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New insights into the Evaluation of Financial Impact of Earthquakes in France: Benefits for Compensation and Prevention

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Models designed to estimate financial impact of earthquake for France are usually poorly constrained and mostly consist of sub-models of either pan-European or Caribbean models for respectively French mainland and Lesser Antilles territories. Even if those turnkey models produce first order estimation for quantifying the impact of an earthquake, they lack of in-situ studies to take into account the specificities of French territories on the overall workflow of modeling especially on hazard, vulnerability and loss estimation. Consequently, these models can't be used with a high confidence in order to estimate the overall exposure of France in relation to not yet occurred but plausible earthquakes.

BRGM, as the French geological survey institute, and CCR, as the French State owned public reinsurance company, are both deeply concerned in a better understanding of the consequences of natural disasters occurring in France. Thus, since 2014, BRGM and CCR have been collaborating, amongst other projects, to develop a new consistent and reliable earthquake impact model for the French mainland and overseas territories covered by the specific French Natural Disasters Compensation Scheme.

This model encompasses a complete modeling chain from hazard to loss estimation. It consists in performing damage scenarios in order to evaluate the financial consequences for compensable insured property on buildings for a given seismic source, defined deterministically or probabilistically. To date, the model evaluates the consequences of seismic events for almost all kind of buildings in France: dwellings (houses and apartments), retail trade, professional and technical business services and industrial facilities. The seismic hazard is estimated deterministically for reference events by region but also probabilistically by generating stochastic earthquake dataset calibrated on the French seismic historical activity. Specific vulnerability assessments have been performed providing hazard to damage relationships specifically calibrated on French buildings.

The model can be used to estimate the consequences of real event such as the unusual M5.2 shallow earthquake occurred in November 2019 in France, providing fast estimation of its impact. The model, using the stochastic earthquake generator, allows us to estimate the exposure of French territories to earthquake providing indicators to support prevention actions led by the

French government in the most exposed areas. Some of these indicators are already available throughout dedicated platform to insurances companies and public authorities and should be supporting State decision-makers and local authorities for prevention action such as retrofitting of buildings or adapting building codes.