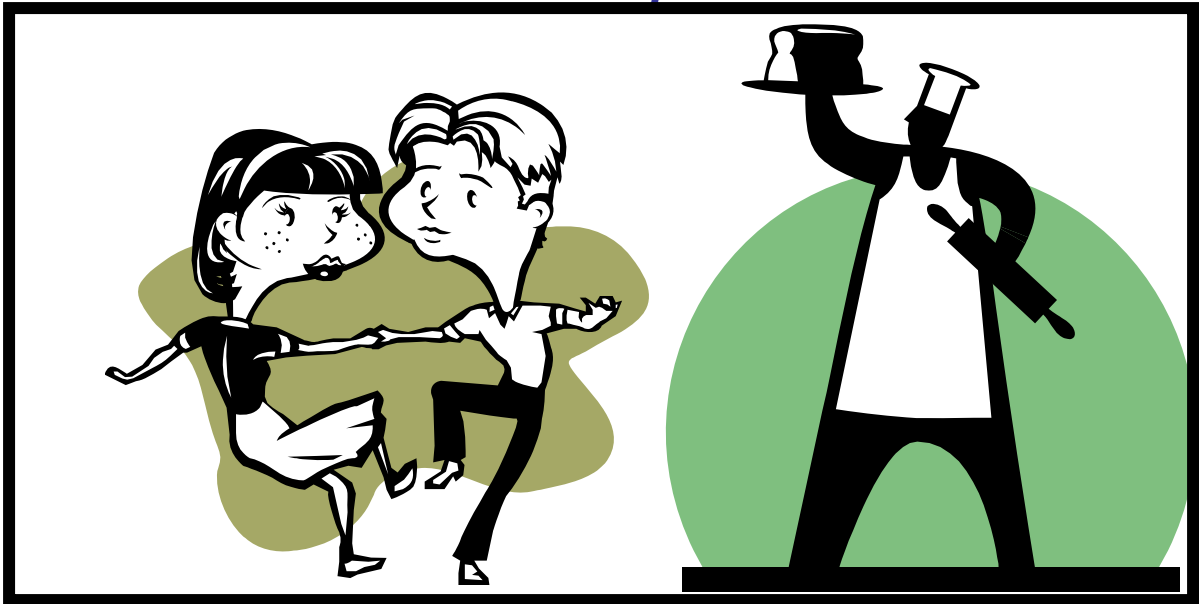


Shake and Bake Experiments A Further Update



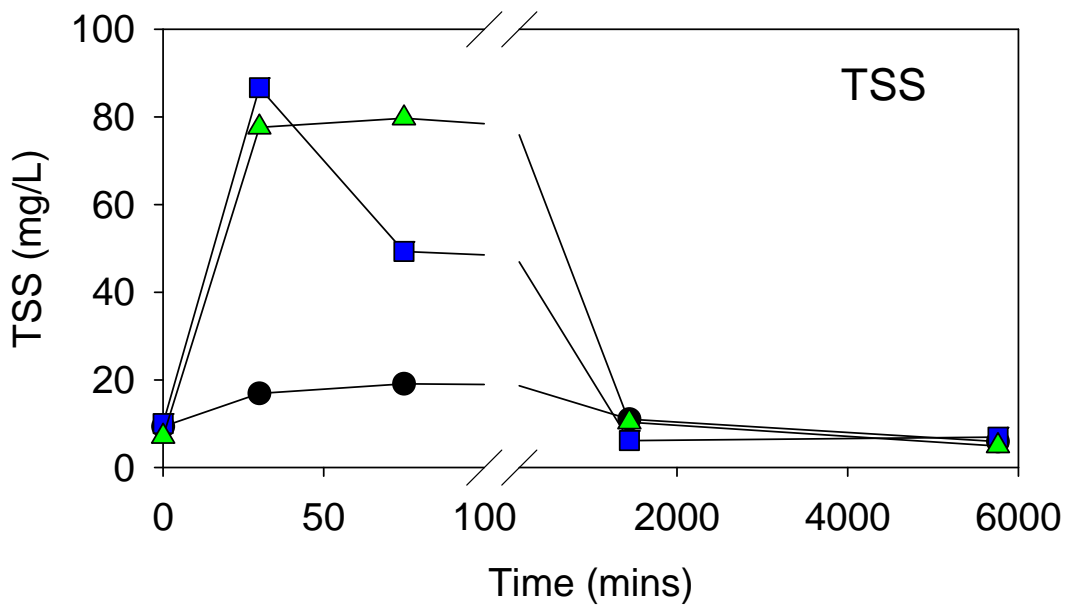
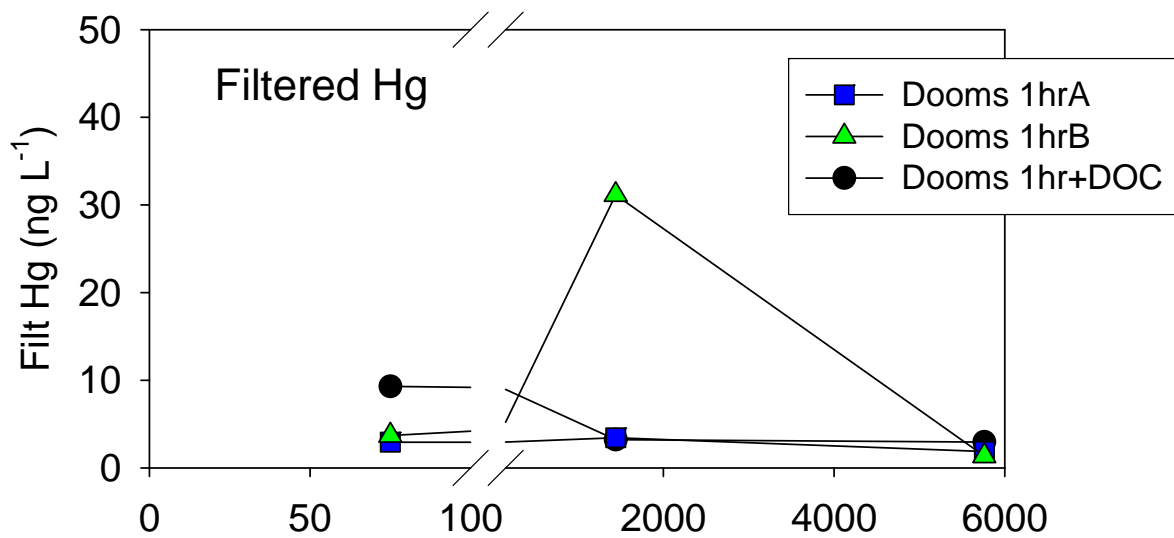
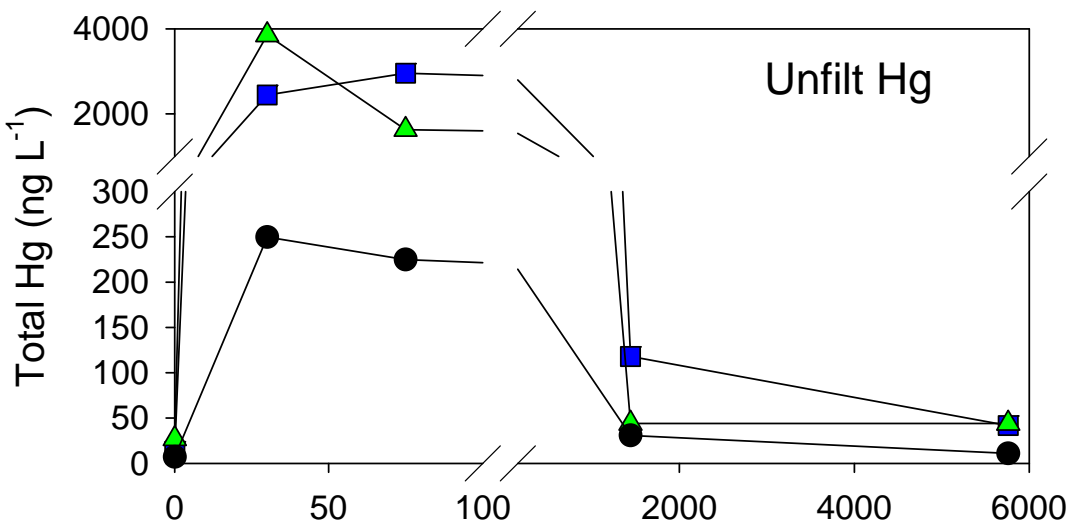
Chesapeake Biological Laboratory
UMCES, Solomons, MD 20688

