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Hydrology and Earth System Sciences Discussions

Interactive comment on "Impact of climate change on sediment yield in the Mekong River Basin: a case study of the Nam Ou Basin, Lao PDR" *by* B. Shrestha et al.

Anonymous Referee #3

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The paper addresses a possible combination of coupling climate-change model outputs with hydrosedimentological impacts at river basin scales of Nam Ou River basin. This paper looks at the potential changes in flows and sediment transport linked to climate change. The paper's objective is suitable to readers of HESS. The paper is well written, easy to read and uses scientific methods and information to answer some hypotheses. All tables and figures are clear. Although sediment modeling yield has limitations to the scale and information used, the outputs are significant to be discussed in the context of the study area. The authors present the study area, mainly sandy clay loam, must inform how spatial heterogeneities are distributed across the basin to

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encompass hydrological behaviors for model's characterization. About the database used, a short discussion about the uncertainties carried out to the global scale mapping is very welcome. "Muscle" acronym should be replaced by MUSLE. From results of Figure 3, calibration period has a total variance explained of 64% and validation period with total variance explained of 74%. The observed and modelled time series approximate well related to total runoff volumes Some observed flow extremes are not well modeled between year 1994 until year 1997. In this period, seven observed floods are not well modeled. These behaviors could demonstrate some floodplain features not well characterized, i.e. consecutive floodprone areas activated, oxbows or even local occupations which accelerates flows. Some discussions about these regional aspects are appropriate. These local situations are difficult to encompass at the scale of the model used, but they can explain that nested experiments, or multi-scale model approaches, are strongly recommended. Thus R2 and PBIAS can be used at different gauging stations and their inherent uncertainties. All these uncertainty carry into model behaviors which affect modeled sediment transport. Model's results are good according to the scale used. Thereafter intrinsic uncertainty from rating curves has consequences into (adopted) observed values. Authors are very encouraged to incorporate a brief discussion on the comparison between the uncertainty of observed values compared to the uncertainty of model outputs. To discuss differences in calibration and validation periods, cumulative plots of both observed and modeled discharges can be useful. Otherwise, Mannings's "n" value for main channel, with initial value of 0.014, but with fitted parameter value of 0.19 must be better explained. This comment serves for other most sensitive parameters. Not only as a spatially mean value (among all channel reaches) but also in comparison for every channel reach across the basin modeled. Local roughness and spatial discretization in the model can "upscale" local roughness into a broader-scaled effective parameter. In Figure 3, calibration period hast total variance explained of 64% and validation period with total variance explained of 74%. The observed and modeled time series approximate well related to total runoff volumes Some observed flow extremes are not well modeled between year 1994 until

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year 1997. In this period, seven observed floods are not well modeled. These behaviors could demonstrate floodplain characterizations, i.e. consecutive floodprone areas activated, oxbows or even local land use which accelerates flows. These local situations are difficult to encompass at the scale of the model used, but it can explain about either nested experiments or multi-scale modelisation are strongly desirable. Thus R2 and PBIAS can be used at different gauging stations and uncertainty can be discussed into a more general approach. Also these behaviors affect sediment transport modeled, because simulated outputs are good but according to the scale used. Because variance of future sedimentological outputs and estimated flows derived from climate change runs are not discussed, authors should recommend an heuristic approach for new papers in this research topic. For instance, a new generation of vulnerability index or criteria, related to downscaled regional values, through quantile mapping of empirical downscaling methods, from global models which better explain the variance's transfer related to scale, in order to perform robust hydrological modeling related to river basin resiliency. All the above comments are considered not to reject the paper, but to enrich possible alternatives to enhance paper's advantages to future research.

The paper is accepted to be fully published in HESS.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 3339, 2012.