FACULTY OF BIOSCIENCE ENGINEERING

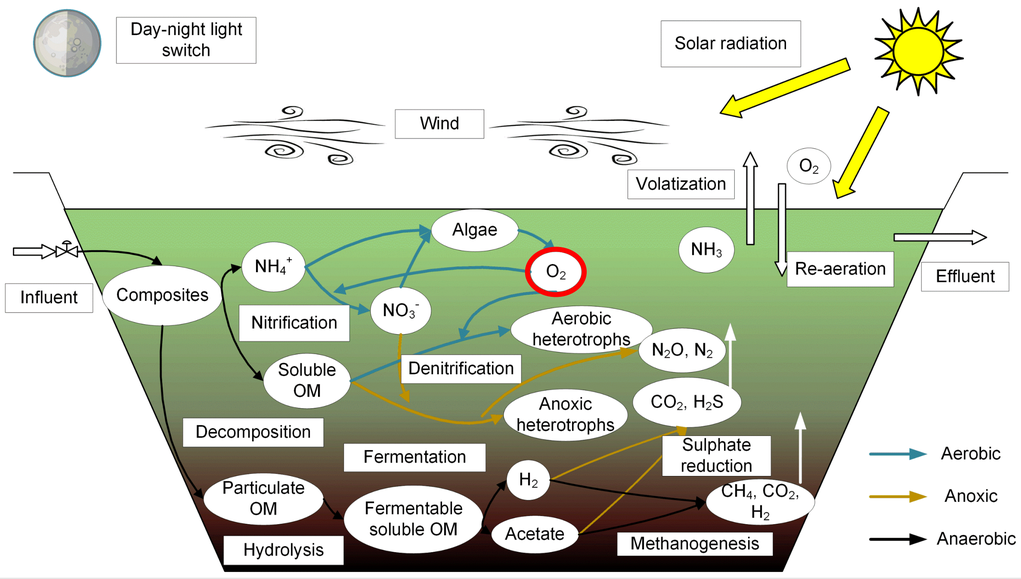
AECO RESEARCH UNIT - DEPARTMENT OF APPLIED ECOLOGY AND ENVIRONMENTAL BIOLOGY – GHENT UNIVERSITY

Long Ho, Wout Van Echelpoel, Duy Pham, Juan Espinoza-Palacios, Maria Arevalo-Durazno, Leacky Muchene, Ziv Shkedy, Andres Alvarado, Olivier Thas, Peter Goethals

