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Managment oriented analysis of sediment yield time compression

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The understanding of inter- and intra-annual variability of sediment yield is important for the land use planning and management decisions for sustainable landscapes. It is of particular importance in the regions where the annual sediment yield is often highly dependent on the occurrence of few large events which produce the majority of sediments, such as in the Mediterranean. This phenomenon is referred as time compression, and relevance of its consideration growths with the increase in magnitude and frequency of extreme events due to climate change in many other regions. So far, time compression has ben studied mainly on events datasets, providing high resolution, but (in terms of data amount, required data precision and methods), demanding analysis. In order to provide an alternative simplified approach, the monthly and yearly time compressions were evaluated in eight Mediterranean catchments (of the R-OSMed network), representing a wide range of Mediterranean landscapes. The annual sediment yield varied between 0 to ∼27100 Mg•km-2•a-1, and the monthly sediment yield between 0 to ∼11600 Mg•km-2•month-1. The catchment's sediment yield was un-equally distributed at inter- and intra-annual scale, and large differences were observed between the catchments. Two types of time compression were distinguished – (i) the inter-annual (based on annual values) and intra- annual (based on monthly values). Four different rainfall-runoff-sediment yield time compression patterns were observed: (i) no time-compression of rainfall, runoff, nor sediment yield, (ii) low time compression of rainfall and runoff, but high compression of sediment yield, (iii) low compression of rainfall and high of runoff and sediment yield, and (iv) low, medium and high compression of rainfall, runoff and sediment yield. All four patterns were present at inter-annual scale, while at intra-annual scale only the two latter were present. This implies that high sediment yields occurred in particular months, even in catchment with low or no inter-annual time compression. The analysis of seasonality of time compression showed that in most of the catchments large sediment yields were more likely to occur between October and January, while in two catchments it was in summer (June and July). The appropriate sediment yield management measure: enhancement of soil properties, (dis)connectivity measures or vegetation cover, should therefore be selected with regard to the type of inter-annual time compression, to the properties of the individual catchments, and to the magnitudes of sediment yield. To increase the effectivity and lower the costs of the applied measures, the management in the months or periods when large sediment yields are most likely to occur should be prioritized. The analysis of the monthly time compression might be used for their identification in areas where no event datasets are available.
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