

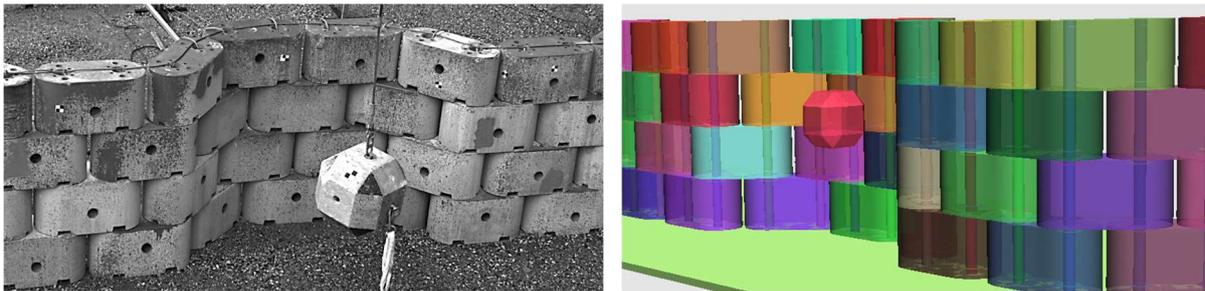
Post Doctoral fellowship in computational mechanics /civil engineering

Context

This Post Doc position is offered by the research unit ETNA, located in Grenoble, a leading team in the field of natural hazards in mountains (https://www6.lyon-grenoble.inrae.fr/etna_eng/). This position is part of a research project involving INRIA, the National Institute for Research in Digital Science and Technology, and led by Géolithe an engineering-consultancy bureau in geology, geophysics, geotechnical and civil engineering.

The research project focuses on an innovative type of rockfall protective structure, made of articulated concrete blocks, for which a Non smooth contact dynamics (NSCD) model has been recently developed using the open-source scientific software SICONOS. This model was calibrated against experimental data obtained from experiments consisting in impacts by a projectile on a real-scale structure.

The overall purpose of this research project is to develop the use of this innovative type of structure, demonstrating its efficiency in arresting rock blocks and improving its design.



Real structure before an impact experiment and its NSCD model

Objectives

In line with the aim of the research group, the candidate will be in charge of different missions making use of the NSCD model.

First, the impact response of the structure will be investigated varying a set of parameters describing the structure and the rock block kinematics prior impact. The aim is, first, to track possible limitations in the numerical model and, second, to identify the most influential parameters in the structure response. If necessary, the NSCD model of the structure will be improved.

Second, a reliability analysis will be conducted leading to the construction of vulnerability curves for different structure configurations.

Third, a meta-model of the structure ability in arresting the rock blocks will be built. The set of varied parameters to be accounted for will be defined together with the project group. The meta-model will relate to the structure stability against impact, considering various failure modes.

Last, but not least, the candidate will be in charge of the work results dissemination, in particular as main author of a journal article.

Expected profile of the candidate

The candidate will have a PhD in mechanics or civil engineering with experience in numerical modelling using discrete or finite element models and programming (preferentially using python language), basic knowledge in sensitivity analysis using surrogate models is also expected.

Additional details

- Starting date: 1st of march 2022.
- Duration: 9 months (min.)
- Location: INRAE, Grenoble, France.

How to postulate – first step

Send a CV and a motivation letter, both in PDF version, to the Post doc supervisors:

- Franck BOURRIER (Research fellow, INRAE-INRIA) : franck.bourrier@inrae.fr
- Stéphane LAMBERT (Research engineer, INRAE) : stephane.lambert@inrae.fr

A few references

- Bourrier, F., Acary, V. (2021) Predictive Capabilities of 2D and 3D Block Propagation Models Integrating Block Shape Assessed from Field Experiments, *Rock Mechanics and Rock Engineering*. Inpress, 10.1007/s00603-021-02696-5.
- Furet, A., Lambert, S., Villard, P., Jarrin, J. P. and Lorentz, J. (2020). Réponse sous impact de murs pare-blocs. *Revue française de géotechnique*. DOI 10.1051/geotech/2020017.
- Lambert, S., Toe, D., Mentani, A., Bourrier, F. A Meta-Model-Based Procedure for Quantifying the On-Site Efficiency of Rockfall Barriers (2021) *Rock Mechanics and Rock Engineering*, 54 (2), pp. 487-500.
- Toe, D., Mentani, A., Govoni, L., Bourrier, F., Gottardi, G., Lambert, S. (2018). Introducing Meta-models for a More Efficient Hazard Mitigation Strategy with Rockfall Protection Barriers (2018) *Rock Mechanics and Rock Engineering*, 51 (4), pp. 1097-1109.