Robert Mason – Project Manager
Andrew Heyes – Chief Chef and Analyst
Matt Reardon – Chief Shaker
and others in the cast

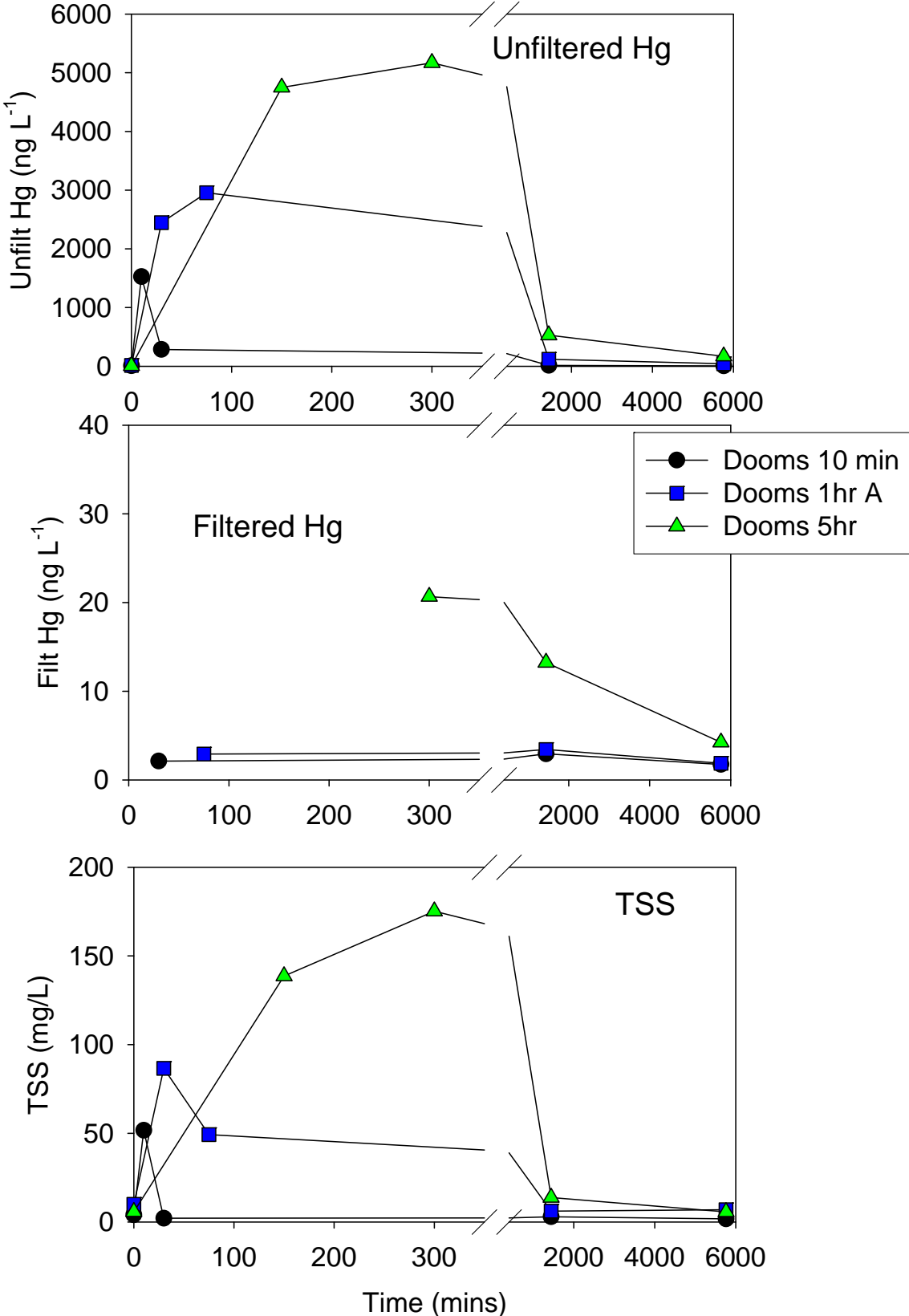
Shake and Bake Experiments

- *Rationale:* To estimate the extent of mercury (Hg) and methylmercury (MeHg) release from sediments during resuspension, and to estimate the impact of resuspension on Hg methylation in the short-term
- *Approach:* Use microcosms containing sediment and water obtained from the site and resuspend the sediment for different lengths of time (20 mins, 1 hr and 5 hrs) for different sediment types and monitor the total and dissolved Hg and MeHg concentrations, as well as TSS and other ancillary parameters, with time during and after the resuspension event to determine the extent of Hg and MeHg release to the dissolved phase. From analysis of sediments before and after the experiment determine if net methylation has occurred in the sediment. To assess the importance of biological activity, DOC was added to some sediments in an effort to stimulate Hg methylation.

