CURRENT POSITION

since 01/10/2014 — **Wissenschaftlicher Mitarbeiter (research & teaching assistant)** Department for Earth and Environmental Sciences**,** LMU Munich, Germany

PREVIOUS POSITIONS

01/05-30/07/2014 — **Reserve instrument manager, electron micro-beam facility,** LEMAS (Leeds Electron Microscopy and Spectroscopy) Centre, University of Leeds, UK

01/05/2012-30/04/2014 — **DFG** (Deutsche Forschungs Gemeinschaft) **visiting research fellow** at the School of Earth & Environment at the University of Leeds, UK

Teaching assistant

2011-2012 — Teaching assistant, Ruhr-Universität Bochum, Germany

Doctoral Research assistant

04/2006-02/2011 — Doctoral Research Assistant, Collaborative Research Centre CRC-526 " Rheology of the Earth" at the Institute of Geology, Mineralogy & Geophysics at the Ruhr-Universität Bochum, Germany

Student teaching assistant

2002-2006 — Student teaching assistant, Institute for Geology & Palaeontology and Institute for Mineralogy, Universität Heidelberg, Germany

FUNDING (PAST)

05/2012-05/2014 — Candidate as **Principal Investigator**, **DFG visiting research fellowship**, School of Earth & Environment, University of Leeds, UK

Project title — Using the chemical stratigraphy in magmatic crystals to track the evolutionary history of a dynamic magma plumbing system

2006-2011 — As doctoral research student with Prof. Sumit Chakraborty and Dr. Fidel Costa, Collaborative Research Centre CRC- 526 "Rheology of the Earth – from the upper crust to the subduction zone"

Project title — Rheological response of the continental crust to thermal pulses related to magmatism and volcanism

EDUCATION

04/2006-02/2011 — PhD Ruhr-Universität Bochum, Bochum, Germany – *Magna cum laude (1.0)*

PhD — Timescales of magma mixing and magma recharge - a case study from Mt. Etna (Sicily, Italy). *Date of award 01/02/2011*

10/2000-10/2005 — Diploma (Equivalent to five years of Bachelors + MSc research degree) Mineralogy, University of Heidelberg, Germany – *Very good (1.1)*

Thesis — The chemical internal structure of phenocrysts from the Laacher See-Tephra (East Eifel volcanic field, Germany) including Li, Be and B. *Date of award 25/10/2005*

2000 — Abitur (A levels), Gymnasium Schloss Wittgenstein, Bad-Laasphe, Germany – *Good (1.7)*

AWARDS

2014 — **Invited seminar talk** at ETH Zurich, Switzerland, June 19, 2014 invitation of Olivier Bachmann

2012 **Fellowship grant** of the Deutsche Forschungs Gemeinschaft (DFG), **candidate as PI**

2012 **Invited seminar talk** at David A. Johnston Cascades Volcano Observatory – USGS, Vancouver WA, USA, June 12, 2012 invitation of Carl Thornber

2012 **Invited speaker** at DMG (Deutsche Mineralogische Gesellschaft) & MSA (Mineralogical Society of America) Diffusion short course, Ruhr-Universität Bochum, Germany, October 2, 2012

2012 **Invited keynote talk** at AGU (American Geophysical Union) Fall Meeting 2012, San Francisco CA, USA, December 6, 2012

2008 **Invited speaker** at AGU (American Geophysical Union) Fall Meeting 2008, San Francisco CA, USA, December 18, 2008

2007 **Invited seminar talk** at Istituto Nazionale di Geofisica e Vulcanologia – Sezione di Palermo, Italy, May 2007 Invitation of Sergio Gurrieri

PROFESSIONAL SKILLS

Practical/Instrumental

- Electron microprobe: CAMECA SX50, SX51, JEOL 8230
- Ion microprobe: Cameca ims 3f (Heidelberg) for analyses of light elements (Li, Be & B) in volcanic crystals
- SEM: use and maintenance of FEI Quanta 650 FEG-ESEM, LEO 440, LEO 1530 and Gemini FESEM for backscatter, secondary, CL and electron back-scatter diffraction (EBSD) techniques, with data processing

Data analysis/Modelling

- **Numerical diffusion modelling** using **finite difference** and analytical solution methods
- Geochemical modelling for major and trace element diffusion in minerals
- **Concept** and **development** of **sequential kinetic modelling** methods
- **Development** and **adaptation** of **systems analysis methods** to geochemical data
- Programming in Mathematica® and FORTRAN 77

ADMINISTRATIVE DUTIES

- Institute seminar series co-ordinator for Institute of Geophysics and Tectonics, School of Earth & Environment, University of Leeds (2013-14)

COLLABOARTORS & SCIENTIFIC NETWORK

- D. Morgan, SEE, University of Leeds, UK
- C. Thornber, USGS-CVO, USA
- M. Pompilio, INGV- Pisa, Italy
- M. Liuzzo, INGV- Palermo, Italy
- M. Viccaro, University of Catania, Italy
- S. Chakraborty & R. Dohmen & K. Hackl, Ruhr-University Bochum, Germany
- F. Costa, Earth Observatory at NTU Singapore, Singapore
- J. Gross, American Museum of Natural History New York, USA
- T. Thordarson, Institute of Earth Sciences, Reykjavik, Iceland
- G. Lloyd, J. Neuberg and A. Schmidt, SEE, University of Leeds, UK

RESEARCH HIGHLIGHTS

The development of novel petrological methods to track magma through space and time in the internal plumbing of basaltic volcanoes (see below).

