

# Mercury Balance of Decomposing Leaf Litter.



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# Outline

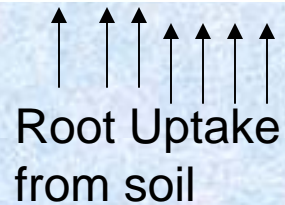
- Background
  - Objective
- Experimental Design
  - Results
- Future Direction

# The Role Of Trees in Mercury Cycle



**TREE LEAVES ARE A SINK**  
**30ng of Hg/ g of Leaf matter**

Bash, Jesse O. 2006



UCONN's Lee Farm  
Coventry, CT

**Objective:**  
Measure the Total Hg and MeHg mass balance of decomposing hardwood leaf litter.



# Mass Balance

- Change in Storage = Input - Output
- Inputs: Wet Deposition, Gaseous Deposition
- Outputs: Leachate, Gaseous Evasion



# The Experiment

- Two compost piles
  - 6' tall, 5' radius
  - “Turned Pile” : turned based on internal temperature
  - “Control Pile”: left static
- 6 month sampling period
- Mercury Concentration measurements in:
  - Wet Deposition
  - Leaf Litter
  - Leachate
  - Air-Litter Gas Exchange

# The Compost Piles

- Composition: 100% leaves from UCONN campus
- Decomposition rate is controlled and greatly increased
- Compost conditions mimic the reported conditions for mercury methylization.



Galloway, M.E. and B.A. Branfireun 2004

# Sampling:

- ❖ Gaseous Exchange- Teflon Chamber, continuous (Gillis and Miller 1990)
- ❖ Leachate- Troughs, collected event based
- ❖ Wet Dep- Station collected event based
- ❖ Compost- Cores, temperature based

