

Interactive comment on “The dynamics of cultivation and floods in arable lands of central Argentina” by E. F. Viglizzo et al.

Anonymous Referee #1

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The present paper describes the possible links that may exist between flooding and land management. The analysis is carried out with a simplified approach and proposes a possible interpretation for the correlation observed between landuse coverage, extend of flooded areas, groundwater level and annual rainfall. The possible feedbacks underlined in the text may be realistic, but honestly I do not think that the analysis presented support the conclusion of the study. In the following, I have summarized some of the most critical aspect of the paper:

- It is not clear to me if the estimation procedure adopted to define the extend of flooded area is appropriate or not. The calculation is based on the change

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observed on agricultural land use (see page 2326) and consequently these two variables (landuse and ground water level) are correlated. According to the authors, the procedure was validated against satellite images that may provide a fair description of the flooding area affected by clouds, trees and floating vegetation (see Smith, 1997). This point is a central one and the validation procedure used should be described in greater details and supported by graphs and data.

- In the section 3.1 the correlation between the percentage of cultivated land, annual rainfall, and ground water level (is the annual mean? this is not clear!) is investigated. In all cases a weak correlation is observed (generally R^2 is lower than 0.46) and this is sufficient for the authors to state that "in terms of flooding potential, the analysis would support the argument that while groundwater might have a larger effect in highlands than in lowlands, rainfall might be more influential in lowlands". Honestly, I can understand where and how this results comes out.
- I totally disagree with the considerations reported in section 3.1 at the lines 2-5. The authors state "The negative relationship between groundwater and cultivation may have practical implications in highlands: first, groundwater level can be useful to predict a cultivation reduction in response to flood expansion; second, considering the slow movement of groundwater in soils, groundwater level can be monitored to anticipate flood risk, helping to cope in advance with its potentially harmful consequences". First of all I do not think that groundwater rise may help to predict landuse changes because the first is influenced by the second term but not viceversa, at least not in the short term. Second, groundwater level is generally characterized by the slow response time and exactly for this reason it cannot be used to predict or "anticipate" flood!
- In section 3.3, the author compare the relationships existing between the percentage of croplands affected by floods and % of cultivated land over different time

window. Honestly, I do not understand the meaning this graph and consequently it doesn't make any sense to me.

- As hydrologist it is hard to believe that the groundwater level may be interpreted as the triggering mechanism for floods. It may be a relevant component in flood production affecting the water storage capacity of the basin, but dynamics of floods can not be related with annual fluctuations in groundwater or rainfall. These two variables can be only used to define the mean state of the hydrological system. It necessary to extend the work including the study of variable generally used in hydrology to study the hydrological extremes (e.g., annual maxima of rainfall). Only after this, if the rainfall extremes do not provide a good indicator for flooding frequency and extension one can take into consideration other possibilities.

Minor corrections

Fig. 5 in the first graph is missing the label (a).

References

Smith, L.C: Satellite remote sensing of river inundation area, stage, and discharge: a review, *Hydrological Processes*, vol. 11, 1427-1439, 1997.

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