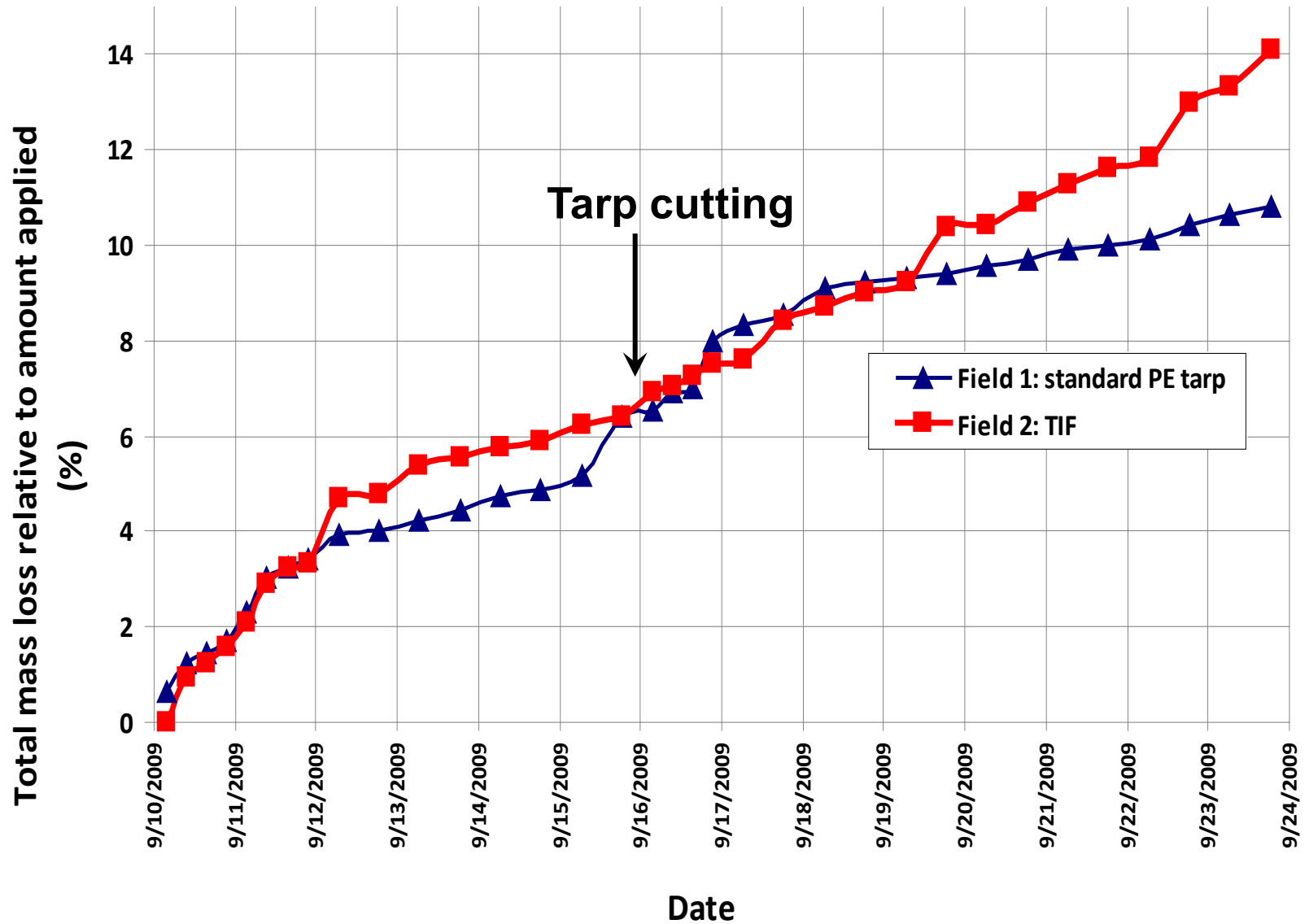
1,3-D Total Emissions, Ventura, CA 2009



Chloropicrin Emissions Rates, Ventura, CA 2009



Chloropicrin Total Emissions, Ventura, CA 2009



CONCLUSIONS

- 1. Drip Fumigation (previous studies) showed that VIF and TIF reduce emissions rates and total emissions of chloropicrin and 1,3-D.**
- 2. Broadcast shank fumigation (current study):**
 - ∅ TIF reduced early emission rates of 1,3-D.**
 - ∅ Cutting TIF within one week after application did not reduce total emissions of 1,3-D from broadcast shank injection.**
 - ∅ Studies on proper timing for tarp cutting are needed. (*Studies are planned for May, 2011*)**

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Thank you very much



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