LabEx OSUG@2020

Observatoire des Sciences de l'Univers de Grenoble

Ce projet est soutenu par le Laboratoire d'Excellence OSUG@2020 (ANR10 LABX56) financé par le programme d'Investissements d'Avenir lancé par l'Etat et mis en oeuvre par l'ANR.

INVESTISSEMENTS D'AVENIR

Titre du projet : Prévoir les impacts des événements hydrométéorologiques en intégrant la vulnérabilité sociale dans les modèles de prévision

Volet : Recherche

Porteur du projet : Isabelle Ruin

Laboratoires impliqués : LTHE, PACTE, National Severe Storm Laboratory (NSSL), Disaster Research Center (DRC)

Bilan du projet pour l'année/la période

Bilan d'activité *(1 page max)*

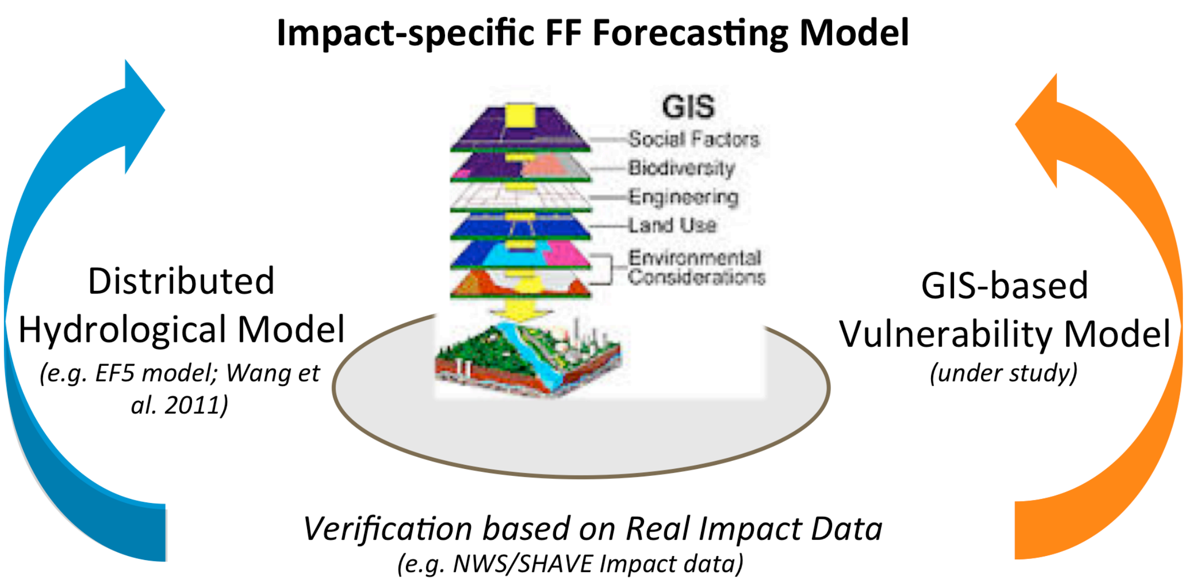
For forecasters and emergency managers the prediction of human impacts due to such a sudden onset and localized event as Flash Flood remains a challenge. The starting point of our research is that the resonance of the spatial-temporal context of the hazard with the distribution of people and their characteristics across space and time reveals different paths of vulnerability and defines the final picture of an exposed area in terms of deadly impacts. In the case of flooding fatalities, for instance, the elderly are often said to be the most vulnerable, but when fatalities are mapped against basin size and response time, it has been shown that in fact it is young motorist who are most likely to be killed in flash flooding of small catchments, whereas the elderly most frequently perish in their homes from large scale fluvial flooding. In addition to that, impacts in terms of loss of life are very much related to the space-time distribution of the everyday life social activity. It means that, depending on contingent conditions (e.g. rush hours when there are errands to run and children to pick up and lots of other cars on the road, or working hours when people feel they must be at work regardless of the conditions) perception of environmental cues and warning messages may be hindered emerging different causes and outcomes of social vulnerability.

Unfortunately, flash flood monitoring and prediction tools (e.g. distributed hydrologic models) do not incorporate social vulnerability. In this work, we seek to develop an impact-specific forecasting tool that will integrate flash flood forecasting hydrological modelling with information about the social vulnerability of the exposed population. To do so, we need to i) measure and map index-based vulnerability scenarios that describe the space-time variability of the vulnerability level; ii) explore the link between the vulnerability levels resulted from different vulnerability scenarios with the level of human impacts; iii) combine the space-time vulnerability indices with the available distributed hydrologic models to test the efficacy of such integrated models in reproducing the impacts of selected past catastrophic events.

Galatia Terti's first year of research was dedicated to the understanding of the root vulnerability causes and to identification of the available dataset to measure social vulnerability to FF. Available literature was reviewed to support our research framework and to provide the required hypothesis for the FF vulnerability assessment. The main output of this phase is the submission of a scientific paper that conceptualizes the dynamic aspect of social vulnerability during a FF event (Terti et al., 2015). Furthermore, social (i.e. population socio-economic profile), exposure (i.e. population distribution, land use), and physical (i.e. built and natural environment) information from various data sources in US have been explored. Especially, we focused on exploring different US census datasets to find out the available socio-economic variables relevant to describe our assumptions in social vulnerability measurement. In the second year of the PhD, human impact data were analyzed to in order to examine the circumstances in which they occur and identify proxy variables that could be tested as human risk predictors.

In addition to facilitating research development, the Labex OSUG@2020 research funds allowed Galateia Terti to attend two international summer schools to acquire new knowledge and techniques in developing interdisciplinary social-physical sciences projects and using complex system modelling (Agent-Based modelling, Cellular automata, Complex networks and Spatial statistics).