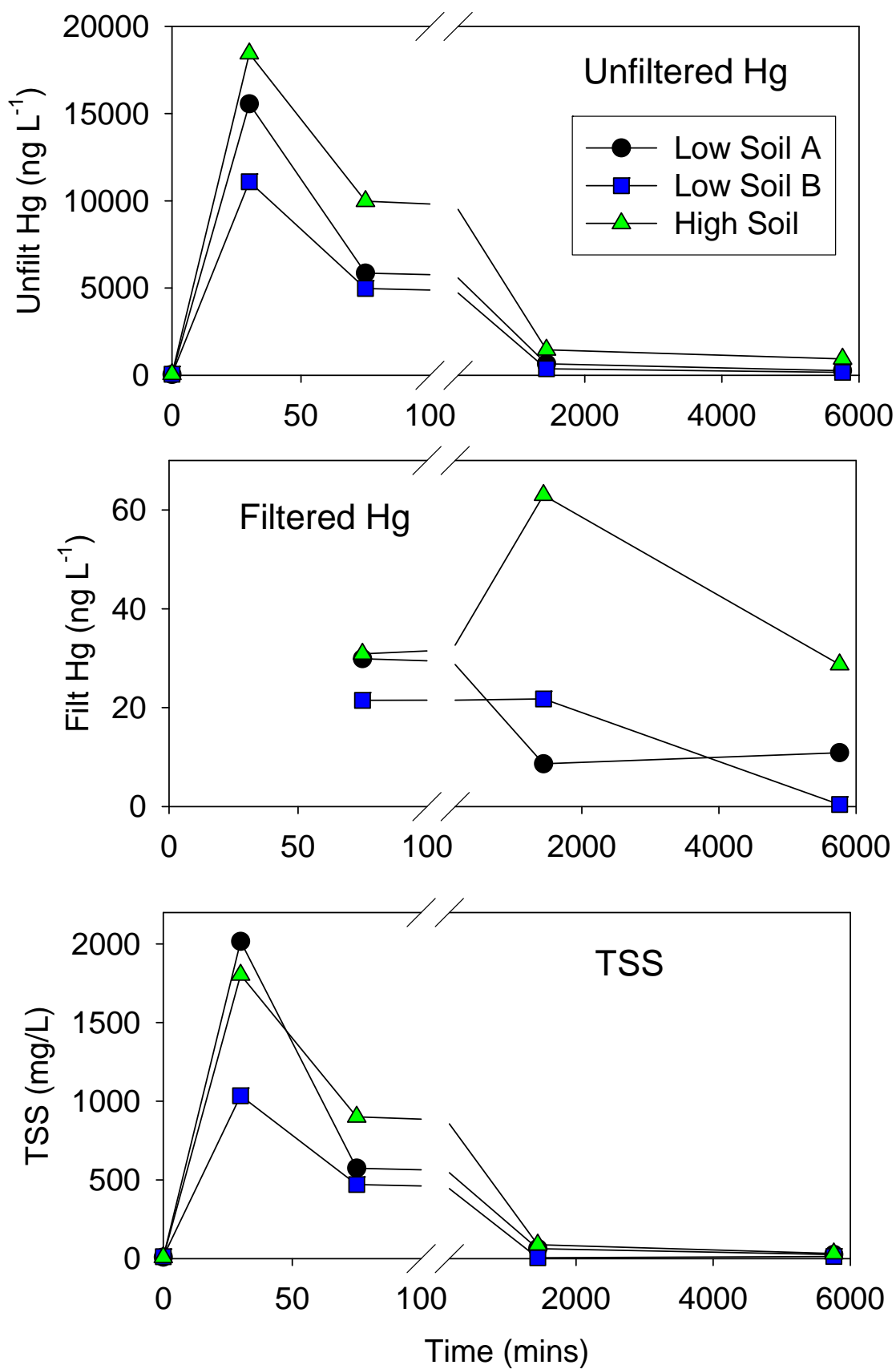
T-Hg in water column of Dooms resuspensions



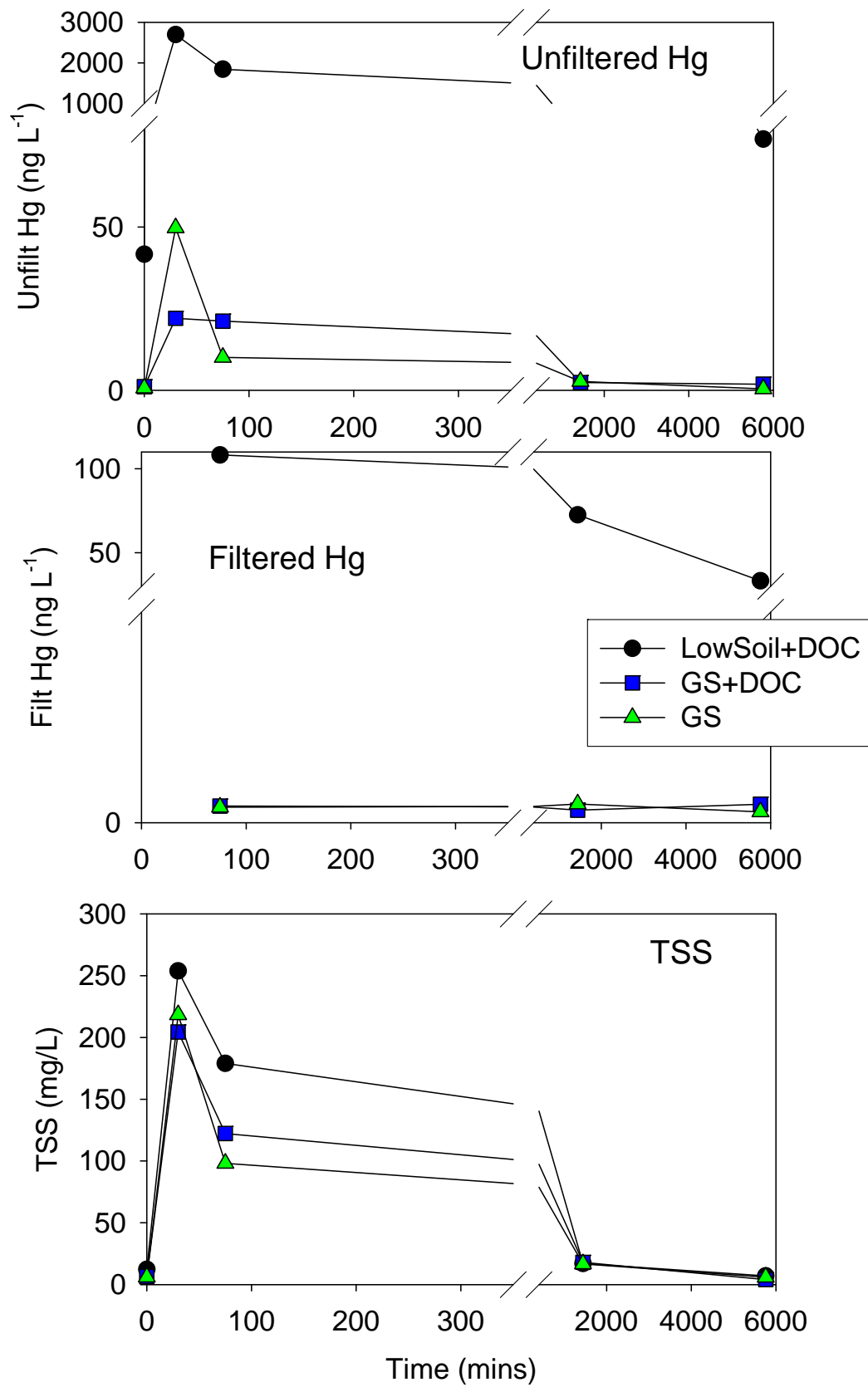
Time dependence of resuspension and T-Hg



