Characterizing Soil Respiration rates across different Land uses in a Tropical Urban Catchment

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1. Introduction

- **Soil respiration** serves as a **proxy** for the level of **soil microbial activity**.
- It is an important factor to ascertain **the rate of soil nutrient cycling**, driven by microbial activity, which is a key indicator of **soil health** and potential **nutrient leaching**.
- However, research on soil respiration in **urban and peri-urban tropical catchments** is currently limited.

Objective

- Assess the effect of changes in **land use** and **climate** on **soil respiration** in a **tropical urban catchment**

Research Questions

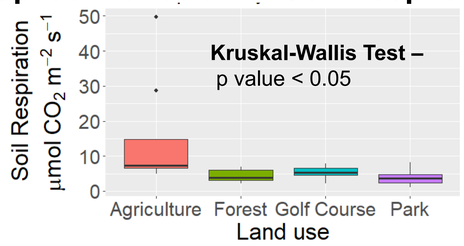
- How does soil respiration vary **spatially** across different land uses?
- How does soil respiration vary **temporally** (daily cycles)?
- To what extent do changes in soil respiration influence **soil nutrient** concentrations?

2. Methodology

- Soil Respiration was measured using the **Li Cor Soil Respiration chamber and Gas Analyzer.**
- Study was conducted in **Singapore**

3. Results & Discussion

Spatial Variation of Soil Respiration

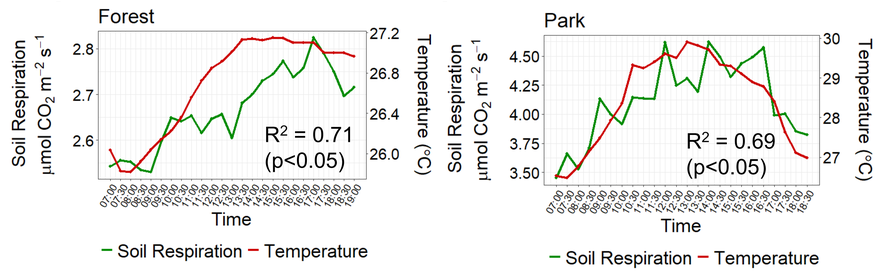


- Soil Respiration **varies with land use**, with **higher levels** of respiration seen in **managed soils** compared to natural soils

Average Soil Respiration

Parks	Forest	Agriculture	Golf course
3.8 umol $CO_2/m^2.s$	**4.4 umol $CO_2/m^2.s$**	**15.1 umol $CO_2/m^2.s$**	**5.2 umol $CO_2/m^2.s$**
(n=16)	(n=13)	(n=8)	(n=8)
Natural		Managed	

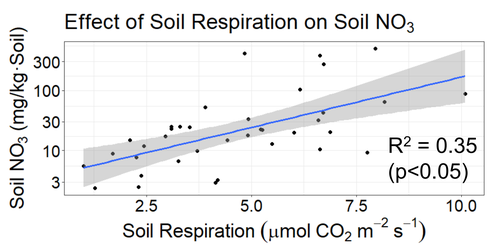
Temporal Variation of Soil Respiration



0.15 umol$CO_2/m^2.s$ (Forest) ← **1⁰C** → **0.24 umol$CO_2/m^2.s$ (Park)**

- Soil respiration is **very sensitive** to **temperature** changes
- Even small changes in soil temperature affect soil respiration.

Impact of Soil Respiration on Nutrient Cycling



- **Positive correlation** between Soil Respiration and **soil NO_3**
- Implication – **increase in soil respiration** likely indicates an **increase in soil NO_3** availability, which affects soil health and nutrient leaching potential.

4. Conclusion

Conclusion

- In conclusion, the results suggest that changes in **temperature** and **land use** likely **affects microbial activity**, which in turn **affects nutrient cycling** and the availability of soluble nutrients.

Future work

- Further research is planned to incorporate soil respiration along with other soil parameters like TOC, DOC, microbes etc, to develop models to better simulate nutrient cycling processes

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