SCIENCES & BIOENGINEERING SCIENCES

The Research Group
Analytical, Environmental and Geo-Chemistry

has the honor to invite you to the public defense of the PhD thesis of

Mingyue Luo

to obtain the degree of Doctor of Sciences

Title of the PhD thesis:
Monitoring and investigation of biogeochemical processes of inorganic pollutants in water, sediment and soil

Promotors:
Prof. dr. Yue Gao (VUB)
Prof. dr. ir. Marc Elskens (VUB)

The defense will take place on
Tuesday, April 4, 2023 at 16h in auditorium D.2.01

The defense can also be followed through a livestream via:
https://teams.microsoft.com/l/meetup-join/19%3ameeting_NzRiMmMyNGMtMTc4YS00MTJiLTgyNDMtNDJiMDM1YTgwOWQ0%40thread.v2/0?context=%7b%22Tid%22%3a%22695b7ca8-2da8-4545-a2da-42d03784e585%22%2c%22Oid%22%3a%22b99ac6e2-2be5-479f-a790-629508100cb2%22%7d
Meeting ID: 321 887 133 731
Passcode: BWsGRH

Members of the jury

Prof. Dr. Marijke Huysmans (VUB, chair)
Prof. Dr. Willy Baeyens (VUB, secretary)
Prof. Dr. Joske Ruytinx (VUB)
Prof. Dr. Hao Zhang (Lancaster University)
Prof. Dr. Ludovic Lesven (University of Lille)

Curriculum vitae

Mingyue Luo obtained her MSc in Chemistry at Vrije Universiteit Brussel in 2018. Later the same year she started her PhD in the research group of AMGC. During her PhD, Mingyue was supported by GROW project and NewSTHEPS project, focusing on investigating the contamination of metal and their chemical speciation in water, sediment and soil responding to natural and anthropogenic processes.

She has (co-)authored 8 international peer reviewed articles of which 2 as first author (one is currently under review). Mingyue has supervised 3 BSc degree students and 3 MSc degree students.

Abstract of the PhD research

Metal contamination in water, sediment and soil is one of the most serious concerns worldwide. Despite that huge investments have been allocated for remediation, metal contamination is still alarming and poses serious threats to the receiving environmental compartments due to high ongoing anthropogenic activities. Many metals act as micro-nutrients at low level, however, they can become toxic once rising to higher concentrations. Thus, frequent monitoring of their concentrations, chemical speciation, and bioavailability in aquatic and soil systems is necessary for a better understanding of their origin, transport and partitioning.

To build an integrated strategy for the evaluation of metal biogeochemical cycling in Belgian aquatic environments, several studies were carried out during this PhD project. The Belgian Coastal Zone (BCZ) as an anthropogenic impacted area, was selected to study element mobilization from sediment to overlying water in the pre- and post- bloom period. Intensive dredging, dumping and boat blasting activities resulted in high metal concentrations in sediments, triggering the release of metals from sediment to overlying water.

The Abeek river, receiving the outflow from the Kinrooi Aquafin water treatment station, was selected to be studied for metal contamination and to be assessed for its environmental quality status since this water will serve for future irrigation of nearby agricultural soil. The metal concentrations in this surface water do not exceed the environmental quality standard (EQS), except for Ni. However, nowadays there is no quality standard for bioavailable metal fractions, which possess the property to directly accumulate in the food chain. The nearby agricultural soil was used as a case study to investigate metal mobilization and potential risk to crops and vegetables growing there. Cadmium in this soil was found above the Flemish guideline value, which only considers total metal contents in solid soil as criteria instead of mobile or labile fractions. In this study, besides several conventional sampling and treatment methods for water, sediment and soil, a novel passive sampling technique of Diffusive Gradients in Thin-films (DGT), was applied in situ for the assessment of labile metal fractions and to unravel the bioavailability of trace metals to organisms. In addition, DGT induced flux models (DIFS) was for the first time applied in a natural soil to study how soil solid phase resupply metal labile fractions to soil porewater, which can mimic the kinetic uptake of metals by plant roots in soil.