T-Hg in water column of soil resuspensions



Impact of DOC on T-Hg in the water column

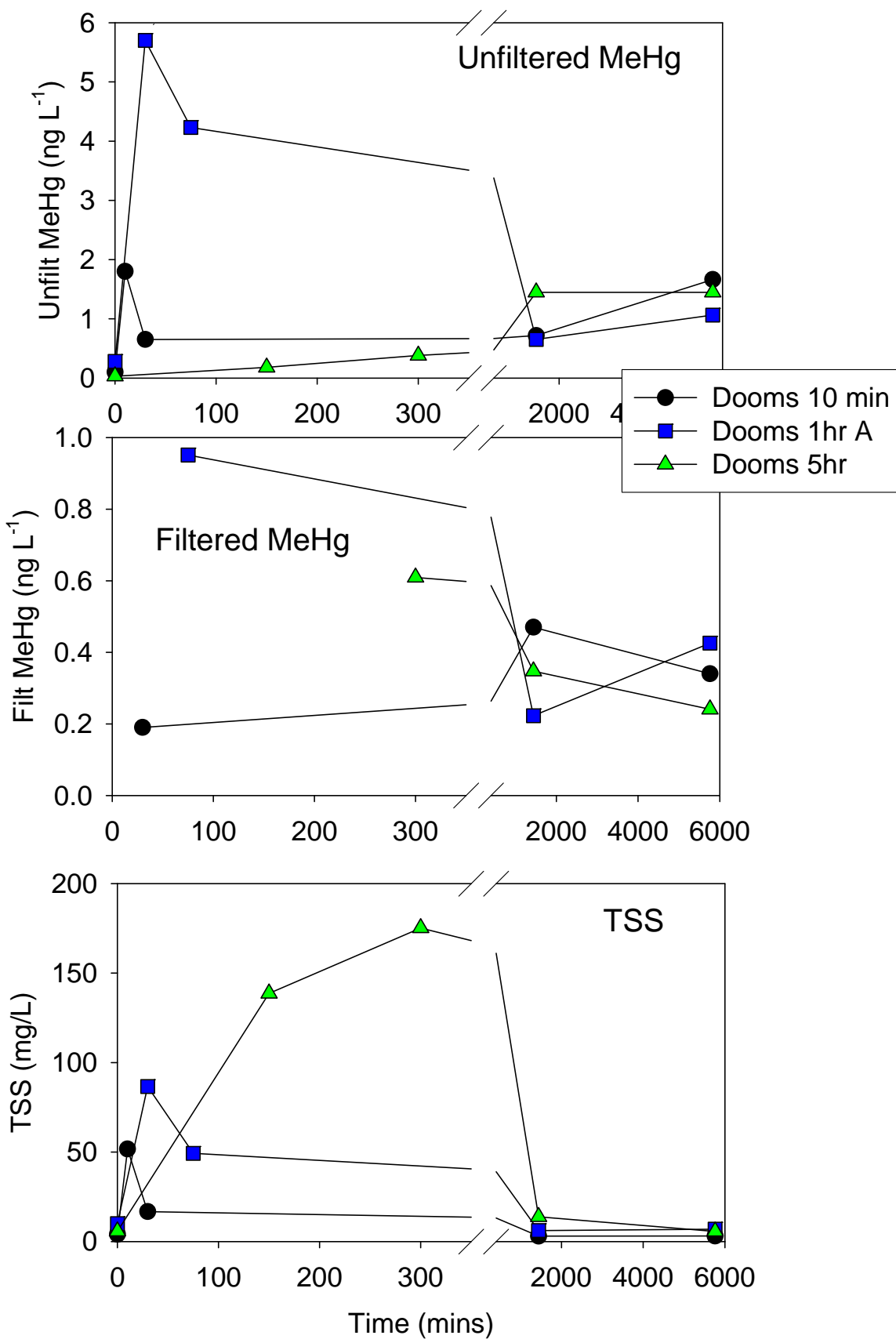


Treatment	Final Diss. Hg (ng/L)	Soil Hg ($\mu\text{g/g}$)
Dooms		12.4 ± 0.06
1hr A	1.88	
1hr B	1.35	
1hr +DOC	2.95	
10 min	1.74	
5 hr	4.24	
Low Soil		4.2 ± 0.08
1hr A	10.9	
1hr B	0.41	
1hr +DOC	33.3	
GS		0.07 ± 0.16
1 hr	0.51	
1hr +DOC	0.87	
High Soil	28.7	10.1 ± 0.1
Blank	0.1-0.2	-
Fill Water	1.3	

