

## **Title: Probabilistic Seismic Hazard Analysis including earthquake clustering**

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### **Proposal**

One of the most recognized limitations in current Probabilistic Seismic Hazard Analysis (PSHA) practice is the use of often arbitrary declustering techniques, which are necessary to comply with the Poisson assumption that is used to calculate the probability of exceedances in each site. In essence, the declustering applied to earthquake catalog removes earthquakes, implying that it leads to underestimating the possible ground shaking in each specific site. The first attempts to quantify the effects of declustering on PSHA shows departures that are often much larger than the epistemic uncertainty of the model itself. The difficulty in overcoming this barrier is due to the fact that a realistic probability distribution of space-time earthquake occurrence is still unknown. Here we aim at overcoming this problem through a numeric non-parameteric PSHA build through simulated earthquake catalogs which maintain the space-time clustering of real earthquakes.

### **Research Program**

The PhD candidate has to have a solid knowledge of hazard analysis, statistics and computer programming. The planned work consists of different steps: (i) Improving an existing model that is able to generate synthetic earthquake catalogs based on well-known earthquake clustering models on time horizons that are of interest for PSHA purposes; (ii) to develop Turing-style tests to check the performance of the model on describing historical seismicity; (iii) to become familiar with well-known codes to calculate seismic hazard, such as OpenQuake; (iv) to evaluate the full hierarchy of uncertainties of the hazard model and to propose a formal validation of the model; (v) to compare the results with the results of the most recent classical PSHA models for Italy, and of other models that have similar goals.

The work will be made in collaboration with colleagues of DiSTAR, of the Scuola Superiore Meridionale, and of the Istituto Nazionale di Geofisica e Vulcanologia. The topic of the PhD proposal fits perfectly the goals of the RETURN Extended Partnership (funded by the European Union Next-GenerationEU), at which the tutor of the proposal participates actively.

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