# Role of Albert Canal system in July 2021 flood: what can we learn from this?

B. (Bram) B.N. Peters[a*], H. Barneveld[a], C. Brauer[a], A. Weerts[a]
[a] *Wageningen University and Research, Hydrology and Quantitative Water Management Group, Department of Environmental Sciences, Droevendaalsesteeg 3, 6708 PB Wageningen, the Netherlands*

**Keywords —** Meuse River, flood risk management, flooding event

## Introduction

In July 2021, the Meuse catchment was impacted by a severe flood. The highest discharge of the Meuse ever was recorded at Sint Pieter, with a value of approximately 3310 $m^3/s$ (van der Veen and Agtersloot, 2021). Tributaries of the Meuse also suffered from severe floods, leading to serious damage in the entire catchment. The fact that this event happened during summer made it even more rare, as previous floods in the catchment usually occurred during winter (Tu et al., 2005). Another remarkable aspect of this flood was the situation at the Albert Canal due to the partly closed Monsin dam at the Meuse near Liège. Due to maintenance of this dam, it could not convey all the water coming from the river as only 2 out of 6 openings were fully available. Therefore, a significant part of the Meuse discharge (~700 $m^3/s$) was diverted into the Albert Canal at Monsin instead. The discharge and water levels in the canal were extraordinary, and this leads to the question how this exactly originated and what happened in the interaction between the canal and the Meuse River. An interesting question is also what would have happened in the Meuse River and the Albert Canal if the Monsin dam had functioned normally. Furthermore, the event poses the question what role the Albert canal could play in the future in alleviating flood risks in the Meuse River by diverting part of the Meuse discharge into the canal.

## Objectives

The first objective of this study was to gain a better understanding of the interaction between the Meuse River and the Albert Canal during this event. A second objective was to implement the Albert Canal system in a SOBEK3-model, which can be used to predict discharges and water levels in the Meuse River. The third objective was to investigate what the hydraulic situation on the Meuse River and the canal would have been, if the Monsin dam would have functioned normally. The fourth and final objective was to examine the potential of the canal to reduce future flood risks in the Meuse River.

## Study Area

The study area covers parts of the Belgian and the Dutch Meuse basin. The part of the Meuse River that was considered, lies roughly between the cities of Liège and Maastricht. The Albert Canal was considered from its origin at Liège up to just downstream of the first (of six) sluices in the Albert Canal at the city of Genk. The canal of Ternaaien, the Monsin canal and the sluices in these canals also played an important role during the July 2021 event, and are part of the study area. The canal Briegden-Neerharen and the Zuid-Willemsvaart are connected to the Albert Canal, but did not play a significant role during the event. Figure 1 gives an overview of the waterways considered in the study area.


*Figure 1 Overview of the hydraulic situation in the study area*

## Research approach

In order to gain a better understanding of the interaction between the Meuse River and Albert Canal system during the event, observed water

* Corresponding author
*Email address:* bram1.peters@wur.nl (Bram Peters)

level and discharge data were obtained for both waterways. The observed discharge data at Eijsden were corrected because of the so-called backwater effect at this location, caused by the flow entering the Meuse River from canal Ternaaien. The timing of peak discharges and water levels were compared for several locations in order to gain insight in how the flood wave propagated through the system during the event. A special point of interest was the amount of water conveyed through the canal of Ternaaien. This discharge was estimated by comparing measured discharges at different locations on the Albert Canal. After this first analysis, the SOBEK3-model was used to simulate the event. In order to do this, the model was extended, as in the original model the Albert Canal system was included only through a boundary condition. The Albert Canal was therefore included up to just downstream of sluice Genk. The canal Ternaaien and the canal Monsin were important during this event, and were schematized in the model as well. Cross-sections for the canals were obtained from a previous modelling study of the canal system by Nossent et al (2016). The canal Briegden-Neerharen was included in the model through a boundary condition on the Albert Canal. The calibration and validation of the extended model was performed based on the July 2021 event. The validated model was used to investigate what the situation would have been if the Monsin dam had functioned normally. The final step of this study was to perform a scenario analysis. Here, model runs were performed for different peak discharges with varying recurrence times. The goal of this scenario analysis is to investigate how water levels and discharge on the Meuse could be lowered by diverting part of the discharge to the Albert Canal. Model runs where flow is conveyed to the Albert Canal were compared with model runs where all water flows through the Meuse River (normal situation). The comparison between these results gives an indication on the potential of the Albert Canal to reduce flood risks in the Meuse River.

## Results

This study is part of an ongoing master thesis study. Therefore, not all results are available yet, such as the implementation of the Albert Canal and the scenario analysis. First preliminary results are shown in figure 2, providing observed and simulated water levels at the entrance of the Albert canal near Monsin. This figure shows that the developed model is capable of simulating water levels at this location well. The general pattern is followed closely by the model, and the error is relatively small, especially after the flood.

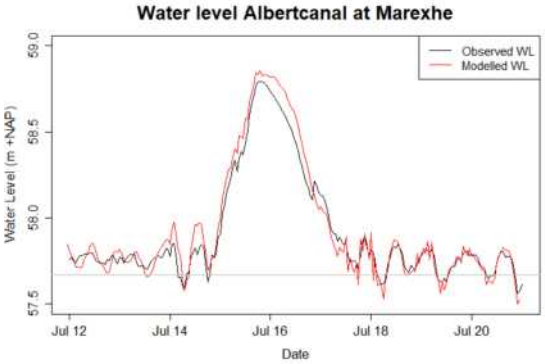


*Figure 2 Modelled water levels compared to observed*

The Nash-Sutcliffe-Efficiency (NSE) was also calculated for this model run. This NSE was found to be 0.939.

## Ongoing research

As mentioned, the research in this study has not been completed yet. Currently, the calibration and validation of the model is still taking place. It is expected that this will be ready soon. The next step will be to simulate the situation in the study area that would have occurred if the Monsin dam was operating normally. This step will be followed by the scenario analysis, for which different scenarios will be examined regarding future peak discharges. It is expected that the work will be finished prior to the NCR-meeting.

## References

Nossent, J. Pereira, F. Verwaest, T. and Mostaert. F. Vereenvoudigd 1D-model Blauwe Kei. Technical report, 2016

Tu, M. J. Hall, P. J. de Laat, and M. J. de Wit. Extreme floods in the Meuse river over the past century: aggravated by land-use changes? Physics and Chemistry of the Earth, Parts A/B/C, 30(4-5):267–276, 2005. doi: 10.1016/j.pce.2004.10.001.

van der Veen, R., & Agtersloot, R. C. (2021, December). *Topafvoeren hoogwater Maas juli 2021*.