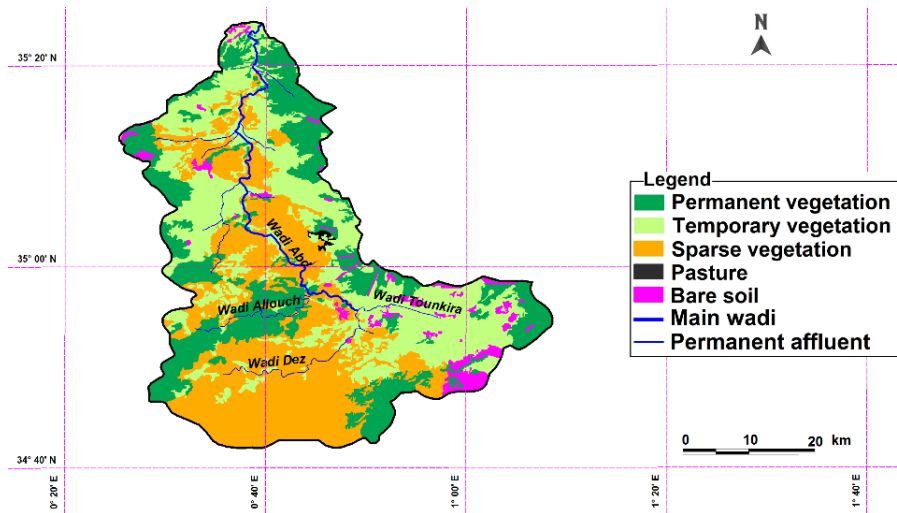


Answers to Review #2

The authors didn't present a thorough critical study of the solid matters measurements. In order to carry out a work on the impact of climate changes on this phenomenon, such a study is a much needed. What does the portion of suspended matter represent in the total sediment transport? What does the soils erosion represent in these values measured at the basin mouth? Remini Boualem showed, in Algeria, that banks ablation is a significant proportion of in the sediment transport in Algeria, what about the banks ablation in your work? In order to be able to study the relationship between Climate Change and the sediment transport. This phenomenon has connection with the extreme events which also are synonyms of climate change. Also, the vegetational cover evolution that has a predominant role in the soils erosion is not mentioned. The climate changes directly affect this evolution and the spatial and temporal evolution of sediment transport as a result. In my view, the authors should first deal with those aspects prior to undertaking the statistic study of the measurements series which were not criticized rigorously. The coefficients obtained along the paper have no physical meaning without extending the intervening phenomena that interact in the phenomenon accountable for the production of those solid matters at the mouth. All the parties: erosion, ablation... must be evaluated in order to take account only of the party which can be in connection with the change in pluviometric and hydrometric mechanisms.

Answers:

1. The solid matter measurements are questioned by the reviewer. As explained in the paper, the river discharge and suspended sediment concentration measurements were performed and provided by the ANRH, the National Agency of Algeria in charge of Hydraulic Resources. The protocol which is described in § 2.2 is the same in all rivers from Algeria and thus for all papers on water resources in Algeria (including the works by Remini Boualem or the references he referred to in his papers – one reference to Remini's paper was added in the revised version). The protocol can be questioned, as we did in the last part of our paper: in the case of an intermittent river, more frequent measurements (and continuous automatic measurements if possible) are suggested in the future.
2. "What does the soils erosion (and the bank erosion) represent in these values measured at the basin mouth?": The origin of the particles transported at the hydrologic station is unknown and can't be determined precisely from the available data set. Additional measurements would be requested. This question is beyond the scope of the paper.
3. "This phenomenon has connection with the extreme events which also are synonyms of climate change": For sure, sediment flux is mainly driven by the extreme precipitation episodes. However, we don't agree that extreme events are "synonyms" of climate change. Extreme events have occurred before climate has started to change. In this paper, the entire data set of rainfall – including the extreme events - is considered so as to provide a general view of the hydrology and sediment transport dynamics in the basin. A future study could be restricted on extreme events, but a general glance is a first mandatory step before extracting parts of the full time series of measurements.
4. "the vegetational cover evolution that has a predominant role in the soils erosion is not mentioned": The available information on the vegetation cover are given in § 2.1. An additional figure of the vegetation cover in 2009 is added in the revised version (see figure below). The question of its evolution between 1970 and 2010 goes far from the scope of the paper. This paper focuses on temporal changes of sediment dynamics in a river turning from perennial to ephemeral, which is very rarely reported in the literature (see the general comment of the reviewer #1). A future and complementary study of the vegetation cover history and its impact on the hydrologic behavior of the basin can be envisaged using historical satellite data and a numerical model (such as WEPP, EUROSEM or SWAT). A paragraph was added to address this question in the conclusion (see below "General comments").



