Editorial

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Before turning attention to the contents of this issue, it is appropriate to pay tribute to the work of Professor Alistair Borthwick who has just remitted office as Chair of the Editorial Advisory Board of *Engineering and Computational Mechanics* after leading the journal since its founding in 2008. He has done an outstanding job in the demanding task of shaping the evolution of the journal and establishing its distinctive profile in the fields of solid and fluid mechanics and their various interfaces within the civil engineering discipline. We are delighted that Alistair will be remaining on the Panel for one more year to enable the journal to profit further from his experience.

The papers contained within this issue illustrate well not only the range of topics covered by the journal but also the continuing demand for sophisticated modelling techniques that investigate the fundamental mechanics of fluids and solids (and, in this case, granular media) for problems motivated by practical engineering problems. On this occasion, the issue contains, in addition to four regular papers, a briefing article – a short contribution that is offered a rapid publication route by the journal to provide topical updates on recent work and/or to stimulate debate within the ICE community.

The briefing paper, by del Olmo and Serrano (2013), offers an interesting development of ideas that were described in their full paper (del Olmo *et al.*, 2012) in an earlier issue of *Engineering and Computational Mechanics*. This precursor article dealt with the morphologic and mechanical analyses of three-dimensional granular media to determine the particle adjustments and the forces and settlements developed. The briefing paper explores further these ideas and generates a tool to describe (in particular, visualise) the distribution of forces within such discrete or granular media. In essence, the tool utilises information about dip and dip direction of the contacts between the particles using a stereographic representation, combined with the forces in these directions, to generate a three-dimensional representation of the force behaviour.

The paper by Leung *et al.* (2013) is a classical structural analysis that deals with the behaviour and effects of moment redistribution on reinforced concrete (RC) and prestressed concrete (PC) members. The underlying objective motivating the analysis is to determine whether moment redistribution affects the load-carrying capacity of PC members and, in particular, whether the flexibility of most design codes that allows a maximum moment redistribution of 20–30% of the design elastic moment in RC

members should also apply to PC members (which tend to be less ductile because of more reliance on compression). The authors develop a nonlinear finite-element analysis to investigate these problems and demonstrate that due care must be exercised when codified moment redistribution for PC members is applied.

The third and fourth papers in this issue are concerned with applications of the technique of smoothed particle hydrodynamics (SPH) to problems that are quite different in engineering context and having applications to quite different fields. Since the inception of the SPH method in 1977 in the discipline of astrophysics (Gingold and Monaghan, 1977), its use has spread to problems in fluid and solid mechanics. Here, the method is applied, respectively, to a downslope lock release of dense fluid (Shao, 2013) into a large quiescent reservoir of light fluid and the flow into a mould of ultra-high-performance, self-compacting concretes (UHPSCC) containing short steel fibres (Kulasegaram and Karihaloo, 2013).

The buoyancy-driven flow generated by the lock release of dense fluid into a reservoir containing quiescent, less-dense fluid (with or without an entry slope) is a classical flow configuration in environmental fluid mechanics and it is one that has attracted a lot of attention for many years as a benchmark configuration against which numerical model predictions can be tested. There is a wealth of laboratory experimental data available with which to compare these predictions (in particular, with regard to the generation of dense, bottom gravity currents) and those of other (i.e. analytical) theoretical models. (The excellent book by Simpson (1999) remains one of the best entry points into this field for the non-specialist.) The paper by Shao (2013) considers the transient flow generated by the intrusion of the dense, downslope flow into a receiving water reservoir, that is itself stably-stratified, and the resulting formation of an internal solitary wave at the intrusion point – a problem defined by an earlier SPH analysis of gravity currents by Monaghan *et al.* (1999). The numerical method developed is based on the general multi-fluid flow equations and uses a unified pressure formulation to address the interactions among the different components of the fluids. It is a mesh-free, particle-modelling approach that the author claims can treat the free surfaces and multi-interfaces in a straightforward manner.

The paper by Kulasegaram and Karihaloo (2013) uses the SPH approach to investigate the distribution and orientation of steel fibres within a viscous, non-Newtonian fluid (in this case,

UHPSCC), as the fluid flows from a hopper into a two-dimensional mould of prescribed geometry and eventually fills it. The numerical solution of the flow equations of continuity and momentum, combined with (a) a bilinear Bingham-type rheological model for the UHPSCC and (b) a novel procedure to monitor the translation and rotation of the steel fibres during the flow, forms the heart of the paper. The solutions illustrate (for increasingly complex mould geometries) how the method is able to capture the time-dependent behaviour of the steel fibres and, in particular, their inhomogenous distributions within the moulds.

The behaviour of a submerged hydraulic jump and, in particular, the assessment of different turbulent closure schemes to describe this behaviour, is the topic of the fourth paper (Raiford and Khan, 2013). The authors focus attention comparing and assessing the accuracy of two turbulent closure schemes ($k-\varepsilon$ and renormalised group (RNG) $k-\varepsilon$) employed in a three-dimensional flow model to simulate a submerged hydraulic jump. Archival laboratory data on mean and fluctuating velocity components for such a flow are used for verification of these two turbulent closure schemes. The study indicates that the three-dimensional flow model itself constitutes a significant improvement on previous two-dimensional models and that, furthermore, the RNG scheme performs better than the $k-\varepsilon$ scheme in predicting the mean flow properties of the flow. (Both schemes perform similarly in predicting the turbulent flow properties.)

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