**Multi-hazards and the city:**

**Tsunami and River Flooding in Earthquake impacted Coastal Cities**

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In the aftermath of the 2010-2011 Canterbury Earthquake Sequence (CES), the location of Christchurch-City on the coast of the Canterbury Region (New Zealand) has proven crucial in determining the types of- and chains of hazards that impact the city. Very rapidly, the land subsidence of up to 1 m (vertical), and the modifications of city’s waterways – bank sliding, longitudinal profile change, sedimentation and erosion, engineered stop-banks… - turned rainfall and high-tides into unprecedented floods, which spread across the eastern side of the city. Within this context, this contribution presents two modeling results of potential floods: (1) results of flood models and (2) the effects of further subsidence-linked flooding – indeed if another similar earthquake was to strike the city, what could be the scenarios of further subsidence and then flooding.

The present research uses the pre- and post-CES LiDAR datasets, which have been used as the boundary layer for the modeling. On top of simple bathtub model of inundation, the river flood model was conducted using the 2-D hydrodynamic code NAYS-2D developed at the University of Hokkaido (Japan), using a depth-averaged resolution of the hydrodynamic equations.

The results have shown that the area the most at risk of flooding are the recent Holocene sedimentary deposits, and especially the swamplands near the sea and in the proximity of waterways. As the CES drove horizontal and vertical displacement of the land-surface, the surface hydrology of the city has been deeply modified, increasing flood risks. However, it seems that scientists and managers haven’t fully learned from the CES, and no research has been looking at the potential future subsidence in further worsening subsidence-related floods.

Consequently, the term “coastal quake”, coined by D. Hart is highly topical, and most especially because most of our modern cities and mega-cities are built on estuarine Holocene sediments.