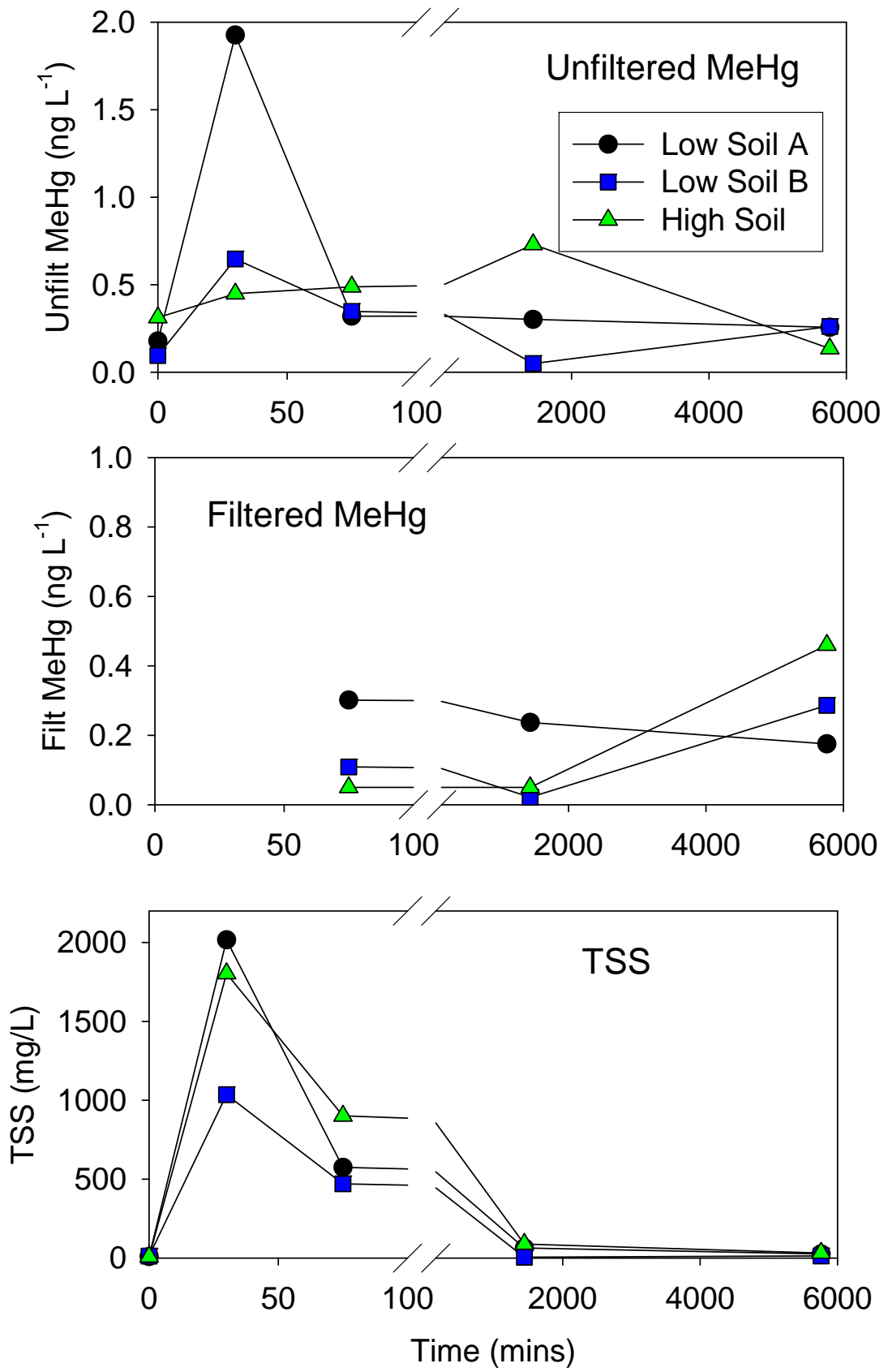
Comparison of particulate concentrations for suspended matter at the end of the experiments with sediment concentrations

Treatment	TSS Hg	Sed Hg
Dooms 1hr A	5.8	17.5
Dooms 1 hr B	8.7	12.5
Dooms 10min	2.2	10.1
Dooms 5 hr	29.4	9.8
Dooms 1+DOC	1.4	12.2
Low Soil 1 hr A	10.1	1.3
Low Soil 1 hr B	12.7	6.7
Low Soil 1 + DOC	7.0	4.7
High Soil 1 hr	28.6	5.3
GS 1 hr	6.0	0.11
GS 1 + DOC	4.0	0.03

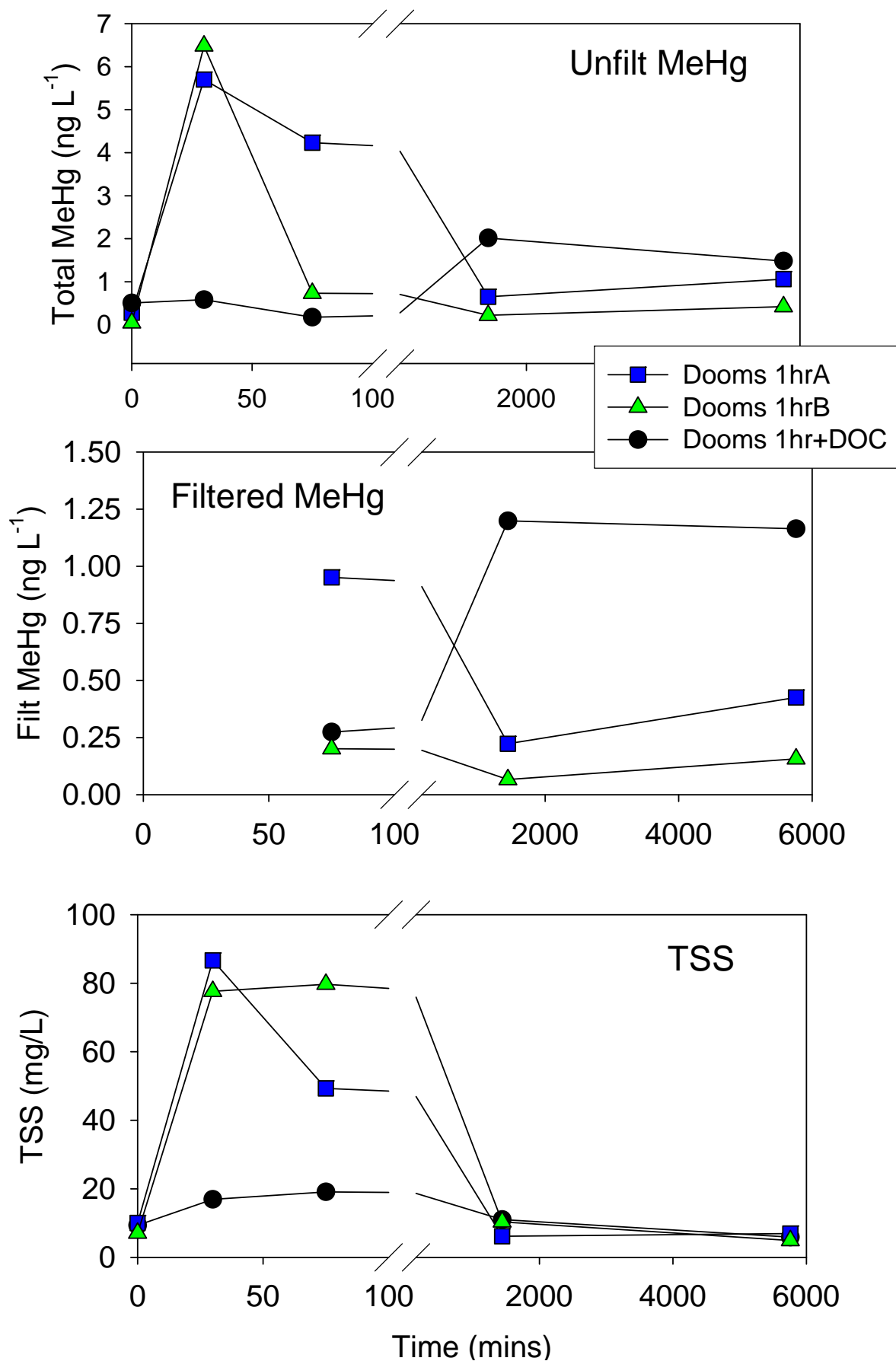
Impact of time of resuspension on water column MeHg



