

The Research Group

Analytical, Environmental and Geo- Chemistry

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

Kevin De Bondt

to obtain the degree of Doctor of Sciences

Title of the PhD thesis:

The forgotten connections between groundwater and urban-water management policies : Stable isotopes ($\delta^{18}O$, δD) and the Urban Hydrologic Landscapes method applied in Brussels.

Promotor:

Prof. dr. Philippe Claeys

The defense will take place on

Friday September 21 2018

in Auditorium E.0.12 at 16:00h

Vrije Universiteit Brussel, Pleinlaan 2 - 1050
Elsene, and will be followed by a reception.

Members of the jury:

Prof. dr. Marc Elskens (chairman)

Prof. dr. em. Edward Keppens (secretary)

Dr. Natacha Brion

Prof. dr. Marijke Huysmans

Dr. Fabrice Rodriguez (IFSTTAR Nantes, Fr.)

Prof. dr. Bernard Declève (LOCI-UCL)

Curriculum vitae

Kevin De Bondt graduated with a Master of Science in Geology from ULB (2005) and in 2007 carried out a MS in Natural Risk Mitigation at ULg. Between 2008 and 2016, he conducted several research projects and started his PhD research in 2011 on urban waters at the AMGC research group.

This PhD research resulted in six articles published in international peer-reviewed journals and six conference papers. In addition, Kevin developed methodologies and supervised stable isotope analyses using AMGC Picarro L2130-I instrument.

Abstract of the PhD research

Urbanization strongly modifies the natural water-cycle and affects water-bodies and water-flows. The presence of urban surfaces (roads, pavements, roofs...) alters the natural water-balance and increases run-off flow. The modification of the natural drainage system and the development of water networks create connections between man-made urban-infrastructures and natural-water bodies that make the urban-water cycle more complex to understand and difficult to manage. Today, urban-water management mainly focuses on stormwater flow-rate mitigation and drinking-water supply through the massive use of « end-of-pipe solutions » and the extension of pipe networks. This water infrastructure is not able to mitigate all the urbanization effects and the degradation of the ecological state of natural water-bodies. Clearly, urban-water management policies must be drastically re-evaluated into a more sustainable long-term vision; in particular considering the current global climate change and the constant population-growth leading to the intensification of urbanization impacts.

In this thesis, two methods are applied to study the physical environment heterogeneity and the connections between groundwater and urban-infrastructure: The « *water stable isotopes* » tracing method and the « *Urban Hydrologic Landscape* » classification. Stable isotopes are used to identify the sources of urban aquifers recharge and to localize connections between the sewers and the groundwater. Stable isotopes are demonstrated useful for sewers management, but their study also highlights the link between urban planning and urban aquifer recharge. The « *Urban Hydrologic Landscape* » method is developed to translate the physical environment heterogeneity into infiltration maps and to determine run-off flow-rate limitations at the local and regional scales. These methods are applied to Brussels as a case study. This work optimizes of Source-Control measures, improves urban planning and leads to run-off flow regulations fully adapted to the local conditions. It serves as a base for a revised, modern and sustainable urban-water management procedure capable to adapt and face the challenges of this century.