

JSPS Summer Programme 2012

JSPS Fellow: Iona McIntosh

PhD Research student, Department of Earth Sciences, Durham University, UK

i.m.mcintosh@durham.ac.uk

Host researcher: Dr Alex Nichols

Institute for Research on Earth Evolution (IFREE), Japan Agency for Marine-Earth Science and Technology (JAMSTEC)

I am a final year PhD student in the UK studying the growth of gas bubbles in magma. Volcanic eruptions are driven by gas bubbles and the mechanisms of bubble growth can control whether an eruption is effusive (e.g. lava flows) or explosive (e.g. pyroclastic flows). The history of a bubble's growth is recorded in the water concentration profile in the surrounding melt, which is preserved when the melt is quenched to glass. In the UK I have measured water concentrations surrounding bubbles in experimentally-decompressed samples, and compared them with predicted concentration profiles from current numerical models of bubble growth. My findings have been surprising – measured concentration profiles reflect bubbles that were shrinking rather than growing, despite being designed as bubble-growth experiments. These counterintuitive results can be explained by resorption caused by temperature-induced changes in water solubility during the quench to glass.

During the summer programme I worked with Dr Alex Nichols of IFREE, JAMSTEC to measure water speciation surrounding bubbles using Fourier transform infrared (FTIR) spectroscopy. Water speciation in glass varies with total water concentration, temperature, pressure, and above and below the glass transition, and thus speciation data will provide insight into processes which create and modify water concentration profiles around bubbles. During my time at JAMSTEC I obtained high resolution maps of water speciation in experimental samples and these will form the basis of my remaining PhD research.

I had a wonderful time working at JAMSTEC. The analytical facilities are excellent, however far more important are the scientists and staff who are very welcoming and happy to help if problems arise. My advice to anyone taking part in future summer programmes is to say yes to any and all invitations and opportunities! This is how I found myself taking part in a fantastic two-week research cruise in the Izu-Bonin arc, observing and sampling submarine volcanoes using a remotely operated underwater vehicle (ROV), and participating in a short field excursion to the Izu peninsula, where we spent our days experiencing outstanding geological sites and our nights enjoying wonderful food and onsen relaxation in traditional ryokan accommodation. Saying yes is also how I found myself experiencing a ninja-theme izakaya in Tokyo, firework festivals, amazing meals out, and (of course) late night karaoke sessions. Unfortunately it's also how I found myself eating raw liver, but hey, it makes for a good anecdote back home.

Having previously lived and worked (as an English teacher) in Fukuoka for a year I had some experience of life in Japan. The summer programme however was an important opportunity to experience working in a research environment. I think my only other piece of advice to future participants would be to try and learn a few basic phrases before you come – a little goes a long way. If you have a little more time then it is wonderful to be able to read the hiragana and katakana writing systems. I would recommend starting with katakana – life in Japan becomes far less intimidating when you can read 'coffee' and 'chocolate'!



Top: the JAMSTEC research vessel 'Natsushima'. Bottom: a completely unexpected 'Diamond Fuji' sunset seen from the deck of the Natsushima – a breathtaking sight and a real highlight of my trip.