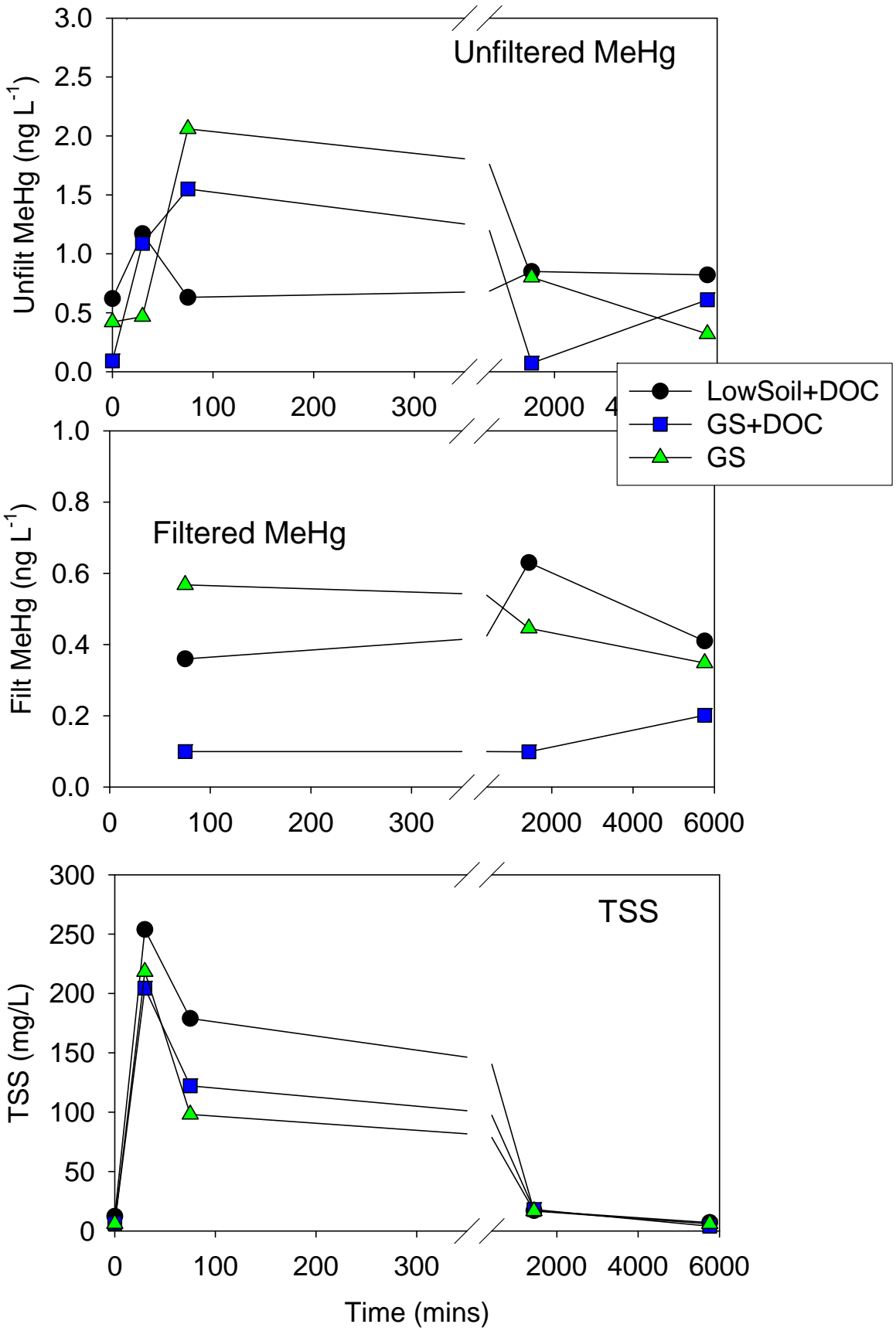
MeHg in suspended Soil particles



MeHg in water column after suspension of Doom's sediment



Impact of DOC addition on MeHg in water column

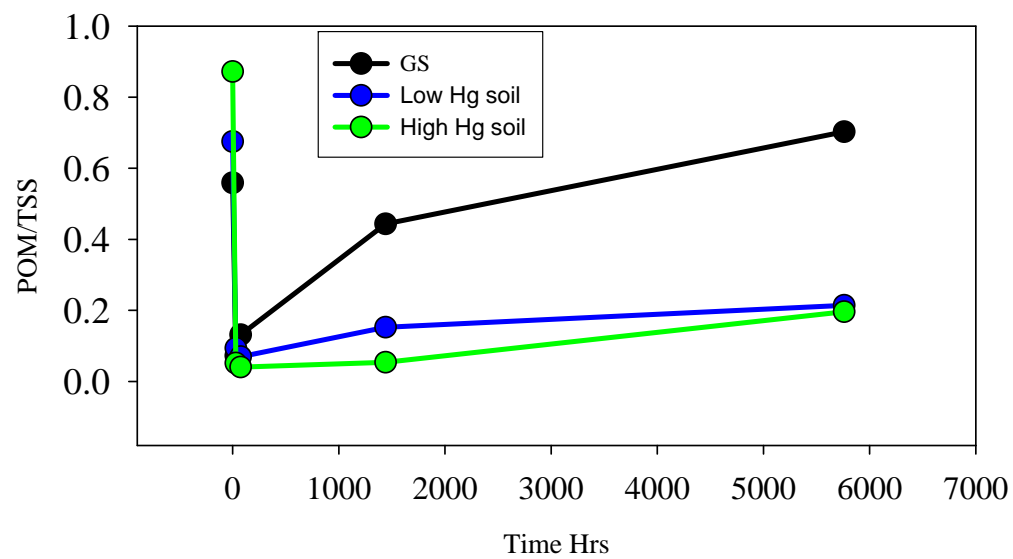
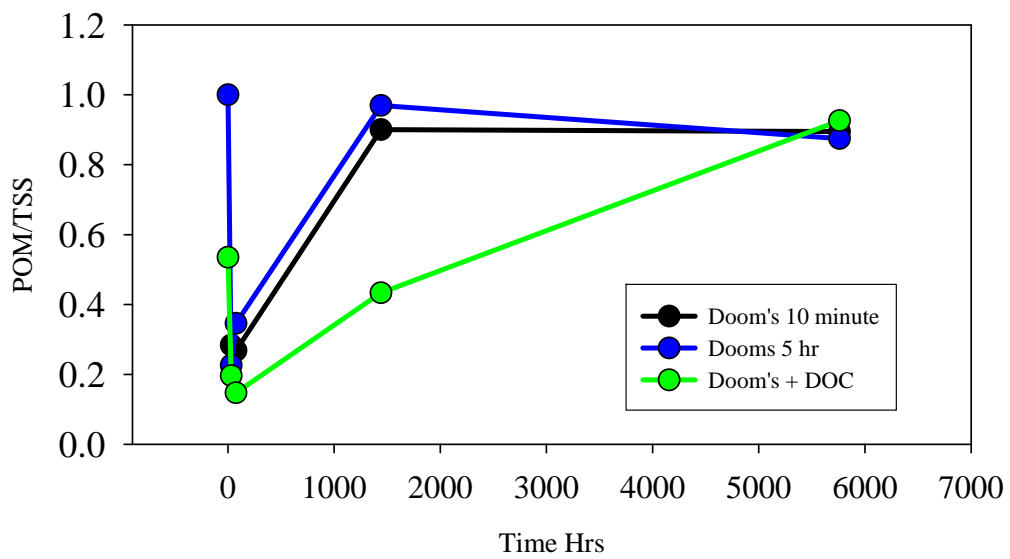
