Diamond-facies fluid flow during subduction: Evidence & consequence

ALEX QUAS-COHEN[1]*, SIMON CUTHBERT[2], GILES DROOP[1], CHRIS J. BALLENTINE[1] AND RAY BURGESS[1]

[1]School of Earth, Atmospheric and Environmental Sciences, University of Manchester, Manchester, UK (*correspondence: alexandra.quas-cohen@postgrad.manchester.ac.uk)

[2]School of Sciences, University of the West of Scotland, Paisley, UK (Simon.Cuthbert@uws.ac.uk)

Exhumed, subducted crustal terranes record the most extreme metamorphic conditions that continental rocks are known to experience and enable us to gain insight into the more elusive systems and processes of the Earth. Abundant fluid flow and fluid-rock interaction is evident during subduction even at the highest-grade conditions: numerous veins within a Fe-Ti, crustal garnet peridotite body in the Western Gneiss Region (WGR) of Norway contain microdiamonds [1]. Many questions remain unanswered regarding fluids and interactions at these depths. Our study focuses on the metasomatism of ultra-high pressure (UHP) rocks in the WGR; in particular, on determining the signature, source and recycling of noble gases and halogens. I present field maps and sketches of various UHP WGR localities to demonstrate the petrophysical relationships between various rock-types and features which demonstrate the nature and composition of intruding fluids; particularly, the associations of pegmatitic garnet websterites, carbonaceous and hydrous phases and different vein-types with Fe-Ti garnet peridotite and bimineralic eclogite bodies. I also present preliminary geochemical data demonstrating phase compositions, P-T conditions, chemical change due to fluid-rock interaction and noble gas compositions. Data gathered so far indicates that garnet websterites represent metasomatised domains of the peridotite and eclogite bodies within the WGR.

[1] Vrijmoed *et al*. (2006) *Mineral. Petrol.* **88**, 381–405.

The impact of transported pollution on Arctic climate

P.K. QUINN[1] *, A.S. STOHL[2], A. ARNETH[3], T. BERNTSEN[4], J. BURKHART[2], M. FLANNER[5], K. KUPIAINEN[6], M. SHEPHERD[7], V. SHEVCHENKO[8], H. SKOV[9] AND V. VESTRENG[10]

[1]NOAA PMEL, Seattle, WA, USA (*correspondence: patrcia.k.quinn@noaa.gov)

[2]Norwegian Institute for Air Research, Kjeller, Norway (ast@nilu.no, jfb@nilu.no)

[3]Lund University, Lund, Sweden (Almut.Arneth@nateko.lu.se)

[4]University of Oslo, Oslo, Norway (t.k.berntsen@geo.uio.no)

[5]University of Michigan, Ann Arbor, MI , USA (flanner@umich.edu)

[6]Finnish Environment Institute, Helsinki, Finland (Kaarle.Kupiainen@ymparisto.fi)

[7]Environment Canada, Toronto, Canada (marjorie.Shepherd@ec.gc.ca)

[8]P.P. Shirshov Institute of Oceanology of the Russian Academy of Sciences, Moscow, Russia (vshevch@ocean.ru)

[9]Aarhus University, Roskilde, Denmark (hsk@dmu.dk)

[10]Norwegian Pollution Control Authorities, Oslo, Norway (Vigdis.Vestreng@klif.no)

Arctic temperatures have increased at almost twice the global average rate over the past 100 years [1]. Warming in the Arctic has been accompanied by an earlier onset of spring melt, a lengthening of the melt season, changes in the mass balance of the Greenland ice sheet, and a decrease in sea ice extent. Short-lived, climate warming pollutants such as black carbon (BC) have recently gained attention as a target for immediate mitigation of Arctic warming in addition to reductions in long lived greenhouse gases. Model calculations indicate that BC increases surface temperatures within the Arctic primarily through deposition on snow and ice surfaces with a resulting decrease in surface albedo and increase in absorbed solar radiation. In 2009, the Arctic Monitoring and Assessment Program (AMAP) established an Expert Group on BC with the goal of identifying source regions and energy sectors that have the largest impact on Arctic climate. Here we present the results of this work and investigate links between mid-latitude pollutants and Arctic climate.

[1] IPCC (Intergovernmental Panel on Climate Change) (2007) *Summary for Policymakers, Contribution of Working Group 1 to the 4th Assessment Report*.