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Correspondence

River Meuse suspended sediment yield: a new estimate and past estimates revisited by P.J. Ward

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The study of P.J. Ward raises the problematic issue of comparing the suspended sediment load of the River Meuse in 1883 (Spring and Prost), in the 1980s (Close et al., 1982; Lemin et al., 1987) at Liège and with that of the period 1995-2005 at Eijsden.

P.J. Ward disagrees with the conclusions of the above-mentioned authors, in large part because he finds no adequate explanation for the increase in load during the past century. He argues that there has been no climatic change, no increase in rainfall intensity, and no soil utilization changes that can explain such variations in suspended sediment yield. He concludes that the changes are without significance because the data reflect either inter-annual variability or differences in methodologies.

Curiously, P.J. Ward does not consider the explanation provided by Lemin et al. (1987) who suggest variations in suspended sediment load in the Meuse between 1883 and 1980 would have resulted from the canalization of the Meuse along its entire reach between Namur and Liège. The text of our paper (Lemin et al., 1987, 51) is as follows:

"Actually, the canalized river between Namur and Liège did not overflow and evacuated the entire load that arrived to it.

A short calculation, based on the increase in suspended sediment transport reported by Close-Lecocq et al. (1982) and an estimate of the importance of sedimentation on the alluvial plain of the Meuse supplied by J. Henrottay (1973), demonstrate that this factor is, without doubt, highly relevant. The surface of the alluvial plain between Namur and Liège is estimated to be approximately 45 km^2. From 1883 until today, the suspended load at Liège has about tripled according to the data of Close-Lecocq et al. (1982); it is approximately 388,000 tonnes per year (an average calculated for load variations between 1958 and 1977). Therefore, the increase in suspended load derived from the surface of the alluvial plain would be approximately two-thirds of 388,000, or 259,000 tonnes per year. We know little as to the rate of sedimentation on the alluvial plain during the last century. However, the study of J. Henrottay (1973), based on the distribution of iron industry artefacts, allows one to estimate the thickness of silt that was added to the bed of the river over the last 700 years. This was approximately 150 cm and corresponds to a little over 2.0 mm per year. This value is consistent with the numbers that we used in carrying out our study of sediment transport. In brief, our calculations seem to indicate that the majority of the increase in suspended sediment load of the River Meuse results directly from the dyking of the river."

Furthermore, as mentioned in the text quoted above, it was not the inter-annual variation in load that was responsible for the increase in suspended sediment that we obtained because the average value of 388,000 tonnes resulted from a calculation that multiplied the different loads observed each day of each year by the suspended load found for the same discharge. In making the calculation for the period 1958 - 1977, the inter-annual variation was strongly attenuated and cannot explain the large differences that are shown clearly on the lines in figure 2 of P.J. Ward.

The considerable difference between the results of measurements made at Liège and at Eijsden warrants attention, as emphasized by P.J. Ward. For us, some of the differences observed probably resulted not only from the dyking of the river upstream that removed flooding of the alluvial plain from Namur but also from the methods used to extract the samples that were analyzed. As regards the latter, we must assume that, in 1883, Spring and Prost infilled a bucket to its rim, and in the 1980s, Close and Lemin infilled Nansen bottles immersed in the center of the river at 3 m depth below the bridge from Fragnée to Liège. We are unaware of the sampling methods used at Eijsden and do not know whether they were made at depth or near the surface, at high flow levels or near the bank ...

References

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