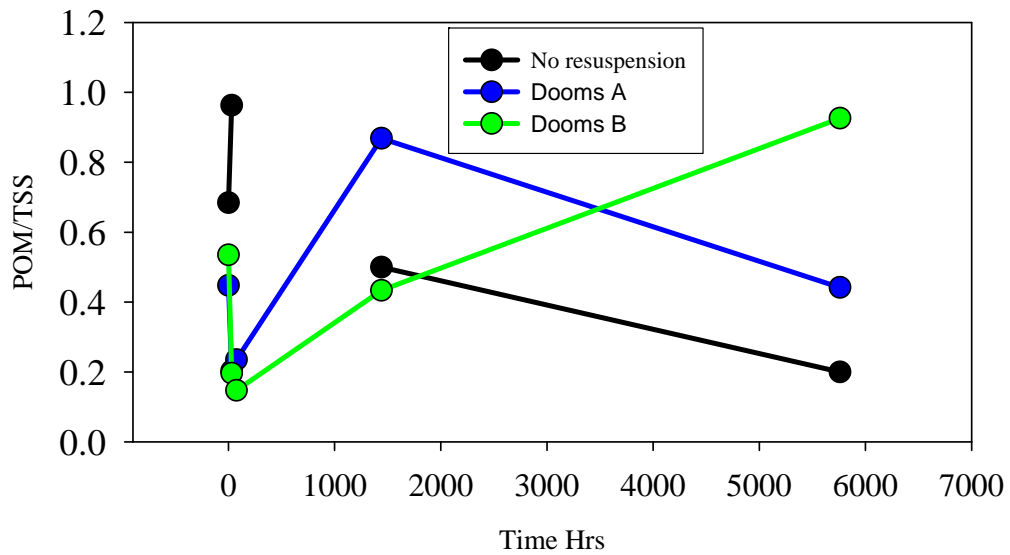


Treatment	Final Diss. MeHg (ng/L)	Soil MeHg (ng/g)
Dooms		29.3 ± 11.0
1hr A	0.43	
1hr B	0.16	
1hr +DOC	1.16	
10 min	0.34	
5 hr	0.24	
Low Soil		15.5 ± 2.5
1hr A	0.18	
1hr B	0.29	
1hr +DOC	0.41	
GS		3.25 ± 1.2
1 hr	0.35	
1hr +DOC	0.20	
High Soil	0.46	1.9
Blank	0.14	-