(New) Fig. 2d added: Vegetation cover of the Abd basin in 2009

5. “The coefficients obtained along the paper have no physical meaning without extending the intervening phenomena that interact in the phenomenon accountable for the production of those solid matters at the mouth”: The scientific literature on the rating curve coefficients values and their variability is rich, because the question of their meaning is still pending. We agree that these values should be related to the processes of sediment production (and transport, see next comment). The dataset faces us with a non linear answer of a system on changing forcing. This study aims at describing the dynamics of this very complex system. The coefficients are discussed on the basis of the available information but their physical meaning is not fully solved by this paper. By the way, is this question solved in any paper? We agree with the reviewer that this study opens avenues on potential future studies on different aspects of sediment dynamics in the basin.

6. “All the parties: erosion, ablation... must be evaluated in order to take account only of the party which can be in connection with the change in pluviometric and hydrometric mechanisms”: Because the suffix “metric” refers to measurements and not to processes or mechanisms, this request is not clear to us. Shall we understand “... in connection with the changes in rainfall and river discharge”? In that case, if we consider the changes from a decade to another at the scale of one century (see for example the alternation of 20 wet years in the 50s and 60s, followed by a severe drought in the 70s and 80s, fig. 4, § 4.2 and 7.1.1), which period could be considered as a reference? This paper emphasizes the fact that a period of 40 years of measurements is not long enough to define a reference behavior. That’s why we don’t discuss the mean value of specific suspended sediment yield, for example, in this paper.

General comment and answer

This paper is based on the complementary study of variability of water and suspended sediment discharge at one gauging station, considering some related climatologic changes (in temperature, and rainfall intensities and periods of occurrence). We thank the anonymous reviewer #2 who is much concerned by the soil cover, erosion process and by the origin of the suspended particles, i.e. by a pedological study of the catchment. A paragraph is added in the conclusion of the revised version: “The quantification of different forcing changes on sediment sources (raindrop erosion, sheet erosion, rill erosion, gully erosion, stream channel erosion) may be investigated in situ (e.g. Poesen et al., 2003) and/or estimated using a numerical model of the hydrologic and sedimentological functioning of the basin, such as WEPP (Nearing et al., 1989), EUROSEM (Morgan et al., 1998) or SWAT (Neitsch et al., 2011). Such a model could help us to test hypothesis and quantify or at least estimate the effects of different forcing changes (temperature, runoff, vegetation etc.).”

Ref. added in the revised version:

Morgan R.P.C., Quinton, J.N., Smith R.E., Govers, G., Poesen, J.W.A., Auerswald, K., Chisci G., Torri, D., and Styczen, M.E.: The European Soil Erosion Model (EUROSEM): A dynamic approach for predicting sediment transport from fields and small catchments, *Earth Surf. Process. Landforms*, 23, 527-544, 1998.

Neitsch, S.L., Arnold, J.G., Kiniry J.R., and Williams, J.R.: Soil and Water Assessment Tool – Theoretical Documentation version 2009. Texas Water Inst. Techn. Report n°406, Texas A&M University, College Station, 2011.

Poesen J., Nachtergaele, J., Verstraeten, G., and Valentin, C.: Gully erosion and environmental change: importance and research needs, *Catena*, 50, 91-133, 2003.

Remini B., Leduc C., and Hallouche, W.: Evolution des grands barrages en régions arides: quelques exemples algériens, *Sécheresse*, 20 (1), 96-103, 2009.