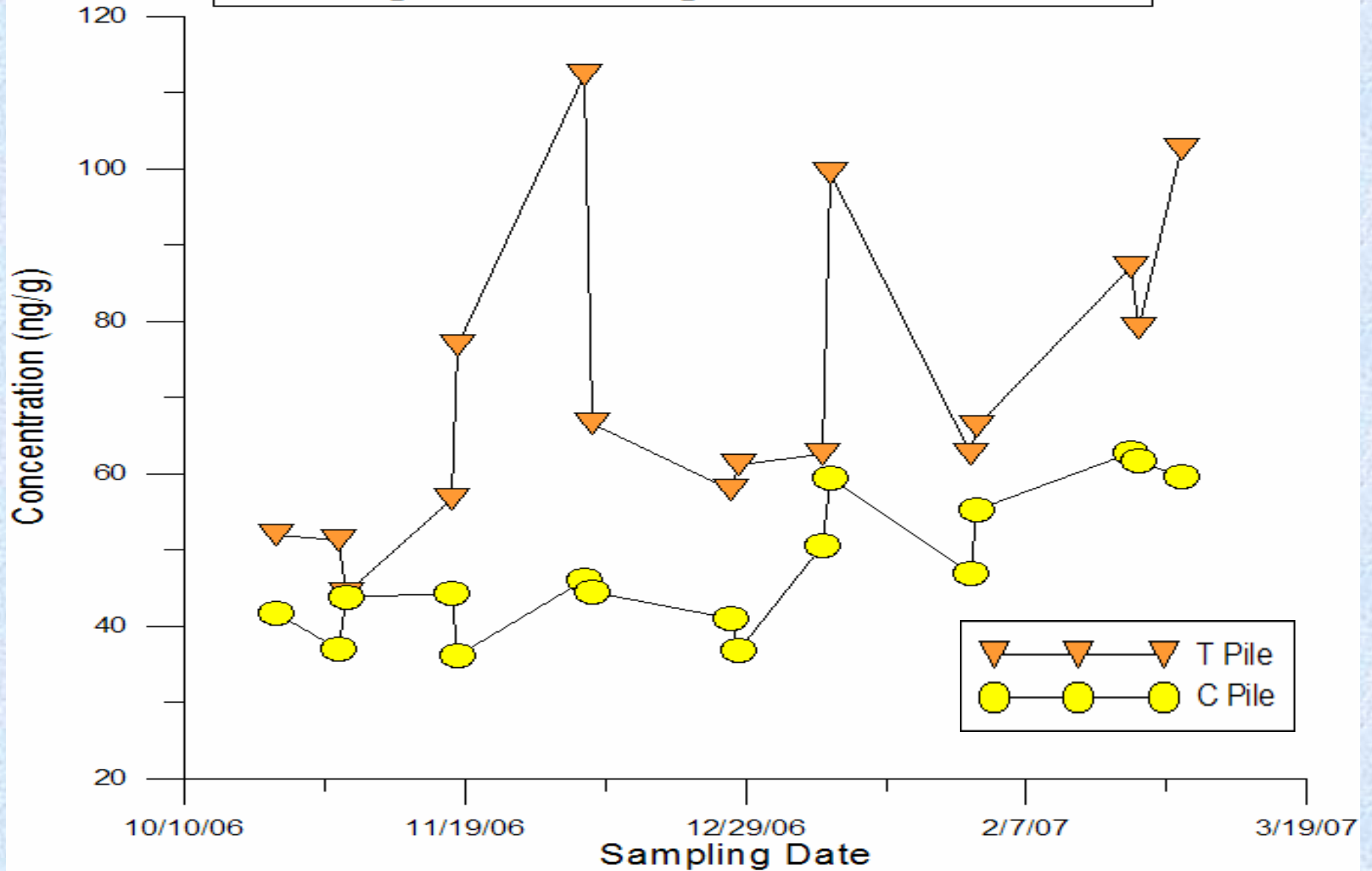




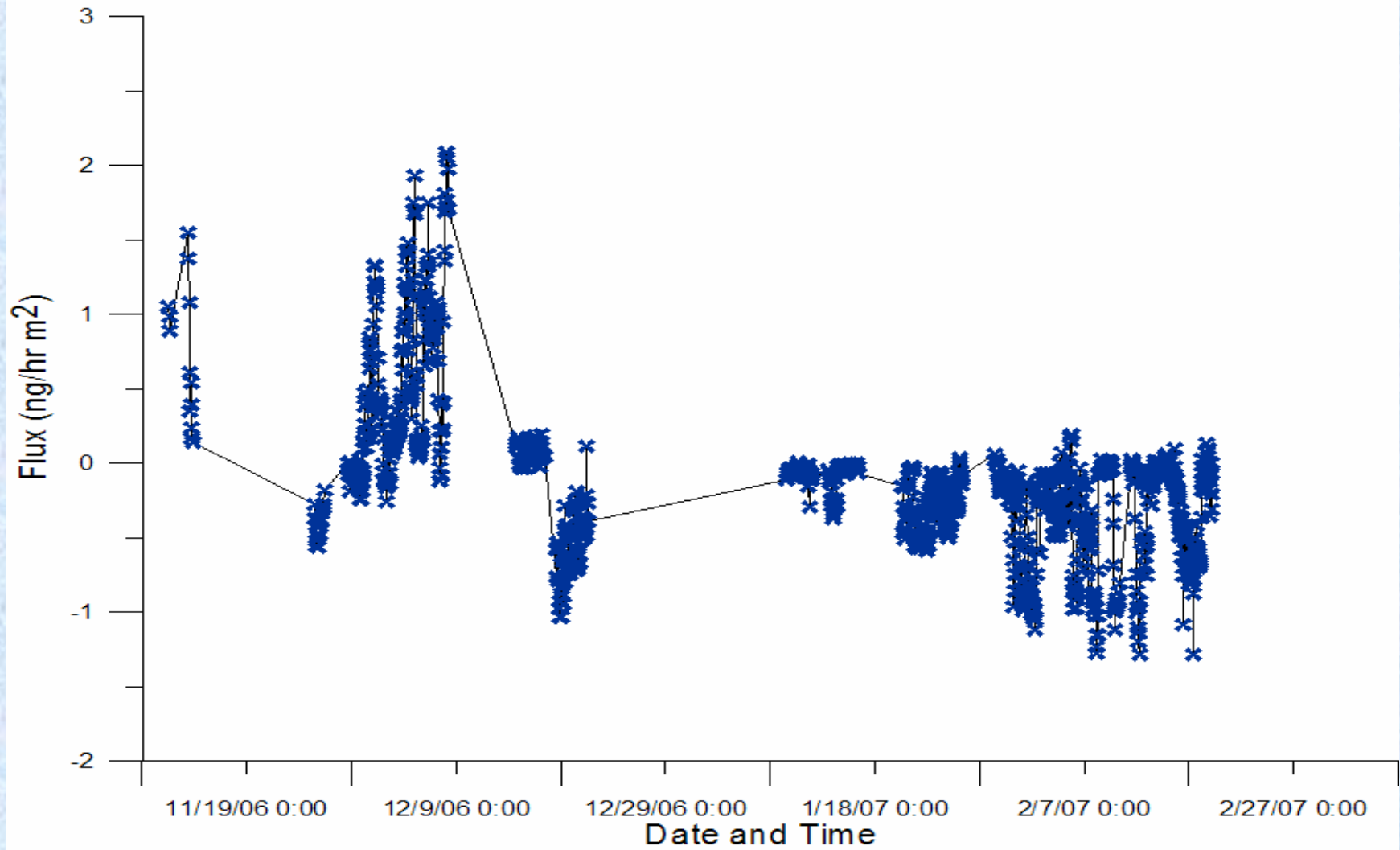
# THg Results



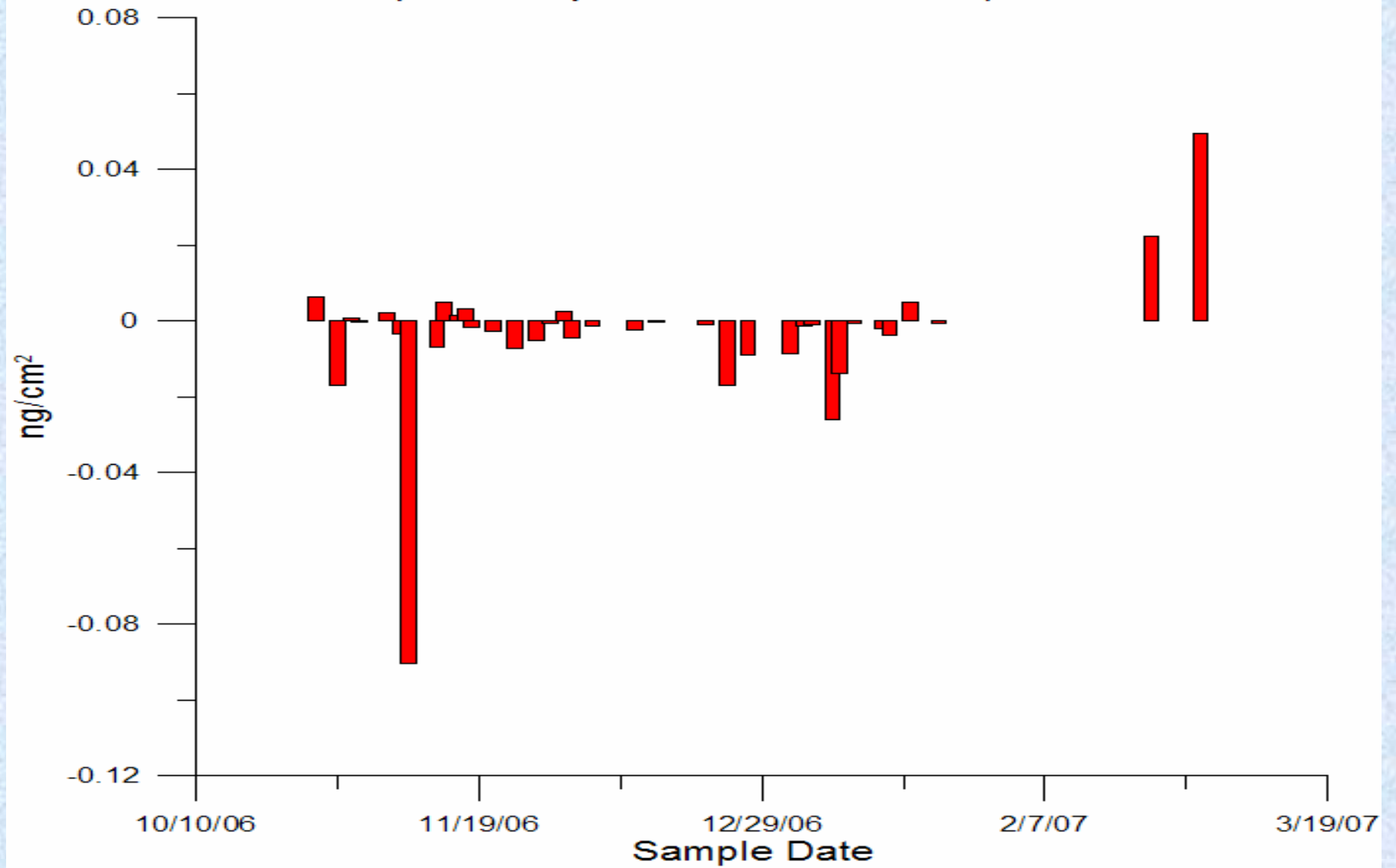