Illustrations - avec légende et crédit *(à envoyer également séparément)*



Terti, G., 2014. Synthetic schema of the concept of the project

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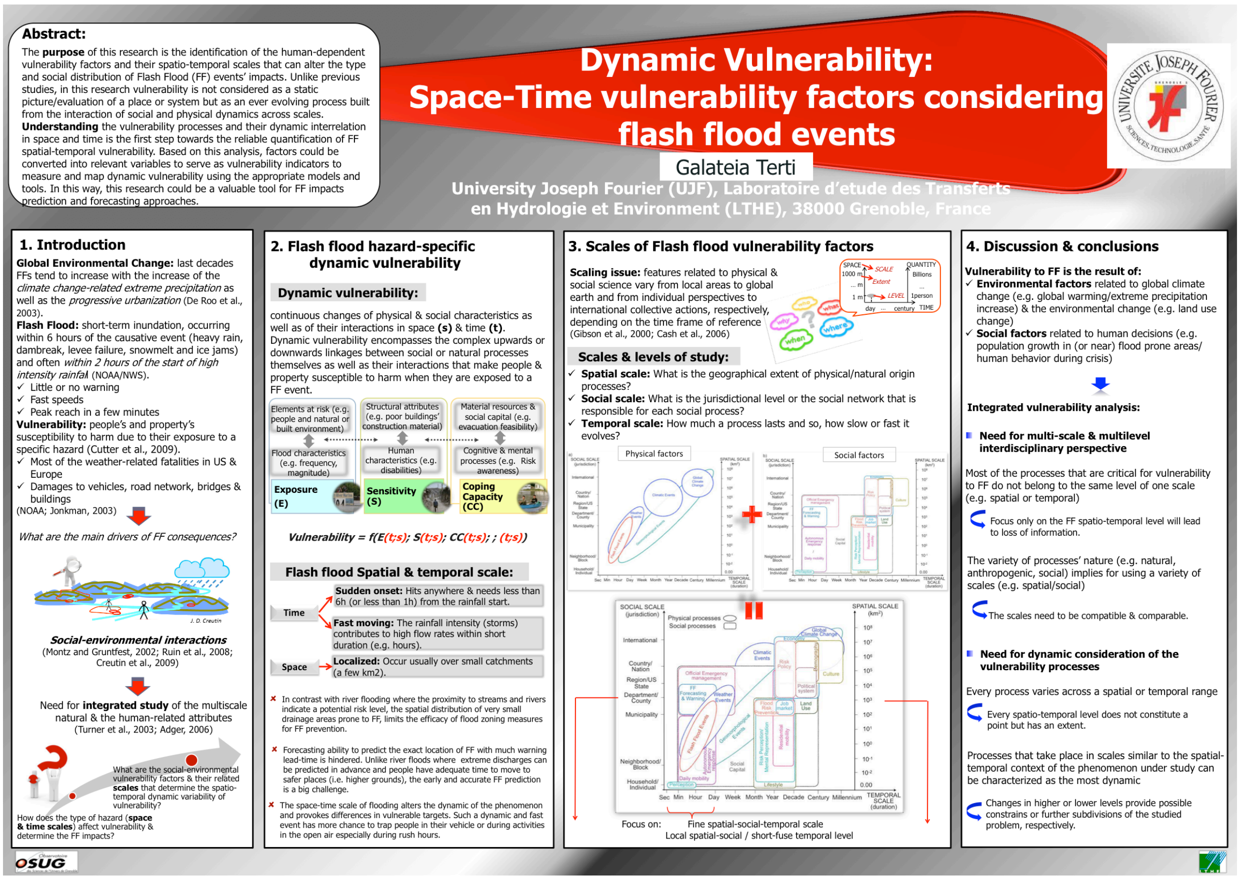

Terti, G., 2014. Poster presented at the Water and Society summer school, May 11-17, Oléron, France.

Production scientifique *(articles scientifiques, actes de congrès…)*

Terti, G., Ruin, I., Anquetin, S., Gourley, J.J., 2015. Dynamic vulnerability factors for impact-based flash flood prediction. *Nat. Hazards,* **79(3)**, 1481-1497.

Terti, G., Ruin, I., Anquetin, S., Gourley, J.J., 2016. A Situation-based Analysis of Flash Flood Fatalities in the United States. Bull. Amer. Meteor. Soc. doi:10.1175/BAMS-D-15-00276.1, in press.

Terti, G., 2014. Forecasting of flash flood impacts integrating the space-time distribution of social vulnerability. Invited seminar at UTSA ESE, November, 21, San Antonio, Texas.

Terti, G., 2014. Dynamic Vulnerability: Space-Time factors considering flash flood events. Poster at Water and Society summer school, May 11-17, Oléron, France.

Bilan financier succinct *(avec suivant les cas : co-financements éventuels, équipements achetés, missions, recrutements divers, fonctionnements divers…)*

Objet de la dépense	**Date**	**Montant**
Participation G. Terti à l'école thématique Water and Society	11-17 Mai 2014	500€
Participation G. Terti à l'école thématique Spatial Structures and Dynamics	14-19 juillet 2014	791,66€
Séjour de travail avec le partenaire américain – frais de déplacement	Novembre 2014- printemps 2015	1072,28€
Participation aux frais de publication Le National Severe Storm Laboratory (NSSL) participera à 50% du coût final de publication.	2015	1136,06€

Annexes si besoin ou lien sur des sites existants et pérennes jusqu'à la fin du Labex (2020)