

Column experiment for New Zealand visit in June

1. Column Test Description

Oxygen nanobubbles loaded on soil particles can be purposely delivered to deep water. During the June visit to NZ, a column experiment will be carried out at the University of Waikato to test the effect of sediment anoxia remediation by using modified local soil technology.

The treatment will be compared with a blank control and each of the test is duplicated. **This will require at least 6 column systems** (i.e., transparent plexiglass cylinder, Fig.1 and 2).

2. Goals and Monitoring

➤ Goals

The **goal** of this experiment is to test the effect of nanobubble technology on remediating sediment anoxia.

- 1) Determine whether, and to what extent, oxygen nanobubble modified soils can improve anaerobic sediment condition
- 2) Determine the effect of nutrients flux at sediment-water interface after applying MLS treatment
- 3) Depending on the availability of algal water (100 L algal water is needed) and the seeds of indigenous submerged vegetation in the winter in June, we also wish to test algal bloom removal and its effect on the restoration of indigenous submerged vegetation.

➤ Monitoring

Temperature, pH, dissolved oxygen (DO), oxidation-reduction potential (ORP) in

water-sediment interface will be monitored in-situ every day using portable equipments such as YSI meter, DO meter, ORP meter. Nutrients including total N, total P, phosphate ($\text{PO}_4\text{-P}$), nitrate ($\text{NO}_3\text{-N}$), ammonium ($\text{NH}_4\text{-N}$) and Chl-a will be sampled and measured in the lab. Approximately 100 mL overlying water samples in the column experiment will be collected for the measurement at day 1, 3, 6, 10 days, and every 5 days over a period of > 3 months. The same volume of filtered lake water with the same nutrient concentration with the withdrawer sample will be added to the column to maintain the total overlying water volume constant.

Important: please confirm whether these measurements can be carried out using Hamilton group's facility and indicate which equipment need to be brought from China.

3. Item Preparation

The experiment and treatment of water/sediment/soils will be conducted by the Pan group. **Sampling and monitoring are expected to be jointly conducted by the Pan and Hamilton group or ideally independently measured by a third party. The instrument and reagents used are expected to be provided by Hamilton group.**

Please confirm whether the following items are available in Hamilton group, if not, please let us know so that we may consider to bring them from China.

Equipment: Column (Fig. 1 and Fig. 2), Vacuum Pump (Fig.3), Nitrogen and Oxygen cylinder (Fig.4)

Materials: Local soil (180 mesh sieve, 100 g), zeolite (40 mesh sieve, 1.5 kg), Chitosan (solid, 100 g), Fly ash (an industrial by-products produced by coal burning, ideally with high contents of Al^{3+} , 180 mesh sieve, 100g), Cyanobacteria bloom water (100L, with Chl-a concentration of >30 $\mu\text{g/L}$), sediment (15 L by volume)

Others: Beakers (100, 300, 500 ml), Graduated cylinder (50, 100, 500 ml), Glass rod, Cuvette (Quartz and Glass, 10mm), Pipette (1, 2, 5, 10 ml),

Polypropylene Centrifuge tubes (50 ml)

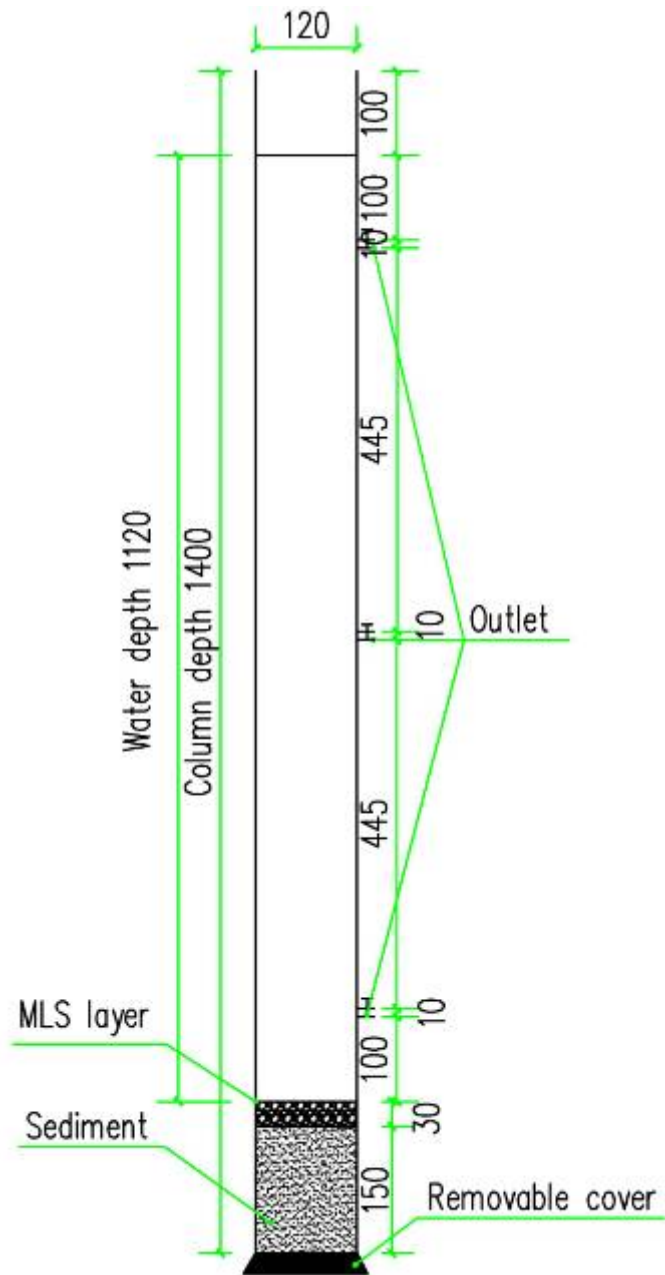


Fig. 1 Design of the column



Fig. 2 Column for the test



Fig. 3 Vacuum Pump with Negative pressure gauge



Fig. 4 Oxygen and Nitrogen cylinder with pressure gauge

4. Experiment Schedule

Date	Contents	Remarks
9 th	Depart from Beijing	may change depending on the passport and visa approval
10 th	Arrival in NZ. Discussion on the experiment.	
11 th – 13 th	prepare for experiment	
14 th	start experiment, sampling, and measurement	
15 th – 19 th	sampling and measurement	
20 th	Depart from NZ	