ANSWERS TO THE REFEREES
FOR THE ARTICLE ENTITLED "ASSESSING THE IMPACT OF RESOLUTION AND SOIL DATASETS ON FLASH-FLOOD MODELLING." SUBMITTED TO HYDROLOGY AND EARTH SYSTEM SCIENCES

POINT BY POINT ANSWERS TO RENATA ROMANOWICZ (REFEREE 2)

⇨ The authors would like to thank Renata Romanowicz for her constructive comments. In the following, we will answer each comment and indicate how the suggestions have been taken into account in the new version of the manuscript.

The authors present a study of the performance of the flash-flood modelling tool, the ISBA-TOPP coupled system under varying grid resolutions and terrain descriptors in order to assess their influence. Two resolution grids were used, 300 m and 1000 m, and it was found that the higher resolution gave better results in reproducing the flood peak. It is not surprising and could be stated without any experiments.

⇨ Change in manuscript: the following comment has been added in the introduction:
"Even if in general higher resolution leads to more accurate simulations, there can be a critical level beyond which the model response is not necessarily improved (Egüen et al., 2012 ; Hengl, 2006)."

Egüen, M., Aguilar, C., Herrero, J., Millares, A., & Polo, M. J. (2012). On the influence of cell size in physically-based distributed hydrological modelling to assess extreme values in water resource planning. *Natural Hazards and Earth System Sciences*, *12*(5), 1573-1582.

Hengl, T. (2006). Finding the right pixel size. *Computers & geosciences*, *32*(9), 1283-1298.

However, it would be interesting to know how fine the grid should be to still give acceptable results and feasible computation costs. In fact, there might be an interesting relationship between the grid size and model performance, obviously depending on the scale of the catchment. I am aware that this could be a separate paper, but I expect the authors to state clearly that the influence of the grid size is not studied here, apart from the comparison of two different grid options.

⇨ As we said in a previous comment, the study of the influence of the grid size is certainly not exhaustive. Indeed, the relationship between the grid size and the model performance, depending on the scale of the catchment, is not the scope of the article. The purpose of this article is not to focus only on the differences generated by the use of different resolutions but rather to investigate and rank the impacts of two different spatial resolutions and different terrain descriptors on flash-flood modelling.
Changes in manuscript: The first sentence in the abstract has been modified into:

"The present study assesses the impacts of *two* grid resolutions and the descriptors of soil texture and land cover on flash-flood modelling at local and basin scales."

When it comes to the terrain descriptors, the authors do not present their comparison in a very clear way. Two different soil texture maps and two different land use maps are applied. Apart from the fact that we know that those maps have different sources and give slightly different percentages of clay and sand, or land surface cover, no other analysis of the differences in map descriptors is given. As a result, a discussion of the possible reasons for the

experimental results is impossible. It would be interesting to know where the differences between the results come from. At the moment, we learn only that for the peaks the texture seems to have a larger impact than the land use and that there is no noticeable difference for peak times between the two. It shows that the comparison between different maps is very crude. There are studies showing that land use and in particular, preferential pathways, can have a large impact on the catchment residence times and the time flood wave travels [Bloschl, 2001, 2007]. The authors are advised to add a discussion on those issues. At the moment, I am not sure what is the paper's outcome.

Bloschl, G., 2001. Scaling in hydrology. Invited commentary. Hydrol. Process. 15, 709–711.
Bloschl, G., 2007, At what scales do climate variability and land cover change impact on flooding and low flows?, Hydrological Processes, 21, 1241-1247.

⇨ Changes in manuscript:

1. A sentence has been added in the introduction:
   "Land use and in particular, preferential pathways, can have a large impact on the catchment residence times and the time flood wave travels [Bloschl, 2001, 2007]"

2. After these lines, some sentences on identification of model structures to account for landscape organization have also been added [see the 3rd answer to M. Zappa].

3. A sentence has been added in 2.3.2 on how land use products modify flow pathways and storage in ISBA-TOP [see the 21st answer to M. Zappa].

4. Some sentences have been added in 2.3.1 on how soil textures modify runoff with soil hydrodynamic parameters in ISBA-TOP:
   "Soil texture has an impact on simulated runoff through soil hydrodynamic parameters, which are determined by CH78 pedotransfer functions (Clapp & Hornberger, 1978) in ISBA-TOP. Edouard et al. (2018) investigated the impact of these parameters on runoff simulations. "

5. Some sentences have been added or modified in 3.1 in order to link the results to the map descriptors:
   "The differences in the soil texture databases, which impact the water storage capacity and the ease of water to move through saturated soil, resulted in ..." in 3.1.1
   "This excess runoff is consistent with lower infiltration and drainage capacity associated with clay-rich soils." in 3.1.2

6. Some sentences have been added in the conclusions:
   "Land cover and soil texture influence locally the processes in the catchments. Their spatial variability has an impact on the preferential flow paths, the flow velocities and the water storage. The complexity of the interactions between processes at the catchment scale does not allow us to clearly conclude on how land cover and soil texture, induce differences in simulated flows."

Edouard, S., Vincendon, B., & Ducrocq, V. (2018). Ensemble-based flash-flood modelling: Taking into account hydrodynamic parameters and initial soil moisture uncertainties. *Journal of Hydrology*, *560*, 480-494.

Clapp, R. B., & Hornberger, G. M. (1978). Empirical equations for some soil hydraulic properties. *Water resources research*, *14*(4), 601-604.