The Lake Waco Wetlands: A Methane Buffer?

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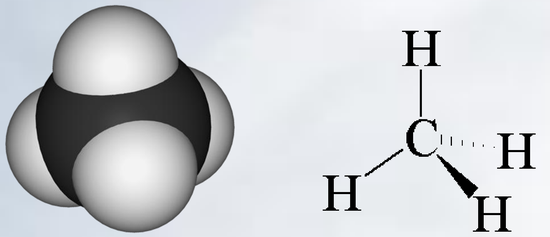
Abstract

According to the US Emission Inventory (2003), 76% of global methane production can be attributed to wetlands. Globally, wetlands span about 5.3 X 10^{12} m^2 and contain a reducing environment in which anaerobic production of methane can occur (Fung 1987). This preliminary experiment was designed to test and compare levels of methane in several locations; the water entering the Lake Waco Wetlands (North Bosque River), upon exit of the wetlands, and the levels in a geographically similar, less polluted river (Middle Bosque River). The hypothesis that the wetlands would increase the amount of methane was rejected. The results demonstrated that the Lake Waco Wetlands appear to significantly reduced the amount of methane entering from the North Bosque River. These data infer factors consuming methane in the wetlands do so at a much higher rate than the factors releasing it, thereby equilibrating the amount of methane.



Methane CH_4

Introduction

Methane, CH_4, is the second most significant greenhouse gas in the atmosphere. It is more potent than CO_2, being twenty-three times more effective at trapping heat in the atmosphere where it lasts for twelve years. Archaea bacteria known as Methanogens release methane as a by-product in environments such as wetlands. Wetlands are the largest natural source of methane on Earth, Figure 1 (AGU 2004). The objective of this preliminary experiment was to test the hypothesis that the Lake Waco Wetlands contribute to methane production.

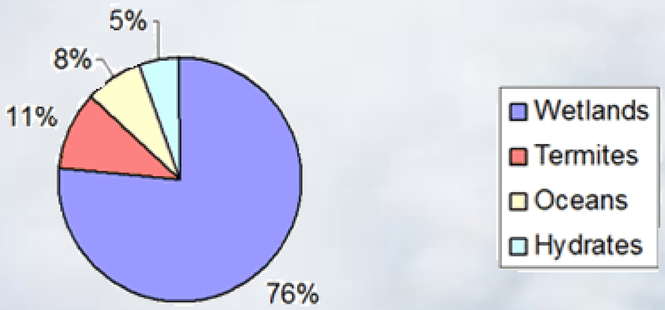


Figure 1. Natural Sources of Atmospheric Methane
Source: Prepared from data contained in IPCC,2001

Materials and Methods

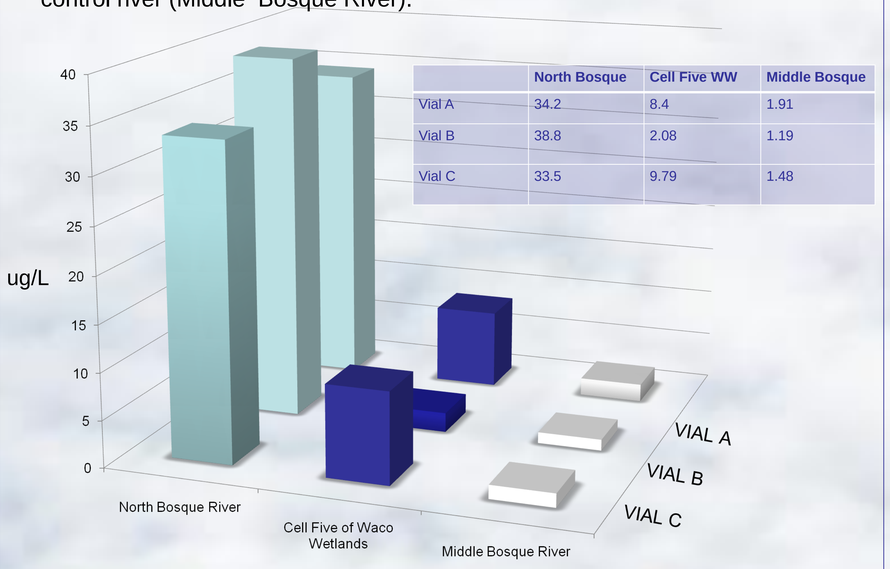
- Obtain nine 40mL VOA 1:1 HCL preserved vials
- At 12 pm - Collect a total of three aqueous samples with zero headspace from cell five of the Lake Waco Wetlands (Figure 2. Outlet) and record water temperature.
- At 12pm-Collect three aqueous samples from the Middle Bosque River with zero headspace and record water temperature. The Middle Bosque River served as a control for this comparison.
- At 12pm- Collect three aqueous samples from the North Bosque River (Figure 3) Inlet to the Waco Wetlands and record water temperature.
- The nine vials were sent to Test America, a certified lab, to test the amount of dissolved methane using the RSK 175 Testing within a five day turn around.
- Analyze Data -compare amount of dissolved methane at outlet of Wetlands to amount of dissolved methane at inlet, also note the amount in the Middle Bosque River (Control).

Figure 2. Cell 5 Lake Waco Wetlands Outlet

Figure 3. Inlet to Lake Waco Wetlands

Results

Methane levels in the Lake Waco Wetlands were not elevated as expected (Figure 4). Levels of methane in water of the North Bosque River appear to be significantly elevated in comparison to levels of methane in the control river (Middle Bosque River).



	North Bosque	Cell Five WW	Middle Bosque
Vial A	34.2	8.4	1.91
Vial B	38.8	2.08	1.19
Vial C	33.5	9.79	1.48

Figure 4. Levels of Methane From Three Water Sources

Conclusions and Discussion

The preliminary findings suggest a unique scenario in which the North Bosque River water has significantly high levels of methane. This may be explained by the fact that local dairy farmers allow manure to be deposited into the North Bosque River. The runoff supplies organic material to decomposers producing large amounts of natural gas and elevating the methane levels of the North Bosque River seventeen-fold when compared to the less polluted Middle Bosque River. The results demonstrated the Lake Waco Wetlands do not contribute to increased methane production. On the contrary, the wetlands appear to reduce the level of methane by a staggering 80%. These data provide strong evidence that the Lake Waco Wetlands may indeed have a buffering potential, in this case.

Methane is a serious greenhouse gas and it is unfortunate that human-activities are responsible for 60% of global methane emissions (IPCC, 2001c). In 2004, the City of Waco took action and brought fourteen dairy farms into court of law for polluting the water of the North Bosque River. Following the environmental lawsuit, The Broumley Dairy Farm partnered with Texas agencies and created an anaerobic digester that uses cow manure to source energy from (SECO). It is expected that when fully operational, the farm will run on energy from the manure alone and no longer depend on a power company – a biological marvel. Other dairy farms along the North Bosque River need to be pressured to do the same, not only will it reduce pollution and keep the river from which Waco obtains its drinking water cleaner, but it will reduce costs for the farms over time.

Today we have the City of Waco, the United States Army Corps of Engineers, and the United States Fish & Wildlife Service to thank for creating the Lake Waco Wetlands which naturally purify polluted North Bosque River water. By constructing this wetland they have actively helped reduce global greenhouse gases attributed to human-related activities.

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(SECO) Biomass Energy: Manure for Fuel, State Energy Conservation Office

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