The different phases of the post-doc will be:

- **Literature review.** This review will focus on the modeling approaches potentially usable for the integration of the dissipation processes during the impact of a block on a soil, modeling of contact law with rolling friction and of block breakage.
- **Formulation and numerical implementation of a novel contact law integrating rolling friction in the framework of second–order cone complementarity.**
- **Modeling of block breakage.** The approach proposed will be based on the modeling of the block as an assembly of rigid or deformable tetrahedron linked by cohesive contact laws. The challenge relies on the implementation of relevant cohesive contact laws, able to reproduce the interaction with the terrain that only partially integrate the energy dissipation processes. As a consequence, they remain limited for a detailed analysis of the block detachment conditions and propagation, strategies that include hazard zones determination and protection structures design.

**Principales activités**

The objective of this post-doc is to improve the modeling of the dissipation processes occurring during the propagation of blocks through mountain slopes. These processes are related with momentum exchanges, friction at the interface, wave propagation through the soil, visco-plastic strains of the soil and the breakage of the rock. The novelty will consist in the development of the interaction between the block and the natural terrain. The models either consider the block as a single material point or explicitly account for the block as an assembly of rigid or deformable tetrahedron linked by cohesive contact laws. The members of the team have a long experience of nonsmooth dynamics either in mechanics, of theirs formulations, or of theirs solutions with respect to time. In mechanics, the main instances of nonsmooth dynamical systems are multisubsystems with Signorini's unilateral contact, set-valued (Coulomb-like) friction and impacts, or in continuum mechanics, ideal plasticity, fracture or damage. The members of the team have a long experience of nonsmooth dynamics modeling together with the development of simulation software. With the integration of Franck Bourrier as a new research member, a part of the activities of the theme is now focused in rockfall trajectory modeling and natural hazard mitigation.

**Informations générales**

- **Thème/Domaine :** Optimisation et contrôle de systèmes dynamiques
- **Ville :** Montbonnot
- **Centre Inria :** CRI Grenoble - Rhône-Alpes
- **Date de prise de fonction souhaitée :** 2019-10-01
- **Durée de contrat :** 1 an, 4 mois
- **Date limite pour postuler :** 2019-04-28

**Contacts**

- **Equipe Inria :** TRIPOP
- **Recruteur :** Acary Vincent / vincent.acary@inria.fr

**A propos d’Inria**

Inria, l’institut national de recherche dédié aux sciences du numérique, promeut l’excellence scientifique et le transfert pour avoir le plus grand impact. Il emploie 2400 personnes. Ses 200 équipes-projets agiles, en général communes avec des partenaires académiques, impliquent plus de 3000 scientifiques pour relever les défis des sciences informatiques et mathématiques, souvent en interaction avec d’autres disciplines. Inria travaille avec de nombreuses entreprises et a accompagné la création de plus de 160 start-up. L’institut s’efforce ainsi de répondre aux enjeux de la transformation numérique de la science, de la société et de l’économie.

**Consignes pour postuler**

**Starting date:** 1st October 2019, duration: 16 months.

Applicants should hold a PhD defended after 1st September 2017.

Applications have to be made online on the Inria website before end of 28th April 2019.

**Sécurité défense :**

Ce poste est susceptible d’être affecté dans une zone à régime restrictif (ZRR), telle que définie dans le décret n°2017-425 relatif à la protection du potentiel scientifique et technique de la nation (PPST). L’autorisation d’accès à une zone est délivrée par le chef d’établissement, après avis ministériel favorable, tel que défini dans l’arrêté du 03 juillet 2012, relatif à la PPST. Un avis ministériel défavorable pour un poste affecté dans une ZRR aurait pour conséquence l’annulation du recrutement.

**Politique de recrutement :**

Dans le cadre de sa politique diversité, tous les postes Inria sont accessibles aux personnes en situation de handicap.

**Principales activités**

The objective of this post-doc is to improve the modeling of the dissipation processes occurring during the propagation of blocks through mountain slopes. These processes are related with momentum exchanges, friction at the interface, wave propagation through the soil, visco-plastic strains of the soil and the breakage of the rock. The novelty will consist in the development of contact laws with rolling friction, and with the integration of rock breakage due to impact.

**Contexte et atouts du poste**

TRIPOP is a joint research team of Inria Grenoble Rhône-Alpes and of the Laboratoire Jean Kuntzmann and started in January 2018 as a follow up of the BIPOP team. The team is mainly concerned by the modeling, the simulation and the control of nonsmooth dynamical systems. Nonsmooth dynamics concerns the study of the time evolution of systems that are not smooth in the mathematical sense, i.e., systems that are characterized by a lack of differentiability, either of the mappings in their formulations, or of theirs solutions with respect to time. In mechanics, the main instances of nonsmooth dynamical systems are multibody systems with Signorini’s unilateral contact, set-valued (Coulomb-like) friction and impacts, or in continuum mechanics, ideal plasticity, fracture or damage. The members of the team have a long experience of nonsmooth dynamics modeling together with the development of simulation software. With the integration of Franck Bourrier as a new research member, a part of the activities of the theme is now focused in rockfall trajectory modeling and natural hazard mitigation.

**References**

Compétences
The postdoc candidate should have competences in solid mechanics and numerical modeling. A strong theoretical background in solid mechanics is mandatory. Furthermore, the applicant must show a strong interest for software development in computational Mechanics. He also has to be motivated by applied research in collaboration with researchers from different disciplines. A good level of English and subsequent writing capacities are also requested.

Avantages
- Subsidized meals
- Partial reimbursement of public transport costs
- Leave: 7 weeks of annual leave + 10 extra days off due to RTT (statutory reduction in working hours) + possibility of exceptional leave (sick children, moving home, etc.)
- Possibility of teleworking (after 6 months of employment) and flexible organization of working hours
- Professional equipment available (videoconferencing, loan of computer equipment, etc.)
- Social, cultural and sports events and activities
- Access to vocational training
- Social security coverage

Rémunération
Gross salary: 2,653 Euros per month.