SPATIOTEMPORAL EFFECTS ON OXYGEN LEVEL IN WASTE STABILIZATION POND AT HIGH ALTITUDE

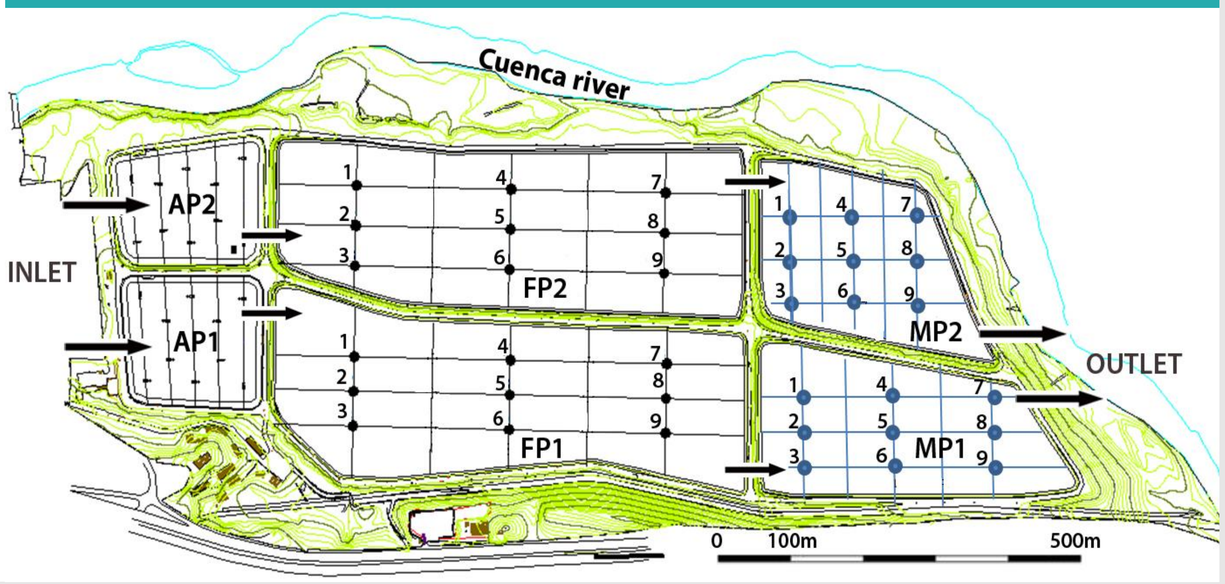
Introduction

- Simplicity, low cost, robustness and high efficiency
- Dependence on climatic conditions, especially at high altitude.



Materials and methods

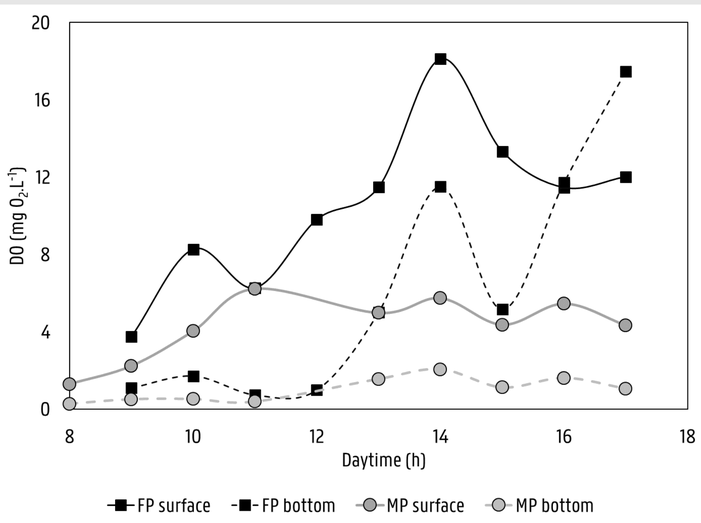
- Located at Ucubamba WSP in Cuenca, Ecuador
- Two parallel lines: an aerated pond, a facultative pond and a maturation pond

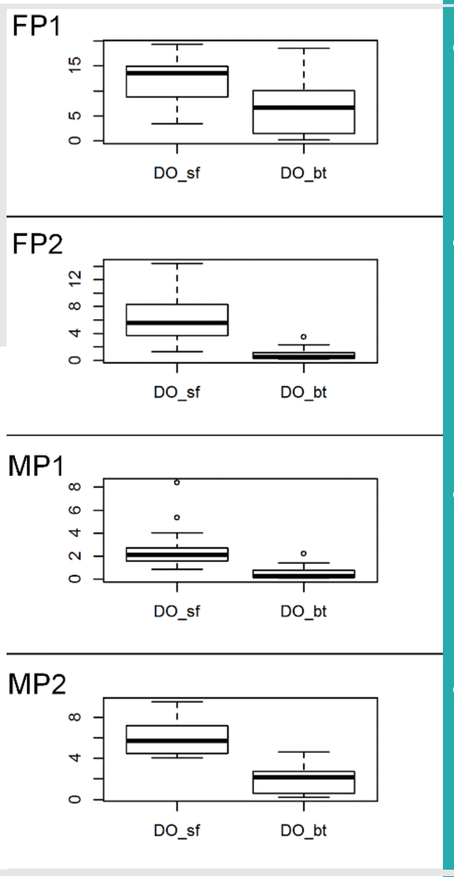


Results and discussion

Spatial and temporal variations

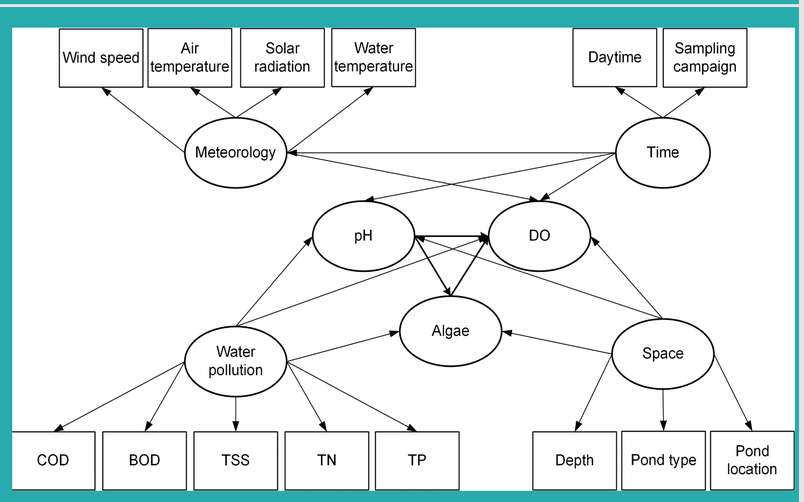
- Higher values in terms of both concentration and variation were found close to the surface
- Due to high solar radiation (≈ 1400 $W.m^{-2}$), oxygen concentration could reach up to 39 mg $O_2.L^{-1}$

