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MODELLING OF MEDIUM TO DENSE FLUID-PARTICLE FLOWS

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ABSTRACT

The production, handling, storage, transport and processing of granular material is of major importance in nearly all sectors of industry. Many natural and industrial particle and fluid-particle systems display unpredictable behaviour, leading to undesirable losses in resources and energy or dangerous natural hazards. Accurate flow models for granular materials and fluids are be beneficial to many applications, ranging from iron- and steelmaking, chemical and process industry, pharmaceutics, to the movement of coastal and river sediments.

This mini-symposium intends to discuss a wide variety of modelling approaches that can be used to simulate the behaviour of relatively dense (particle volume fraction > 0.01) particle and fluid-particle systems. On the one hand, a **kinetic theory based mathematical modelling approach in an Eulerian frame** can be used, such as kinetic-theory based models, which are based on the fundamental assumption of 'molecular chaos' at the grain level.

On the other hand, a **Lagrangian or particle-based approach** can be used based on either statistical methods, where inter-particle collisions are implemented by probability based 'virtual' collision partners, or based on deterministic methods, such as the **Discrete Element Method** (DEM) and the **CFD-DEM method**. Moreover, these approaches can be combined to yield **hybrid Eulerian-Lagrangian models** for the particle phase, which have great potential to model large particulate flow systems, e.g., geophysical flows. Also, modelling particle-fluid interactions accurately in large systems is extremely challenging. Therefore, the development of **filtered drag laws** (for the Lagrangian approach) and **sub-grid drag models** (for the Eulerian approach) is still an on-going task.

This mini-symposium intends to build bridges between different communities and modelling approaches. It aims on providing a platform for the discussion of novel model strategies and algorithms, as well as their validation. Participants are encouraged to present their **theoretical research as well as applications and/or experimental results.** Contribution of work related to hybrid modelling approaches is especially encouraged.