The Effects of Forest Fire on the Release of Mercury from Soil

REU student: Chelsea Ottenfeld
Mentor: Professor Joe Ryan
Ph.D. student: Jack Webster

Overview

• Background information
• Analysis Methods
• Results
• Conclusion/Further work
• Questions

Background

Mercury Cycle

- Mercury poses human and ecological health risks
- Methylmercury (MeHg) is a neurotoxin
- Fish absorb by bioaccumulation and are the main exposure of mercury to humans
- It can be accumulated to toxic levels in humans

Background

Mercury in the West

• Mercury is a global contaminant but also a local contaminant.
• Coal fired-power plants in the United States release about 20-50 kg y⁻¹ of mercury per plant (EPA, 1997)

• Mesa Verde: 416 ng/L
• We are interested in the distribution of mercury in watersheds

Background

Mercury is the most prevalent contaminant
8% of fish advisories increasing yearly

Background

• Study the release of mercury in forest fire
• In aquatic environments mercury can be methylated and is accumulated in fish which humans then consume
• Vallecito Reservoir
• We think one problem for mercury transport is forest fire
• Arid region= Increasing fire
**Background**

- The strong association between mercury and organic matter is reduced sulfur. Forest fire may be oxidizing sulfur and reducing bond strength.

- **Oxidation = ?**

- **Home of the ancient ruins of the Anasazi Indians**
- **Mesa Verde has 600 cliff dwellings**
- **Covers 52,000 acres**
- **World Heritage Site**

**Methods**

**Results**
Results

• In unburned soils the Hg concentrations are much higher with the average being around 60 ng/g.
• In unburned soils the concentrations steadily decrease with depth.
• In burned soils the concentrations stay around 25 ng/g.
• Why do the unburned soils decrease while the burned stay the same?

Soil-Mercury Concentration in Unburned Soils as a Function of Depth

Soil-Mercury Concentration in Burned Soils as a Function of Depth

Conclusions

• There is a strong correlation between Organic Matter and Hg concentrations.
• Areas that are burned have lower mercury concentrations and unburned areas have higher concentrations.
• Preliminary release experiments show that high burn areas have the highest percent release.
Implications

• Mercury is staying in the soils and being transported to surface waters

• When weak binding occurs, more mercury is likely to dissociate and become more available for uptake

Future Work

• Continue release experiments to determine if greater mercury release is caused by greater fire intensity.
• XANES (X-ray absorption near edge spectroscopy) to determine if sulfur oxidation is responsible for weaker Hg-OM binding.
• Determine what the Hg-OM binding constants are in fire affected soils.

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References


QUESTIONS?