### Average Pile THg Concentrations



### THg Air-Leaf Litter Exchange



### Net Liquid Flux (Wet deposition-Leachate)



# THg Balance Over Entire

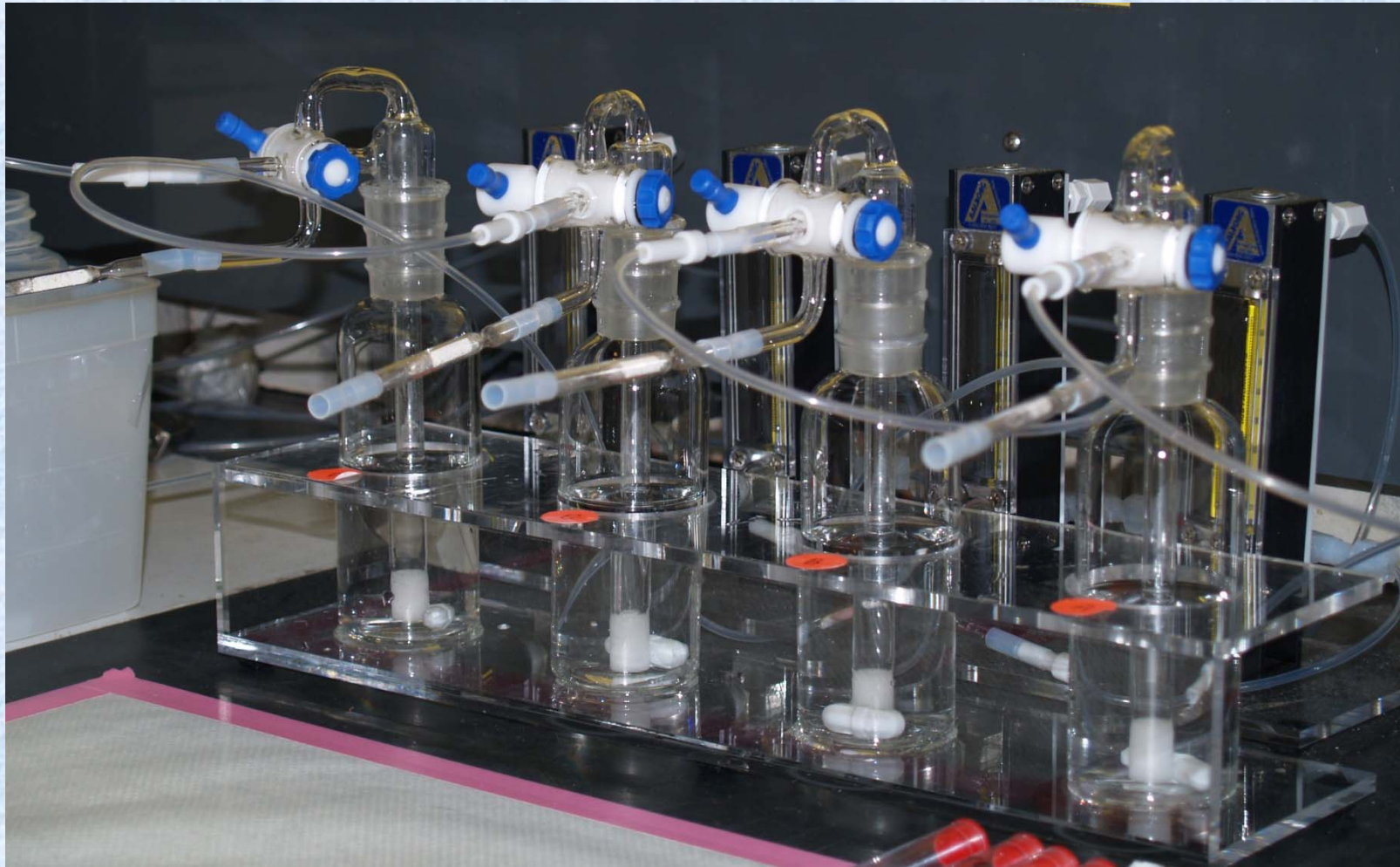
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## Experiment

