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# Recent changes in climate, hydrology and sediment load in the Wadi Abd, Algeria (1970–2010)

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**Abstract.** Here we investigate the changes of temperature, precipitation, river runoff and sediment transport in the Wadi Abd in northwest Algeria over a time series of 40 hydrological years (1970–2010). Temperature increased and precipitation decreased with the reduction in rainfall being relatively higher during the rainy season. A shift towards an earlier onset of first rains during summer was also found with cascading effects on hydrology (hydrological regimes, vegetation, etc.) and thus on erosion and sediment yield. During the 1980s, the flow regime shifted from perennial to intermittent with an amplification of the variations of discharge and a modification of the sediment regime with higher and more irregular suspended particulate flux. Sediment flux was shown to almost double every decade from the 1970s to the 2000s. The sediment regime shifted from two equivalent seasons of sediment yield (spring and fall) to a single major season regime. In the 2000s, autumn produced over 4 times more sediment than spring. The enhanced scatter of the $C$–$Q$ pairs denotes an increase of hysteresis phenomena in the Wadi Abd that is probably related to the change in the hydrologic regime. At the end of the period, due to irregularity of the discharge, the ability of a rating curve to derive suspended sediment concentration from river discharge was poor.

## 1 Introduction

Fluvial and estuarine suspended sediment fluxes are changing dramatically under the combined effects of anthropogenic activities and climate change. On a global scale, recent changes showed a trend towards increasing land erosion and decreasing fluxes to coastal waters (Walling and Fang, 2003; Vörösmarty et al., 2003; Wang et al., 2006). The sediment flux trapped in regulated basins with reservoirs is higher than 50 % (Vörösmarty et al., 2003). Locally, it can reach more than 60 % after the impoundment of one single dam, like on the Red River (Vinh et al., 2014), and more than 80 % on rivers with many dams (86 % on the Yellow River, Wang et al., 2007; > 95 % on the Ebro River, Durand et al., 2002). Other engineering activities (meander cutoffs, river-training structures, bank revetments, soil erosion controls) also significantly affect sediment fluxes and can participate in the shift from a transport-limited system to a supply-limited system, like on the Missouri–Mississipi River system (Meade and Moody, 2010).

Climate change, through increasing temperatures and evaporation, tends to accelerate the water cycle and modify hydrologic regimes (Bates et al., 2008). Precipitation intensities and the frequency of extreme events are projected to increase under climate change, leading to more frequent flood events of higher magnitude that will, in turn, affect patterns of erosion and deposition within river basins (Tucker and Slingerland, 1997; Pruski and Nearing, 2002; Tockner and Stanford, 2002; Coulthard et al., 2012). Recent studies focused on the impact of climate change on sediment transport (e.g. Gomez et al., 2009; Hancock, 2009; Walling, 2009; Hancock and Coulthard, 2011; Knight and Harrison, 2013; Lu et al., 2013). Syvitski (2003) showed on an example that sediment transport may increase due to the increasing discharge or decrease because of the enhanced tempera-