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Variations in Sediment Yield from the Upper Doubs River Carbonate Watershed (Jura, France) since the Late-Glacial Period

Vincent Bichet, Michel Campy, and Jean-François Buoncristiani

UMR 5561 CNRS, Centre des Sciences de la Terre, Université de Bourgogne, 6 boulevard Gabriel, 21000 Dijon, France

Christian Digiovanni

Laboratoire de Géologie-Environnement, Université de Tours, Parc Grandmont, 31200 Tours, France

Michel Meybeck

URA 1367 CNRS, Laboratoire de Géologie Appliquée, Université de Paris VI, 4 place Jussieu, 75252 Paris cedex 05, France

and

Hervé Richard

UMR 9946 CNRS, Laboratoire de Chrono-Ecologie, Université de Franche-Comté, 16 route de Gray, 25030 Besançon cedex, France

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The Upper Doubs River Valley is a 910-km^2 watershed feeding into Lake Chaillexon. The lake was formed by a natural rockfall at the end of the Bølling Chronozone (around 14,250 cal yr B.P.) and since then has trapped material eroded from the watershed. The filling process and variations in sediment yield have been investigated by mechanical coring, seismic surveys, and electric soundings. The detrital sediment yield of the upstream watershed can be calculated by quantifying the sedimentary stocks for each climatic stage of the Late-Glacial period and Holocene Epoch and estimating the lake's entrapment capacity. This enables us to determine the intensity of the erosion processes in relation to climate and environmental factors. The Bølling–Allerød Interstade produced the greatest yields with mean values of 19,500 metric tons per calendar year (t/yr). The Younger Dryas Chronozone saw a sharp fall (8900 t/yr) that continued into the Preboreal (2100 t/yr). Clastic supply increased during the Boreal (4500 t/yr) before declining again in the Early Atlantic (2400 t/yr). Since then, yields have risen from 4500 t/yr in the Late Atlantic to 6800 t/yr in the Subboreal and 11,100 t/yr in the Subatlantic. Comparison of quantitative data with the qualitative analysis of the deposits and with the paleohydrologic curve of the watershed based on level fluctuations in lakes around Chaillexon shows that climate was the controlling factor of sediment yield until the Late Atlantic. From the Late Atlantic–Subboreal around 5400 cal yr B.P. (4700 ^{14}C yr B.P.) and especially from the end of the Subboreal Chronozone and during the Subatlantic Chronozone (2770 cal yr B.P./2700 ^{14}C yr B.P.–present) climatic constraints have been compounded by human activity related to forest clearing and land use. © 1999 University of Washington.

INTRODUCTION

The Upper Doubs River Valley (Fig. 1) was blocked by a natural rockfall during the second half of the Bølling Chronozone around 14,250 cal yr B.P. (Schardt, 1903; Campy *et al.*, 1994). Behind this natural dam a lake formed that was 7.5 km^2 in surface area with initial volume of 87×10^6 m^3. Entrapment of sediments eroded from the watershed in the Late-Glacial period and the Holocene Epoch gradually filled the lake, leaving today's small residual lake of 0.7 km^2 with a mean volume of 6.6×10^6 m^3 (Fig. 2).

Several features make Paleolake Chaillexon and its watershed suitable sites for investigating the quality and quantity of sedimentary fluxes and environmental constraints during postglacial times (Svendsen *et al.*, 1989; Campy *et al.*, 1994; Bossuet *et al.*, 1996; Bichet, 1997):

- The sedimentary record is unbroken from the Bølling Chronozone to the present day and covers the transition from a natural system to one affected by human activity.
- The lacustrine trap is located at the head of the basin, close to the material source areas and accordingly little alluvium is stored in the watershed.

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