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Analysis and modeling of a hail event consequences on a building portfolio

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North-West Switzerland has been affected by a severe Hail Storm in July 2011, which was especially intense in the Canton of Aargau. The damage cost of this event is around EUR 105 Million only for the Canton of Aargau, which corresponds to half of the mean annual consolidated damage cost of the last 20 years for the 19 Cantons (over 26) with a public insurance. The aim of this project is to benefit from the collected insurance data to better understand and estimate the risk of such event.

In a first step, a simple hail event simulator, which has been developed for a previous hail episode, is modified. The geometric properties of the storm is derived from the maximum intensity radar image by means of a set of 2D Gaussians instead of using 1D Gaussians on profiles, as it was the case in the previous version. The tool is then tested on this new event in order to establish its ability to give a fast damage estimation based on the radar image and buildings value and location. The geometrical properties are used in a further step to generate random outcomes with similar characteristics, which are combined with a vulnerability curve and an event frequency to estimate the risk. The vulnerability curve comes from a 2009 event and is improved with data from this event, whereas the frequency for the Canton is estimated from insurance records.

In addition to this regional risk analysis, this contribution aims at studying the relation of the buildings orientation with the damage rate. Indeed, it is expected that the orientation of the roof influences the aging of the material by controlling the frequency and amplitude of thaw-freeze cycles, changing then the vulnerability over time. This part is established by calculating the hours of sunshine, which are used to derive the material temperatures. This information is then compared with insurance claims.

A last part proposes a model to study the hail impact on a building, by modeling the different equipment on each facade of the building, such as the number of windows or the material type. The goal for this part, which is more prospective, is to have a model which would allow to quickly estimate the risk of a given building according to its physical characteristics and to the local wind conditions during a hail event.