THE INFLUENCE OF LATERAL INFLOW ON THE WATER LEVEL IN THE IJSSEL

The flood in the Meuse in 2021 in the Netherlands was not accurately predicted because of the ignorance of lateral inflow in the forecasting of the water level. The IJssel is a branch of the River Rhine and receives lateral inflow from the Oude IJssel and Twentekanaal. Researching the influence of lateral inflow in the IJssel can help to determine if it should be considered in forecasting water levels in the IJssel. Therefore, the aim of this research is to analyse the influence of lateral inflow on the water level and shape of the discharge wave in the IJssel.

Discharge waves in the Rhine, Oude IJssel and Twentekanaal from the past 30 years were analysed based on their peak discharge, duration and shape. The timing of lateral inflow was changed such that they enter the IJssel on the peak discharge in the IJssel, referred to as the reference timing. The effect of the change in timing was analysed on the maximum water level in the IJssel. The influence of lateral inflow on the shapes of discharge waves in the IJssel was analysed for shapes with different skewness and width.

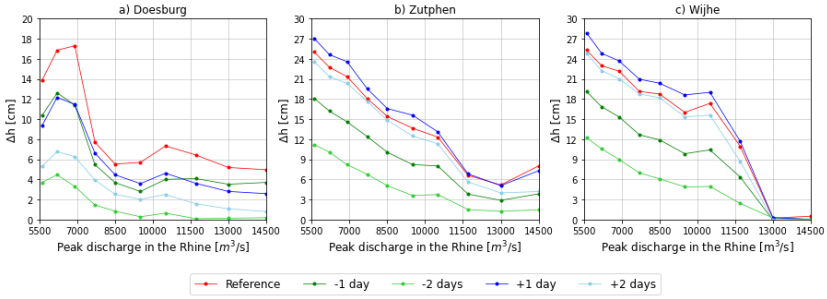

Figure 1 Change in maximum water level in the IJssel at a) Doesburg (downstream of inflow Oude IJssel), b) Zutphen (downstream of inflow Twentekanaal) and c) Wijhe (downstream of Zutphen) as a result of the reference timing and 1 and 2 days earlier and later than the reference timing.

Discharge wave analysis showed that the highest and longest discharge waves in the Rhine occurred during high water season, while the discharge waves in the Oude IJssel and Twentekanaal had also high peak discharges during low water season. The changed timing showed that the reference timing caused a maximum increase in water level at Doesburg (+17cm) and one day later than the reference timing at Zutphen and Wijhe (+27 cm). The increase in water level depends on the amount of lateral inflow, the peak discharge coming from the Rhine and the river profile. The maximum difference in water level caused by a change in shape was ± 4 cm.

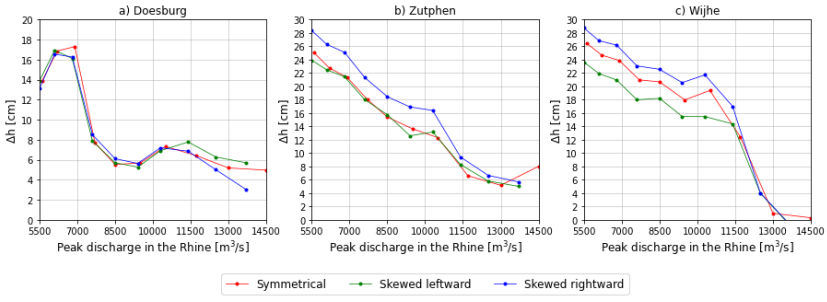

Figure 2 Change in maximum water level in the IJssel at a) Doesburg, b) Zutphen and c) Wijhe as a result of the high lateral inflow for various shapes of discharge waves in the Rhine at Dornick.

Overall, the timing of lateral inflow resulted in a higher increase in maximum water level than the change in the shape of the discharge wave in the IJssel. At peak discharges lower than 7000 m³/s in the Rhine, lateral inflow has the most impact. At these discharges lateral inflow can make a difference for navigation and floodplain inundation. The influence of lateral inflow changes along the IJssel due to the different river profiles. It can be concluded that lateral inflow from the Oude IJssel and Twentekanaal can increase the water level in the IJssel, but the amount of increase depends on the timing, location along the IJssel and the discharge wave from the Rhine.

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