

## ***Interactive comment on “AGRIDE-c, a conceptual model for the estimation of flood damage to crops: development and implementation” by Daniela Molinari et al.***

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The paper presents a conceptual flood damage model for the agricultural sector – the AGRIDE-c model. AGRIDE-c is characterized by a general framework designed to be flexible in application in different context with marginal adaptation or consideration of local, context-specific damage variables, respectively. The model approach is based on expert judgement and complemented by information from literature. The research contributes to overcome the lack of knowledge and tools to assess flood damage and risk in the agricultural sector. The main strength of the presented model framework is its transferability, i.e. the flexibility to apply the model in contexts characterized by

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different crop calendars and/or climate conditions.

After introducing the research need, the state-of-the-art of flood damage modeling in the agricultural sector is summarized. Subsequently, the AGRIDE-c model framework is described and applied in a case study in the Po River Plain. Finally, experiences from the case study are discussed and conclusions are drawn.

The paper follows a logical structure. The significant relevance of the research is substantiated by the authors in a reasonable and transparent manner. The used data and methods are sufficiently described. The authors give an adequate overview of existing literature and list the references appropriately. I recommend publishing the paper after minor revisions by the authors. In this respect, please consider the following comments:

General comments

- Please briefly discuss and justify the consideration of the element “damage to soil” in the model framework against the background that no approach to estimate this damage type as yet exists. From a theoretical point of view the implementation of this damage type is fully comprehensible and reasonable as 1) it ensures a comprehensive view of potential consequences of flooding in the agricultural sector, and 2) damage to soil can significantly contribute to overall flood damage in this sector. However, from a practitioner’s perspective, the fact that the consideration of damage to soil is suggested on the one hand, but no concrete approach for such an estimation is provided (since not existent) on the other hand, can cause ambiguities. Further, a consideration of damage to soil in the model application using rough assumptions and proxies for this variable could introduce noise to the overall loss estimation rather than valuable information.

- The AGRIDE-c spreadsheet plays a central role in the model concept. It is currently provided to the reader via a hyperlink to a project website in Italian language. Due to language constraints of non-Italian-speakers as well as potential expiry of the hyperlink I suggest to additionally provide the spreadsheet in the supplement of this paper, if technical requirements of NHES can be met or bypassed (Excel sheets cannot be

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uploaded to NHESS supplements). This would ensure unlimited availability and better access of the spreadsheet.

#### Specific comments

Page 2, l. 6-8: The given characteristics of limited model transferability and applicability are not exclusive for agricultural sector, but rather represent general difficulties in flood damage modeling, i.e. often also apply to models for e.g. the residential or the commercial sector. I suggest to rephrase the sentence to avoid the impression that these aspects are exclusive problems of agricultural models.

Page 2, l. 23: "The paper is organized in four parts" is a bit confusing. To match this number, the exclusion of the sections "introduction" and "conclusion" is required. Moreover, in the subsequent sentences you list five different sections. Please rephrase the sentence towards a more unambiguous statement. For example, "the paper is organized as follows".

Page 3, l. 1: "The main available damage models [...]". This statement is unclear to me. Do you mean "prominent examples of damage models"? Please clarify.

Page 9, l. 27-30: Although in a European context floods usually have a negative effect on soils, the studies of e.g. Hein et al. (2003) and Tockner et al. (1999) show that such events can also have clearly positive effects, namely in the form of an increase of soil fertility. The fertility increase is explained by a (re-)distribution of river sediments and organic matter in the course of flooding. These river sediments replenish carbon and nutrients in topsoil and, hence, can make agricultural lands more fertile. I suggest to briefly discuss this aspect in the paper. An adaptation of Figure 2, where the box "damage to soil" currently states only the negative effect of flooding, could also be considered.

#### Technical corrections

Page 12, l. 16, w. 11: Grammar issue. "nor" should be replaced by "neither".

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Page 19, l. 2, w. 13-15: Consider rephrasing "in another terms". For example, into "in other words".

#### Suggested references

Hein, T., C. Baranyi, et al. (2003). "Allochthonous and autochthonous particulate organic matter in floodplains of the River Danube: the importance of hydrological connectivity." *Freshwater Biology* 48(2): 220-232.

Tockner, K., D. Pennetzdorfer, et al. (1999). "Hydrological connectivity, and the exchange of organic matter and nutrients in a dynamic river-floodplain system (Danube, Austria)." *Freshwater Biology* 41(3): 521-535.

I look forward to the further progress of the model development and application.

Best regards, Patric Kellermann

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