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Qualitative approach to residual hazard from the 2013 flood effects in the Garonne River (Val d'Aran, Central Pyrenees)

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The Val d'Aran is a region located in the central, axial part of the Pyrenees. The Garona River, the main river that drains it, produces relatively frequent flood events. The last significant flood occurred in June 2013 and it caused extensive damages, as well as a large impact on the media. Based on the 2013 flood effects, a qualitative approach to the residual hazard was performed in order to understand the characteristics of the main zones that were affected and, therefore, may be affected in the future. Two representative sectors along the Garona River were chosen for the study: Arties-Vielha and Era Bordeta-Les stretches.

The qualitative approach to the residual hazard has been performed considering that the study of the landforms and the flood effects can give orientation to identify the major flood prone areas. The residual hazard is considered as the hazard that remains even when effective mitigation measures to minimize flood processes are in place. The geomorphology in quasi-natural conditions provides information about the natural dynamic of the river. The geomorphology was studied by analysing the landforms from the 1956 aerial pictures that indicate fluvial processes of the area in quasi-natural conditions. Comparing the effects and flooded areas with the fluvial geomorphology and ancient maps, the most significant flood prone areas can be predicted for future episodes.

Administration agencies (CHE, ACA) considered the return-period of this flood lower than 50 years. For this low to medium frequency event, two main types of flood effects were identified: erosions and overflows. Erosions were much more significant than overflows. Regarding to erosions, different cases were found: 1) anthropically narrowed channel stretches recovered their original width; 2) the erosions along the river coincided mostly with landfills that nowadays occupy the floodplain; 3) anthropically deviated stretches recovered their natural paths. Furthermore, these erosions caused problems in dikes and landfills producing even their collapses in some places. Overflows, which were less significant than erosions, were not occasioned by large rising of water level. They occurred in accused meanders, ancient occupied channels and where flood was obstructed by obstacles. It is important to remark the importance of the 1956 aerial pictures and ancient maps to identify the ancient morphology and also of field work to predict the hazard prone areas.

All the effects derive from the same problem: channel reduction and occupation. This reduction aggravates the erosion tendency of the Garona River (see Victoriano-Lamariano et al., also presented in EGU 2015) and thus the damages. Summarizing, comparing the 1956 aerial pictures with the 2013 flood effects, the main affected areas are those with a residual hazard that could have been predicted by identifying the sectors in which land uses and river management changed. If new anthropic interventions decreasing the channel section are done, most likely the Garona River will recover its ancient path in future floods. Therefore, a qualitative assessment to the residual hazard can be performed. As a consequence, the new defence measures should consider the above findings to increase effectiveness.