# Abstract

Since the Eyjafjallajökull eruption in 2010, the volcanic modelling community has been focused on improving the prediction of ash dispersion and simulation of eruptive columns.
While many new and powerful numerical methods have been developed for Computational Fluid Dynamics (CFD) and Atmospheric Modelling, very few have been integrated into models for volcanic eruptions.
Conventional plume models usually lack high spatial resolution if the distance to the volcanic vent is large and (mostly) cannot represent shocks. Both of these problems are to be dealt with by using new CFD techniques.

In contrast to algorithms which are currently available in the volcanic modelling community, this work focuses on implementing different spatial discretization methods - Discontinuous Galerkin Methods (DGM) instead of Finite Volume Methods or Finite Difference Methods - while also using Adaptive Mesh Refining (AMR) techniques.
This combination eliminates both resolution problems (due to AMR) and the lack of shock capturing (due to DGM).
Gas dynamics are described by either using the Euler or Navier-Stokes Equations while the AMR utilizes h-adaptivity with a suitable error estimation.
Time-integration is either performed with strong stability preserving (explicit) Runge-Kutta (SSPRK) methods or implicit timestepping schemes such as Rosenbrock-Wanner methods.

I will present results that show the ability to capture shocks with DGM and present challenges that arise with both CFD and AMR approaches in volcanic modelling.

Library used for AMR: AMATOS (see Behrens et al., 2005)

# References

Behrens, Jörn; Rakowsky, Natalja; Hiller, Wolfgang; Handorf, Dörthe; Läuter, Matthias; Päpke, Jürgen and Dethloff, Klaus (2005). *amatos: Parallel adaptive mesh generator for atmospheric and oceanic simulation. Ocean Modelling*, 10(1–2):171 – 183. ISSN 1463-5003. doi:http://dx.doi.org/10.1016/j.ocemod.2004.06.003. The Second International Workshop on Unstructured Mesh Numerical Modelling of Coastal, Shelf and Ocean Flows
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