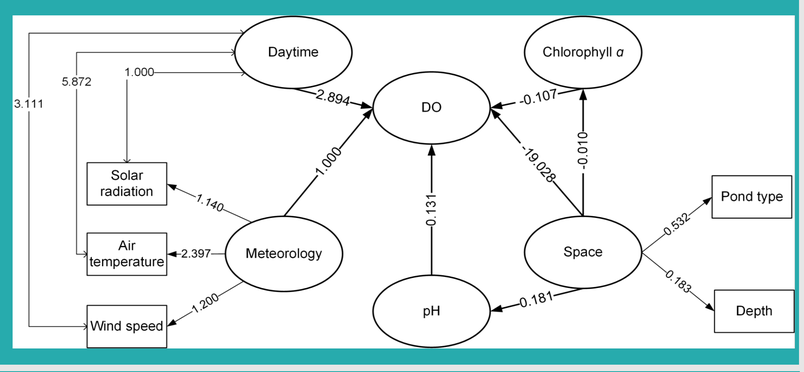




Structural equation modeling

- 4 latent variables: meteorology, water pollution, time, and space
- SEM allows for the estimation of direct and indirect effects of latent and manifest variables.
- Non-significant effect of water pollution on oxygen level
- Substantial effect of daytime and space on DO

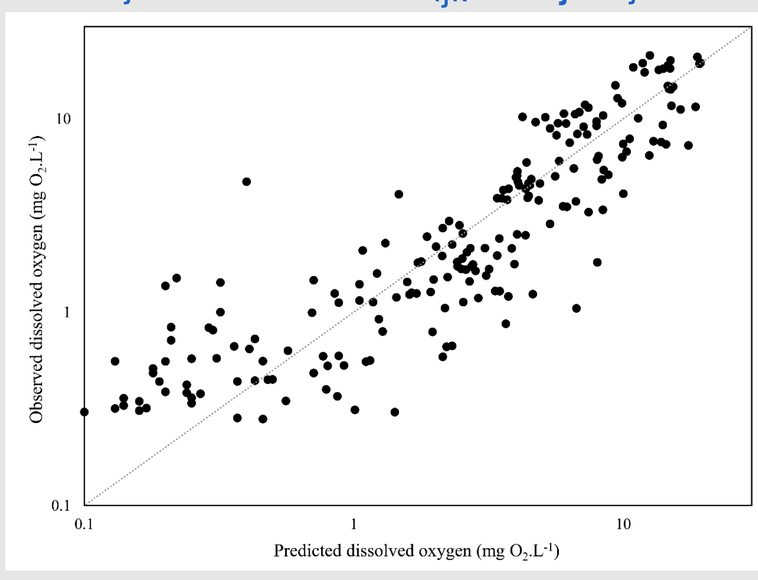




Linear mixed effect models

$$\log DO_{ijk} = -3.276 + 0.01 \times BOD_{ijk} + 0.0005 \times Chlorophyll_{ijk} + 0.174 \times Water.temp_{ijk} - 0.352 \times LnDepth_{ijk} + 0.2 \times Daytime_{ijk} - 0.0068 \times Daytime^2_{ijk} + a_k + \mathbf{a_{jk}} + \varepsilon_{ijk}$$

- Goodness-of-fit increases from 64% to 79% after including spatiotemporal effects as random effects



Conclusions

- High altitude caused lower removal efficiencies.
- DO had vertically and horizontally different patterns within and among ponds.
- SEM and mixed model proved their capacity on predicting the variation of DO, hence, are highly recommended in future pond modelling.

Long Ho

Long.TuanHo@ugent.be
www.ugent.be

Universiteit Gent
@ugent
Ghent University

GHENT UNIVERSITY