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Characterization of remarkable floods in France, a transdisciplinary approach applied on generalized floods of January 1910

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The 2007 Flood Directive promotes the integration and valorization of historical and significant floods in flood risk management (Flood Directive Text, chapter II, and article 4). Taking into account extreme past floods analysis seems necessary in the mitigation process of vulnerability face to flooding risk. In France, this aspect of the Directive was carried out through the elaboration of Preliminary Flood Risk Assessment (PFRA) and the establishment of a 2000 floods list. From this first list, a sample of 176 floods, considered as remarkable has been selected. These floods were compiled in discussion with local authorities in charge of flood management (Lang et al., 2012) and have to be integrated in priority in local risk management policies. However, a consideration emerges about this classification: how a remarkable flood can be defined? According which criteria can it be considered as remarkable? To answer these questions, a methodology has been established by building an evaluation grid of remarkable floods in France. The primary objective of this grid is to analyze the remarkable flood's characteristics (hydrological and meteorological characteristics, sociological- political and economic impacts), and secondly to propose a classification of significant floods selected in the 2011 PFRA.

To elaborate this evaluation grid, several issues had to be taken into account. First, the objective is to allow the comparison of events from various periods. These temporal disparities include the integration of various kinds of data and point out the importance of historical hydrology. It is possible to evaluate accurately the characteristics of recent floods by interpreting quantitative data (for example hydrological records. However, for floods that occurred before the 1960's it is necessary resorting to qualitative information such as written sources is necessary (Coeur, Lang, 2008). In a second part the evaluation grid requires equitable criteria in order not to emphasize one flood typology or one flood dynamic (for example flash floods are often over-represented than slow dynamic floods in existing databases). Thus, the selected criteria have to introduce a general overview of flooding risk in France by integrating all typologies: storm surges, torrential floods, rising groundwater level and resulting to flood, etc.

The methodology developed for the evaluation grid is inspired by several scientific works related to historical hydrology (Bradzil, 2006; Benito et al., 2004) or extreme floods classification (Kundzewics et al. 2013; Garnier E., 2005). The referenced information are mainly issued from investigations realized for the PFRA (archives, local data),from internet databases on flooding disasters, and from a complementary bibliography (some scientists such as Maurice Pardé a geographer who largely documented French floods during the 20th century).

The proposed classification relies on three main axes. Each axis is associated to a set of criteria, each one related to a score (from 0.5 to 4 points), and pointing out a final remarkability score.

• The flood intensity characterizing the flood's hazard level. It is composed of the submersion duration, important to valorize floods with slow dynamics as flooding from groundwater, the event peak discharge's return period, and the presence of factors increasing significantly the hazard level (dykes breaks, log jam, sediment transport. . .)
• The flood severity focuses on economic damages, social and political repercussions, media coverage of the event, fatalities number or eventual flood warning failures. Analyzing the flood consequences is essential in order to evaluate the vulnerability of society at disaster date.
• The spatial extension of the flood, which contributes complementary information to the two first axes.

The evaluation grid was tested and applied on the sample of 176 remarkable events. Around twenty events (from 1856 to 2010) come out with a high remarkability rate. The January 1910's flood is one of these remarkable floods. This event is foremost known for its aftermaths on the Seine basin, where the flood remains the strongest recorded in Paris since 1658. However, its impacts were also widespread to France's Eastern regions (Martin, 2001).

To demonstrate the evaluation grid's interest, we propose a deep analysis of the 1910's river flood with the integration of historical documentation. The approach focus on eastern France where the flood remains the highest recorded for several rivers but were often neglected by scientists in favor of Paris's flood. Through a transdisciplinary research based on the evaluation grid method, we will describe the January 1910 flood event and define why it can be considered as a remarkable flood for these regions.