Funded PhD project at SUERC, University of Glasgow:

**Geochronology & geochemistry of Carboniferous volcanism throughout the Midland Valley of Scotland.**

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During the Carboniferous (359-259 Ma), Scotland lay near the equator in a position akin to central Africa, and therefore had a hot climate. The northern parts of Scotland were upland areas and the southern parts of Scotland were lower lying. Further to the north and west lay the North American continent, to which Scotland was joined, and to the south of what we know as England, lay a large ocean. During the Carboniferous, sea level rose and fell several times. There were times when southern Scotland lay underwater, covered by a shallow, warm sea. At other times this area lay above sea level. The shallow tropical seas of Carboniferous Scotland, much akin to the present-day Bahamas, were full of life and much of this life became preserved as fossils in the rocks, including shellfish, corals, crinoids, sharks and other fish. When above sea level, the land was covered by tropical swamps, where forests of large trees, that were very unlike modern trees, flourished. Giant-sized centipedes, dragonflies and spiders ruled the landscape along with amphibian and early reptiles, the forerunners of the dinosaurs. Over time, the remains of trees that had fallen into the swamps were buried deeply and compacted, eventually forming peat, and finally coal.

Volcanic activity was another important feature of the Carboniferous. The continent at this time was being ‘stretched’, allowing magma to well up from the mantle to form many volcanoes. The remains of these volcanoes are preserved as intrusive rocks and lava flows that dot the landscape of southern Scotland. These rocks comprise classical sites, such as Arthur’s Seat, Edinburgh.

Although the stratigraphic relationships of intrusive and extrusive volcanic rocks and the Carboniferous sedimentary rocks of Scotland are good, the absolute age and temporal framework of the rocks is poor. Lack of an accurate and precise temporal framework essentially leaves the Carboniferous rocks of Scotland ‘floating’ in time with reference to the Geological Time Scale. Without an absolute chronology the rates of climate change and evolution of flora and fauna preserved within the Carboniferous sediments throughout Scotland cannot be assessed.

The aim of this PhD project is to date, using high precision radio-isotope (Ar/Ar and U-Pb) geochronology, the Carboniferous volcanic rocks located throughout the Midland Valley. The data will be used to construct a robust temporal framework that can place these sequences of rocks within the global Geological Time Scale and constrain the ages of fossil-bearing sediments.

The project will utilise both high precision Ar/Ar (lavas and explosive eruptions) and zircon U-Pb geochronology (intrusive rocks and explosive eruptions) to date rocks from throughout the Midland Valley. The rocks will be sampled from secure stratigraphic settings and the required mineral phases for geochronology be extracted by the student. The fieldwork will be extensive and rocks will be characterised using optical microscopy, XRF and elemental analysis. The geochronological data will provide absolute temporal markers for anchoring the Carboniferous rocks of Scotland to the global Geological Time Scale. Radiogenic isotopes (Nd, Sr and Pb) will provide information about the magmatic evolution of the Carboniferous rocks and their parent magmas through time.

We are seeking a dynamic candidate with strong background in Physics, Engineering or Earth Science. The student must be mathematically competent with experience of working with, or desire to work with programming languages such as Python or Matlab. The 42-month studentship will be based at the Scottish Universities Environmental Research Centre (SUERC) in East Kilbride, Scotland (<http://www.gla.ac.uk/research/az/suerc/>). The student will be a member of the College Science & Engineering, University of Glasgow Graduate School (<https://www.gla.ac.uk/colleges/scienceengineering/graduateschool/>) and will work directly with our industry partners Thermo Fisher Scientific.

To discuss the project please contact Professor Darren Mark (Darren.mark@glasgow.ac.uk).

To apply for the projects follow the instructions found at the link: <https://www.gla.ac.uk/colleges/scienceengineering/graduateschool/postgraduateresearchstudy/howtoapply/>

**Closing date 15th November 2021. The project will start early in 2022.**