A Systems analysis tool for tracking magma migration pathways: The first method I have developed uses the compositional variations within crystals to establish populations and groupings of crystals that had been subject to the same or similar magmatic processes. By invoking a systems analysis approach – adapted from engineering methodologies – to a geological setting, I am able to extract information regarding magma flow pathways from the diverse population of olivine erupted. The developed tool is 'key' to unravelling magma plumbing and tracking the pathways taken by compositionally different batches of magma on their way to the surface. The great potential of the method is that it is analytically inexpensive and can be employed gainfully to understand the plumbing relations of geographically and temporally remote volcanoes. The method has been applied to eruption products of Mt. Etna.

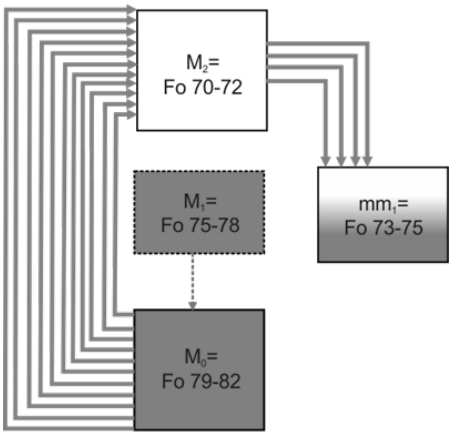

Fig. 1 illustrates such a Systems analysis diagram of olivine crystals from Mt. Etna. Boxes represent magmatic environments (e.g. reservoirs) of different composition identified based on different olivine core and rim plateau compositions. Arrows illustrate nature and direction (core to rim) of zoning in individual crystals. The density of the connection lines can be used to infer the dominant passageways of magma transport. Based on this plot it is possible to identify and quantify populations of crystals with similar magma transport histories. *Kahl et al. (2011 & 2013)*

Sequential kinetic modelling tool to recover duration of magma transport: The second technique involves the further development of the diffusion models utilised by the Bochum research group. The systems analysis information provides a framework, linking crystals by chemistry and process; diffusion modelling allows quantification of time, a key parameter for assessment of volcanological hazards. This tool was paramount to quantifying the characteristic timescales of the evolution of magma migration routes for the first time within Mt. Etna's plumbing system.

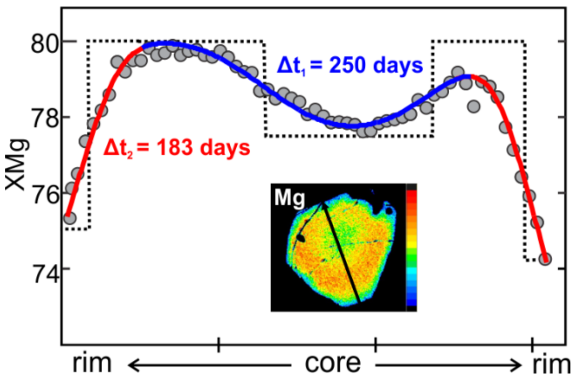

Fig. 2 depicts a typical result of stepwise modelling of a zoned crystal. Dots: Analytical data; Black dashed line: Initial profile; Black line: Best fit diffusion model. Inset: Mg distribution map (the darker the colour the higher the Mg concentration); Black arrow indicates the direction of the micro-analytical traverse. Sequential modelling reveals two timescales (Δt1, Δt2) corresponding to the residence of the crystal in two different magmatic reservoirs.

Linking magmatic processes to signals of volcanic unrest: The third aspect of my career to date has focused on building links between the timescales that can be obtained from the investigation of erupted products, and the time-series data from geophysical and geochemical monitoring that are recorded before and during volcanic crises. My work has demonstrated the connections between timescales recovered from diffusion modelling and CO_2/SO_2 degassing data obtained around the 2006 summit eruption of Etna volcano. The integrated methodology resolved two gas-rich magma recharge events occurring within months of each other (June and September), each triggering a different eruptive cycle in July and August 2006, respectively. Correlating these observations shows that a systematic rise of the CO_2/SO_2 gas values was associated with the gradual supply of gas-rich magma into parts of Etna's shallow plumbing system. This work contributes to better understanding the link between volcanic unrest signals and the underlying magmatic processes at depth.

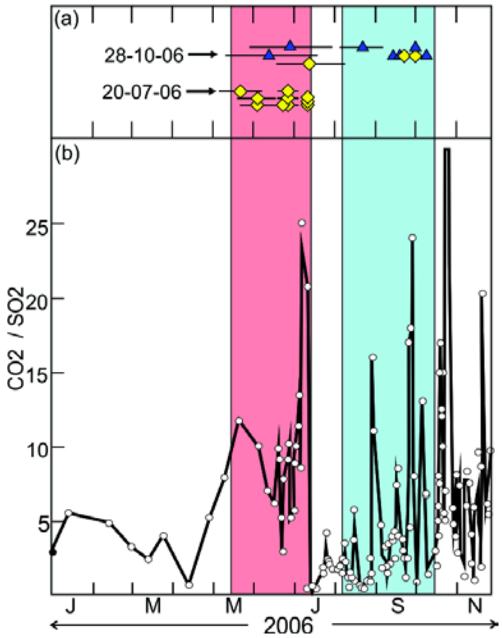

Fig. 3 shows the connection of (a) timescales recovered from kinetic modelling with (b) CO_2/SO_2 degassing data obtained before and during the July and October 2006 summit eruptive events of Etna volcano. CO_2/SO_2 data from Aiuppa et al. (2007).
Error bars represent uncertainties arising from geothermometry and oxygen fugacity. *Kahl et al. (2013)*