Transport of PAHs and Pesticides in Urban Watersheds

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Background

The process of urbanization is a well-known contributor to pollution in the environment. This human activity has a major influence on the level of contaminants found in nearby watersheds. The Greater Toronto Area is Canada’s largest urbanizing area, situated in the Lake Ontario basin with six different river watersheds running through it. This study took place in Mimico Creek and Rouge River, as they provide a large contrast to other areas in the nearby watersheds. Toronto Area is Canada’s largest urbanizing area, situated in the Ontario Basin. The Mimico Creek is the most developed watershed with a population of 400,000 people, whereas Rouge River is a mainly rural watershed with urban expansion slowly developing.

What are PAHs- Polycyclic Aromatic Hydrocarbons?

- Semi-volatile persistent organic pollutants with an anthropogenic origin (incomplete combustion of organic compounds)
- Can be harmful to living organisms; mutagenic, carcinogenic and toxic
- Can transport in atmosphere before being deposited in soil, vegetation and water bodies
- Hydrophobic so is mainly transported in suspended sediments in rivers

Methodology

Samples were collected in 3 mm, black, double-layered polyethylene bags at 3 points of water taken during a single rainfall event in November.

Concentrated samples were transferred to Gas Chromatography tubes and spiked with internal standard. The samples were analyzed for 15 Polycyclic Aromatic Hydrocarbons, and 5 pesticides using Gas Chromatographic Mass Spectrometry. Peak in suspended sediment concentration is found during the periods of increasing river flow rate. Much higher concentrations of PAHs and pesticides in more urbanized watershed- Mimico creek can be inferred that anthropogenic sources are contributing to contamination of watersheds.

Results

Concentrations of PAHs found in particulate phase in Mimico (left) and Rouge (right) sampling sites

NAP= napthalene, ACY= acenaphthylene, ACE= acenaphthene, FLU= fluorene, PHE= phenanthrene, ANT= anthracene, PYR= pyrene, FLA= fluoranthene, CHR= chrysene, BaA= benzo(a)anthracene, BaP= benzo(a)pyrene

SS= Suspended Sediment

Discussion

- Much higher concentrations of PAHs and pesticides in more urbanized watershed- Mimico creek
- Can infer that anthropogenic sources are contributing to contamination of watersheds
- Common trend of higher concentration of suspended sediment correlating with higher concentration of PAHs and pesticides
- Indicates that the PAHs and pesticides are transported through watershed surface with sediment particles
- Spike in suspended sediment concentration is found during the periods of increasing river flow rate
- May have been caused by an increase in runoff which would transport the sediment particles from the surrounding surface into the water

Ongoing Work

- Analysis of March runoff samples to better understand the behavior of organic contaminants
- Analysis of March snowmelt samples to better understand the behavior of organic contaminants

Acknowledgements

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References


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What are pesticides?

- Used on lawns for cosmetic or agricultural purposes
- Banned by the Ontario government in 2009
- Used on lawns for cosmetic or agricultural purposes

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Five samples were filtered using Whatman filters in separate plastic beakers from the Mimico inlet. Whatman filters are pre-weighed, 0.45 μm filter paper that weighs 1.5 g and using a HgSateertor 2.

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References

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