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Long-term impacts of hydropower plants on the sedimentology and morphology of the Warche riverbed (Belgium)

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Significant hydrological and morphological changes occur with the construction of hydropower plants. The main modifications are related to changes in the hydrological regime and disturbances of the sediment continuity.

This study is based on the Warche River in the northern Ardennes (Belgium), on a 7 km stretch downstream of the Bütgenbach dam built in 1932. During the winter months, the hydroelectric power plants release a flow of 10m³/s almost every day, which corresponds to the morphogenic flow (0.6 bankfull discharge).

A study carried out in the 1990s (Assani and Petit, 1997) showed that, following the construction of the Bütgenbach dam, a general incision of the entire 7 km stretch took place in about 30 years, followed by a doubling of the channel width. Other changes such as a reduction in the number of riffles and pools, an increase in the number of gravel banks and islands and an increase in rock outcrops in the channel have also taken place.

In our study, the question is to quantify the rate of propagation of this incision. For this purpose, RFID tags implanted in pebbles were used. As the morphogenic discharge is reached almost daily, surveys were conducted directly in the days following the deployment of the PIT tags. In a second step, more spaced surveys were also carried out according to the hydrological events.

A second part of our study consists of analysing the morphological evolution since the 1990s by comparing past surveys with the topographic data of 2022. Thanks to these data, we can observe whether a new morphological equilibrium has been reached or whether the canal continues to widen.