The NEMOH Final Conference will be held in Catania, Sicily, at the foot of Mount Etna, in the first half of November 2015, when approaching the end of the project on December 31, 2015. The Conference will be a topical moment in the life of NEMOH: it’s where the NEMOH fellows will be able to show to a ample community of scientists their activities and achievements, demonstrate the experience they have acquired in science, and qualify themselves as excellent representatives of the next generation of volcanologists. Besides the vast community of NEMOH’s scientifics, extended to the many colleagues who provided highly qualified training at NEMOH schools, courses, and field trips, selected top scientists from all over the world, mostly indicated by the same fellows, will be invited to join the Conference together with representatives of the EU Research Executive Agency. The Conference will be more than simple presentation of activities and results; as a suggestion from the same NEMOH fellows, the invited experts will be asked to interact directly with them and discuss, in separate groups as well as in plenary sessions, the present and future trends in volcanology and the most critical open issues in the scientific areas of research developed under NEMOH. The Conference will follow the last NEMOH School dedicated to Volcanic Hazards, a highly relevant issue relating volcano science to volcano impacts, and volcano scientists to the society.

The dates and location of the NEMOH School and Final Conference will be published in the NEMOH website and diffused to the scientific community.

The European Union within Horizon 2020, the European funding plan for scientists in the next seven years (2014-2020). It was a really precious lesson, both for the clarity of the lecturer and for the importance of the topic. In fact, nowadays a relevant part of scientists’ work consists in writing projects to get funds for their research. Therefore, we appreciated the interaction between students and experts on this very delicate theme.

It was a very useful school for my research-topic. Modeling volcanic ash aggregation requires often a basic knowledge of fluid-dynamics and a clear approach to ordinary and partial differential equations. And this school has been the occasion to clarify some concepts and doubts that are always present in an “early researcher’s life”. No less important was also the day dedicated to OpenFOAM, since it represents the GNU standard to solve fluid-dynamics complex problems in the scientific community. In my opinion the next generation of volcanologist will have to know at least the basic features of Computational Fluid Dynamics (CFD): OpenFOAM seems to be the good environment to learn how to do it. The thing that impressed me more is that in less than a day we were capable to understand and solve numerically quite complicated problems!

Finally, the lecture on multiphase flows showed me the next frontiers of multiphase fluid-dynamics, which represent probably the future approach to the study of volcanic ash aggregation. In summary: a kind of training to recommend to all the students (not only from volcanology) and to all the organizers.
Cristian Montanaro - NEMOH fellow
Secondment at Institute of Earth Sciences (IES), University of Iceland, Reykjavik

In the period May-June 2015 I was invited to a secondment at the Institute of Earth Sciences (IES), University of Iceland. The aim was to carry out research on the volcanic hazard assessment in Iceland. It included visits to geothermal areas, and a field trip to the Vatnajökull ice cap to study the deposits from recent phreatic eruptions, for sampling and analyses.

At IES I have been supervised by Prof. Magnus Tumi Gudmundsson who followed me during my research and helped me, with very stimulating and fruitful discussion on volcanism, geothermal systems, and previous steam-blast events in Iceland. A relevant component of the secondment was the chance to participate to the Vatnajökull field trip; there, I had the possibility to visit Gígjissík lake in the area of Kverkfjöll, a volcanic caldera with an active geothermal area on its northern rim. The interest raised from the fact that on the 15th of August 2013 the lake emptied spectacularly producing a small flooding (Jökulhaup) and several small phreatic explosions. This represented therefore a unique opportunity to have a look at the deposits and get more insight on the processes of phreatic eruptions in an area poorly studied and understood. The overall expedition took 12 days, one and a half of which necessary to reach the area of interest.

Together with Magnus and my NEMOH fellow-mate Hannah Reynolds we explored the area around the lake, which incloses several small calderas (or near-boiling) hydrothermal pools, and sulphuric fumaroles in hydrothermally altered ground. GPS measurements of the present lake level and of the remaining (and not snowy covered) explosion craters were taken. The abundant discussion we had in the field concerned largely the chemical and physical of the deposits, the nature of the sediments involved in the explosions, in order to reconstruct the processes and dynamics after lake drainage. Finally, samples were collected in the proximity of craters, and ice cores were drilled to retrieve material from the distal deposits to better characterize the fine ejecta dispersed in small fans 1 km north of the lake.