$$\Delta S_{budget} = F_{air} + F_{Liquid}$$

<b>Pile</b>	<b>Total Hg in Pile Column (ng/cm<sup>2</sup>)</b>	$\Delta S_{measured}$ (ng / cm <sup>2</sup> ) <i>From Compost Concentrations</i>	$\Delta S_{budget}$ (ng / cm <sup>2</sup> )	<b>Wet-Dep (ng/cm<sup>2</sup>)</b>	<b>Leachate (ng/cm<sup>2</sup>)</b>	<b>Air Flux (ng/cm<sup>2</sup>)</b>
T-Pile	844.25	-3.32	0.042	0.16	-0.39	0.272
C-Pile	433.45	-87.59	0.022	0.16	-0.41	0.272

# MeHg Results



# MeHg Tissue Laboratory Methods:

Method:	Reference	Modifications:
Leaching: KOH/Methanol	Frontier Method CALFED D15	2 ½ hour leaching 0.15g of sample
Ethylation: Sodium Tetraethyl borate	EPA Method1630 Liang, Horvat and Bloom	200microL of Na- Tetrathylborate 50microL of Sample 20min Reaction
Purge and Trap: N <sub>2</sub> and Tenax traps	EPA	15min drying time
Analysis: Gas Chromatography, Pyrolitic Column, Cold Vapor Atomic Fluoresence Spectrometry	Frontier Method EPA	

# MeHg Wet Dep/Leachate Analysis

Method	Reference	Modifications:
Distillation	EPA Method	
Ethylation		Sample quantity decreased Antifoaming agent used
Purge and Trap	EPA method 1630	
Analysis: Cold Vapor Atomic Fluorescence Spectrometry	EPA method 1630	



