Infiltration instabilities in granular materials: theory and experiments

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Some of the most important geotechnical challenges involve the interaction of soil and water. Hydraulically induced erosion processes manifesting themselves in dam failure, mud slides and liquefaction are particularly destructive causing enormous damage to infrastructure and buildings. Critical for the prevention of these events is a better understanding of the conditions leading to the formation of unwanted fluid pathways by erosion ultimately leading to the catastrophic failure of whole structures. Although erosion has been the subject of extensive investigations in civil and petroleum engineering, the transient processes characterising the onset of instabilities are still poorly understood.

After organising a workshop in November 2012 on this topic, we decided to publish the contributions to the workshop in a special issue of *Acta Geotechnica*. The following contributions focus largely on the objectives of the workshop, which were as follows:

- Providing a forum for national and international researchers investigating instabilities in granular materials.
- Presentation of current and future research activities.
- Exchange of ideas on new experimental, mathematical and numerical approaches.
- Future research directions.

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The content of this special issue provides a broad overview of different approaches to investigate erosion, or in a broader sense hydraulically induced fluidisation, of granular and cohesive soils. These approaches include continuum-based computational and analytical methods to investigate the transient nature of erosion as well as the manifestation of instabilities during erosion and methods on the micro-scale to describe the characteristics of soils in terms of pore structure and load distribution as well as to investigate micro-structural features of the erosion process itself. The special issue is completed with contributions focussing on practical problems associated with water currents and embankments. It is hoped that this series of articles will provide readers with a useful up-to-date overview of recent advances in the exciting and challenging field of erosion and continue to bring researchers from different disciplines and areas of civil engineering closer together by sharing and exchanging experimental, analytical and numerical techniques to study and better understand phenomena associated with fluidisation and transport processes of soils caused by flowing water.

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