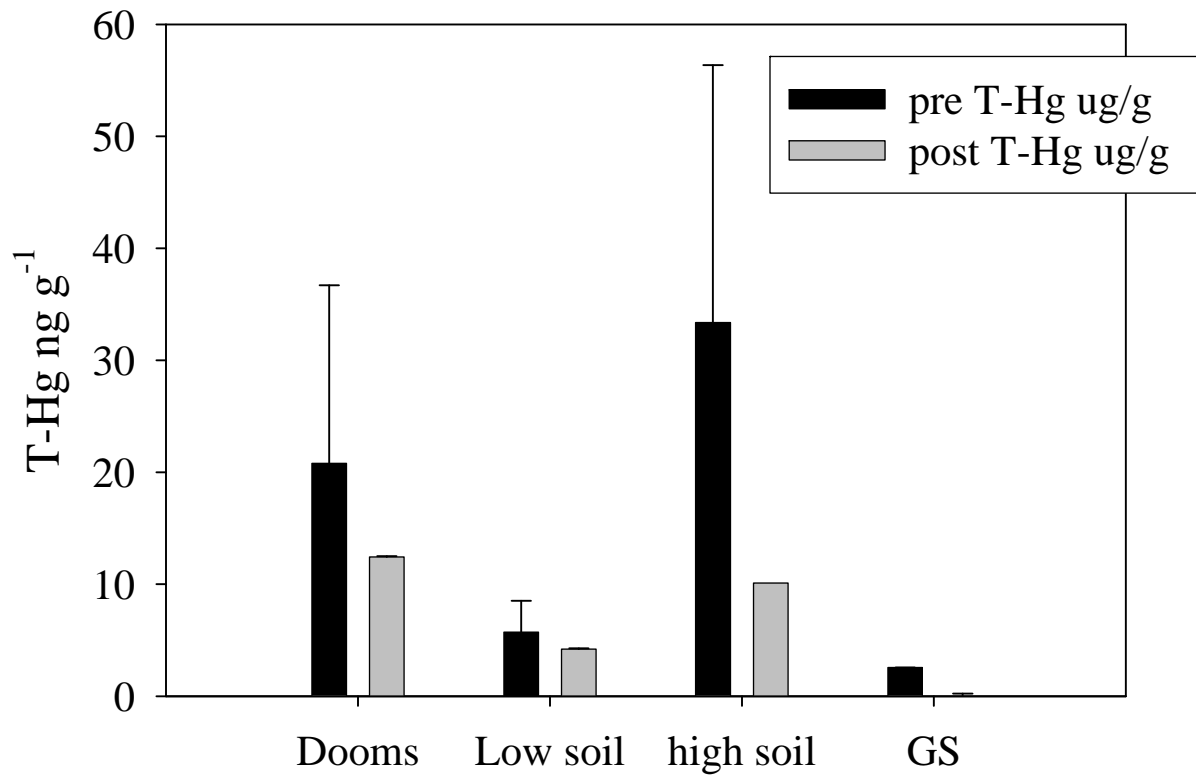
Summary

1. Concentrations of total MeHg track those of TSS in the water column overall, and there is no indication of a significant release of MeHg upon resuspension
2. After 96 hours, dissolved MeHg concentrations were 0.5 ng/L or less for most treatments, but were somewhat higher in two of the three resuspended systems where DOC was added. Overall, values at the end of the experiment were lower or similar to that found in river water
3. Resuspension time did not appear to have a large impact on the results.

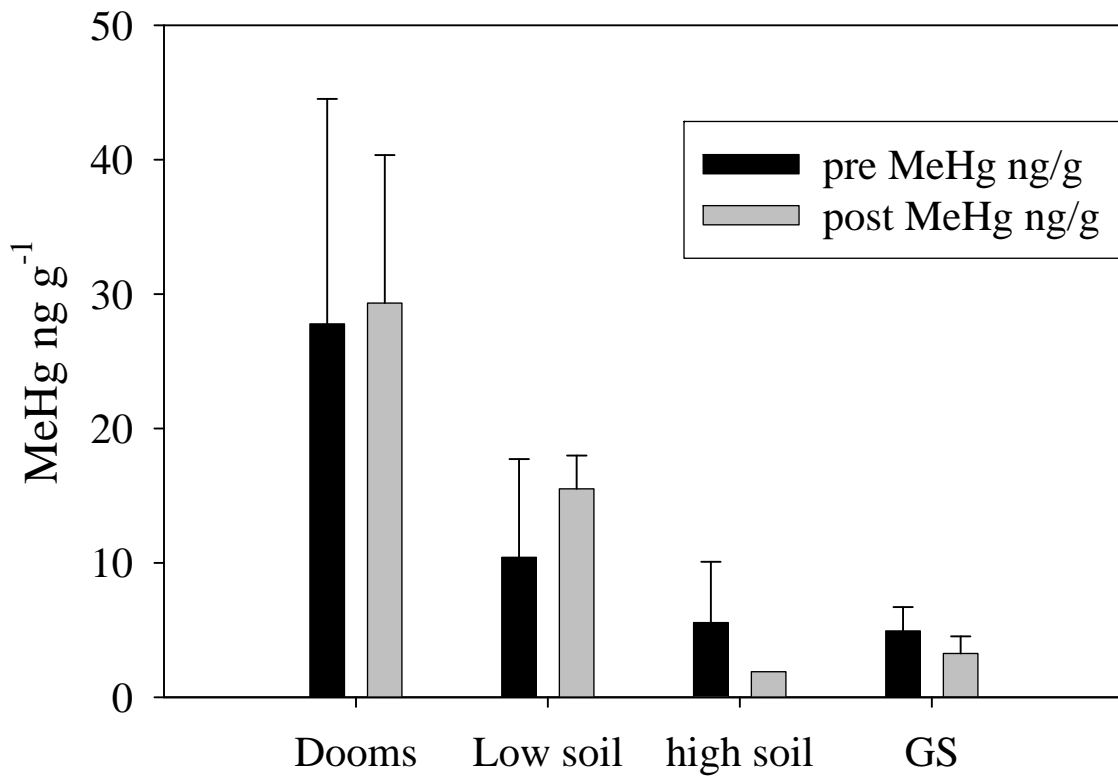
Particle organic matter content



T-Hg in sediment



MeHg in sediment



Final Methylmercury Sediment Summary

Site	Sulfate mg L ⁻¹	Nitrate mg L ⁻¹	OM %
Dooms	4.7 (0.23)	2.0 (1.1)	6.0 (0.7)
Low Soil	4.1 (0.3)	3.1 (0.7)	5.3 (0.2)
High Soil	3.5	2.5	2.8
GS	1.1 (0.3)	4.0 (0.8)	10.1 (0.2)

Site	Plain	+DOC
Dooms	33.0	14.6
Low Soil	14.7	17
GS	2.4	4.1

Other Things....



South River Dam Sampling

Site	T-Hg ng/g	MeHg ng/g	MeHg %	OM %
UP 28	996	6.1	0.6	7.4
UP 29	1232	25.0	2.0	7.6
UP 30		14.6		9.2
DN 31		12.0		8.8
DN 32	1093	15.7	1.4	9.4
DN 33	1175	23.8	2.0	9.7
DN 34	1587	39.8	2.5	9.4
DN35	1108	9.9	0.9	9.3
GS	222	3.6	1.6	8.9

And finally.....

Water Sample Analysis	
MeHg (ng/L)	
Filtered	0.63
Unfiltered	0.58

Concentrations of Mercury and Methylmercury in Sediment Samples from the River

Dupont Site	T-Hg ug/g	MeHg ng/g	%MeHg	MeHg Av	MeHg Stdev
Lo-Hg-001	7.31	13.00	0.18		
Lo-Hg-085	7.38	16.08	0.22		
Lo-Hg-005	2.46	2.16	0.09	10.41	7.3123
HiHg-P11-01	57.29	10.36	0.02		
HiHg-P11-01	31.36	4.90	0.02		
HiHg-P11-01	11.44	1.39	0.01	5.55	4.5238
Doom's 01	5.68	16.00	0.28		
Doom's 02	37.38	46.94	0.13		
Doom's 03	19.34	20.41	0.11	27.78	16.734
GS-01	2.56	6.19	0.24		
GS-02	2.55	3.67	0.14	4.93	
Riv-1	4.02	4.90	0.12		
Riv-2	5.01	19.67	0.39	12.28	
Levee Erode	8.87	2.07	0.02	0.02	

1. Doom's had the highest average MeHg concentrations and a relatively high %MeHg, even though the total Hg was relatively high
 2. The soils had both a low MeHg concentration and the high Hg soil had a very low %MeHg.
- Note: These analysis were done to parameterize the sediments. Samples were very in homogeneous.