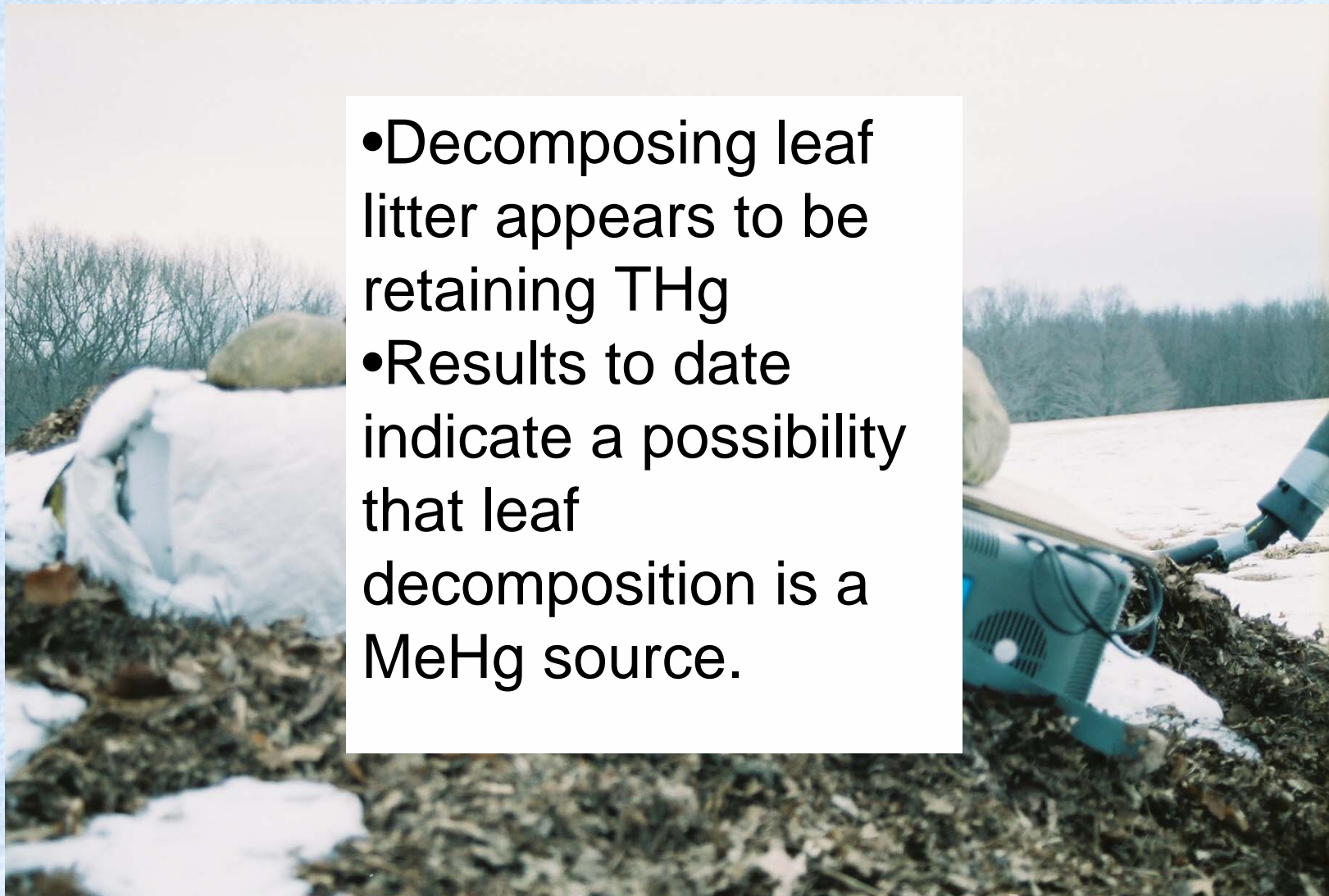
# MeHg (Preliminary Data)

- Wet Dep and Leachate
- Both Exhibit ~1% of THg
- Compost:
- concentrations:
  - 4-6ng/g
  - 10% of THg
- SRM Recovery % 90



# Preliminary Conclusions:

- Decomposing leaf litter appears to be retaining THg
- Results to date indicate a possibility that leaf decomposition is a MeHg source.



# Future Work

- Finish MeHg Analysis (25% Complete)
- Other Possibilities:
  - Hg in Decomposing Biota
  - Different Aeration methods
  - Plant up-take from degraded leaf material

# Thank you!!

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## Other Help:

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UCONN Plant Science Farm

UCONN CESE Laboratory