Geophysical Research Abstracts
Vol. 15, EGU2013-11675, 2013
EGU General Assembly 2013
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estimating sediment loads by monitoring, physically based modelling and statistical analysis

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In this study we compare the results of a soil erosion model applied at watershed scale to the suspended sediment measured in the stream network. A sediment delivery model is applied at watershed scale; the evaluation of sediment delivery is related to a connectivity fluxes index that describes the internal linkages between runoff and sediment sources in upper parts of catchments and the receiving sinks. An analysis of the fine suspended sediment transport and storage was conducted for an human impacted intra-Apennine catchments draining into a Bilancino reservoir,Florence, Italy. The suspended sediment were collected from a section of river defined as a close systems using a time integrating suspended sediment sampling. Hillslope gross erosion was assessed by a USLE-TYPE approach. The time scales of catchment hydrologic and chemical response was evaluated using spectral analysis. By comparing the spectral power of the input sediment source and output stations each wavelength determines how strongly the catchment attenuates hydrologic and chemical signals on each timescale. The delay time distribution of the turbidity dataset, and hence of suspended sediment, were calculated using the cross correlation function. Results show that the time of particle transit ranging between 190 days to one year. The turbidity dataset at the output station has consistently lower power spectrum than the inlet station along the range of the studied wavelengths. On the other hand, the output station shows a scaling exponent α higher than the inlet station. Implying a higher persistence of the turbidity "phenomena". The fractal analysis points out that the system is not in equilibrium. The present work has demonstrated that by comparing the spectral power of the input and output stations at each wavelength for the turbidity dataset, it is possible to explain the behaviour of a basin subject to anthropogenic disturbances. Furthermore, when the results obtained from field data are compared with those from the RUSLE model, the SDR values indicate that there was sediment storage on the channel bed of the non-impacted stream, more than of the impacted one. This discrepancy may be due to an underestimation of hillslope deposition by the RUSLE model.