

Sediment exports of French rivers to the sea

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Introduction: Sediment exports from continental areas to the seas are essential to estimate continental denudation rates. Moreover, sediment flux estimates are a key component to calculate regional budgets of sediments and associated pollutant matters. But one major limitation for these approaches is due to the lack of current, homogeneous and accurate data of sediment exports in rivers.

From the homogeneous and recent French river Quality Database, 88 French rivers reaching the sea were listed, and their sediment exports were computed based on available water discharge and sediment concentration data. An improved rating curve approach is performed to estimate mean annual sediment fluxes from such dataset. This study allows drawing a map of sediment exports from French rivers and identifying their relative contributions to the coastal areas as well as the temporal patterns of sediment flows.

Methods: Sediment fluxes were mainly assessed from the French river quality database, which is characterized by a low temporal resolution but long term measurement periods. An improved rating curve approach from daily discharge data, which allows the estimation of mean annual sediment load from infrequent sediment concentration data, was used to calculate the sediment budgets.

Results: The resulting mean annual sediment loads show that French rivers export 18.91 Mt of sediments per year to the seas. Among the 88 defined French rivers to sea, the four largest basins (Loire, Rhone, Garonne and Seine) export 15.8 Mt per year that corresponds to 83.5% of total exports. A relation between the mass of sediment exported and the size of drainage basins is traditionally evocated; however, considering these French rivers, no relation is highlighted, due to the variety of river basin typologies. Indeed, French rivers to the seas are characterised by different typologies (behaviour), with lowland rivers in temperate climate as the Seine river, and also mountainous upstream and Mediterranean downstream for the Rhone river. Sediment exports from French rivers are thus variable in space since the Rhone river exports 50%

of these sediment discharges, while it drains only 20% of the considered areas.

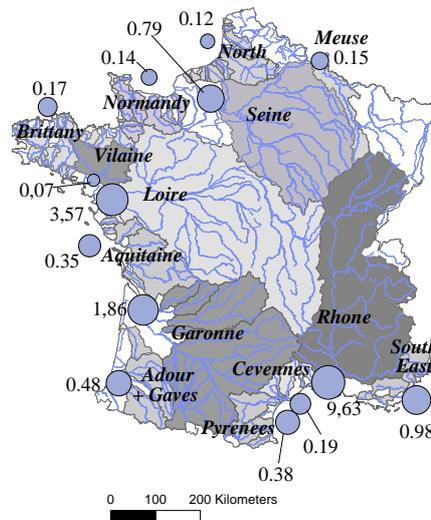


Fig. 1: Estimated suspended sediment loads from French rivers to seas (Mt/yr)

The differences between the considered river basins are also shown by temporal indicators describing duration of the exports which may be linked with the sediment production processes over drained areas.

Discussion: This study thus proposes a new database of sediment exports from French areas. Such approach may be realised in other areas in the world, in order to improve our knowledge of sediment exported to the oceans, and also to constitute a set of validation for modelling studies.