Together with local NEMOH fellow Hannah Reynolds, I visited a hydrothermal area to measure heat flow in the ground. Magnús and I spent a day at the geysir Strokkur and took thermal videos of its eruptions. Later on, I took some other field trips. I leave impressed, a phreatic eruption took place at Kverkfjöll volcano during my stay. The resulting excursion to this glacier-covered, hydrothermally active volcano was the highlight of my secondment. We sampled and mapped the eruption deposits, starting the collection of a detailed data set, which was later complemented and extended by NEMOH fellow Cristian Montanaro. My second secondment brought me to yet another hotspot of European volcanic research. Being interested in the statistics of phreatic eruptions, setting up collaboration with Laura Sandri at INGV Bologna in Italy was a natural choice. The Bologna group developed the BET_VH code to compute probabilities of volcanic hazardous phenomena. After a detailed introduction to the software by Laura, I set up a database for phreatic eruptions at a specific volcano. We are now applying the BET_VH code to calculate the probability for the occurrence of phreatic eruptions, which will be of high interest for the local stakeholders. This secondment perfectly complemented my project with expertise and opportunities I could not have found in Bristol. They are therefore a valuable addition to my research, so once again: Thank you NEMOH!

Julie Oppenheimer - NEMOH fellow
Sweet experiments in the analogue lab

The Geophysical Fluid Dynamics laboratory in Bristol often smells like flapsacks, an English treat made of oats and sugar syrup. That’s because many occupants of the lab use golden syrup as an analogue for magmatic melt. I chose to work with syrup because its rheology and other properties can vary. I set up experiments to investigate the effectiveness of magma-layers, by adding water or changing the room temperature.

My research is on how crystal-rich magmas lose their volatiles, an open question in volcanology. To this end, I study bubble shapes and gas flow in suspensions of syrup and glass beads (analogues for melt and crystals respectively). I started by replicating experiments performed by engineers and physicists, who inject air into particle suspensions sandwiched between two glass plates. This 2D set-up allows observation of gas migration patterns, but it also affects bubble shape. Thus I increased the gap between the parallel plates, and I performed experiments in gravity. As a result, the bubble shapes vary. In volcanoes, gas bubbles form from volatile exsolution, so I also used chemical reactions to grow bubbles in situ.

I observed two transitions in gas bubble morphology, from round bubbles to deformed shapes, and from smooth to rough. These transitions did not depend on the liquid viscosity. Instead, they were mainly affected by particle fractions. The bubbles first began to deform at the lowest particle packing value, at which most particles mechanically interact with their neighbours. Above this value, adding particles to the suspension increased the number of contacts between bubbles and coalesced more efficiently, and favoured gas expulsion through permeable pathways. This mechanism promoted outgassing in the more particle-rich suspensions, and thus provides an appealing explanation for how crystal-rich magmas lose their volatiles. These results have recently been published in Frontiers in physics, in a paper co-authored by Dr. Alison Rust, Prof. Kathy Cashman, and Dr. Bjorn Sandnes. It is freely available to download on their website.

Deepak Garg - NEMOH fellow
The role of NEMOH in career development

NEMOH gave me a wonderful opportunity to meet and present myself to many well known scientists working in my research field. It helped me to get their knowledge and experience, that will be useful in the long run. Events like short courses and schools organized in the frame of NEMOH were of a great scope; there, I had overview of technologies and techniques used in the field of volcanology.

The courses covered a broad view of topics including monitoring, experiments and numerical modelling including a detailed guidance on how to apply and write proposal for research grants.

In our fellows’ projects we are trying to merge complementary research fields in a multidisciplinary approach. In this way NEMOH opens a new door for us to switch from one field to another and experiment our capabilities. On my side, being a mathematician I am applying numerical modelling to the Earth sciences and specifically to volcano dynamics.

Since I joined the NEMOH ITN, it provides a good amount of funding for travelling to attend interesting conferences, it helps me in setting up contacts with other scientists: people from different international research groups or the scientific community, and direct knowledge of many relevant scientists to apply for a position in science.

The skills and knowledge acquired under NEMOH not only enable us to apply for future research funding at national and international level, but also allow us to apply for other job opportunities in academia and industry.

Karen Strehlow - NEMOH fellow
From exploding lakes in the North to probabilistic hazard assessment in the South - scientific sightseeing in NEMOHland

My first secondment led me to Europe’s volcanic paradise: Iceland. While my work on hydrothermal systems is purely theoretical at home, volcanology in Iceland is “the real thing”. Magnús Tumi Gudmundsson took care of a great field complementary to my numerical project.

I observed two transitions in gas bubble morphology, from round bubbles to deformed shapes, and from smooth to rough. These transitions did not depend on the liquid viscosity. Instead, they were mainly affected by particle fractions. The bubbles first began to deform at the random loose packing value, at which most particles mechanically interact with their neighbours. Above this value, adding particles to the suspension increased the number of contacts between bubbles and coalesced more efficiently, and favoured gas expulsion through permeable pathways. This mechanism promoted outgassing in the more particle-rich suspensions, and thus provides an appealing explanation for how crystal-rich magmas lose their volatiles. These results have recently been published in Frontiers in physics, in a paper co-authored by Dr. Alison Rust, Prof. Kathy Cashman, and Dr. Bjorn Sandnes. It is freely available to download on their website.