Session II : Sediment transport : forms and processes

Gob F.[1], Houbrechs G.[2], Petit F.[3] : "Sedimentary dynamics and bedload transport in the Semois river (Ardennes, Belgium)".
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In order to create an instrument to aid in decision making for managers of watercourses, a multidisciplinary study was undertaken along a thirty-kilometre stretch of the river Semois, in the Ardennes (Belgium). One part of this study aimed to determine the sedimentary dynamics of the river (particularly in relation to the problem of dredging as a means of flood prevention). From the point of view of sediment management many elements were to be examined: the size of the bed load, the rate of renewal of gravel bar deposits and the contribution of sediment from tributaries. This entailed determining the critical discharge for sediment movement, the size of material transported and the importance of sedimentary stock (contribution of slopes, reshaping of alluvial fill etc.).

In the lower part of its course (the area of the basin is almost 1200 km^2), the Semois cuts into the Palaeozoic rock of the southern Ardenne region and forms long incised meanders (elongated in relation to the schistosity of the region). The narrowness of the flood plain (floodplain-channel width ratio less than 4) does not allow the formation of free meanders; the river is in almost constant contact with one of the valley sides and normally flows on the bedrock. The channel is particularly large but not very deep (width-depth ratio more than 25) and the bankfull discharge is low and therefore occurs more frequently than that of other rivers in the northern Ardenne.

The hydrographical basin of the Semois and the stretched nature of its incised meanders reduce the possibility of extension of its tributaries. Their area often covers only tens of kilometres squared. This, together with the steep-sidedness of the Semois valley, gives way to tributaries with marked slopes and high stream power, which explain the river's coarse bed load.

We were able to determine the critical discharge for sediment movement and the distance of bed load transport as well as the importance of the active band of bed load transport using classic coloured tracers (tracers made in situ or introduced into the river), which were placed in the Semois and in four of its tributaries. Metallic tracers and radio-transmitting tracers were used to complete this line of research.

It has emerged that the recent dredging carried out in the study zone, as the result of the technique used, has actually acted as a sediment trap. The topographical surveys carried out before this work was started, just after it had been started and again four years later have allowed us to assess the extent of renewal of gravel bar deposits and to evaluate the quantities of bed load transport. In this way is has been possible to test the validity of different bed load transport equations (Meyer-Peter, Schoklistch, Kalinske, Bagnold), where we have adapted the values of sediment movement initiation in relation to the results obtained using tracers.