

KATIE WILKINSON SCHOLARSHIP REPORT

CAN THE DOMINANT CONTROLS ON DYKE THICKNESS BE DETERMINED ON THE ISLE OF ARRAN? – CHARLOTTE MILLER

My dissertation focused on assessing whether the dominant controls on dyke thickness in the Isle of Arran can be determined. The Isle of Arran is a small island situated to the West of Glasgow (figure 1). It was chosen due to the abundance and variation of dykes across the island, as well as their good exposure and the variation in the country rock that the dykes were emplaced in. Additionally there have been a variety of studies on dykes on Arran, however none have specifically focussed on the variation in thicknesses of the dykes.

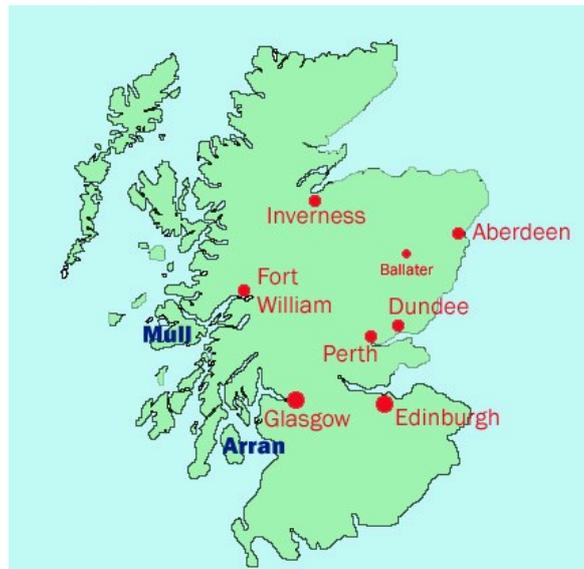


Figure 1 – Map showing where Isle of Arran is

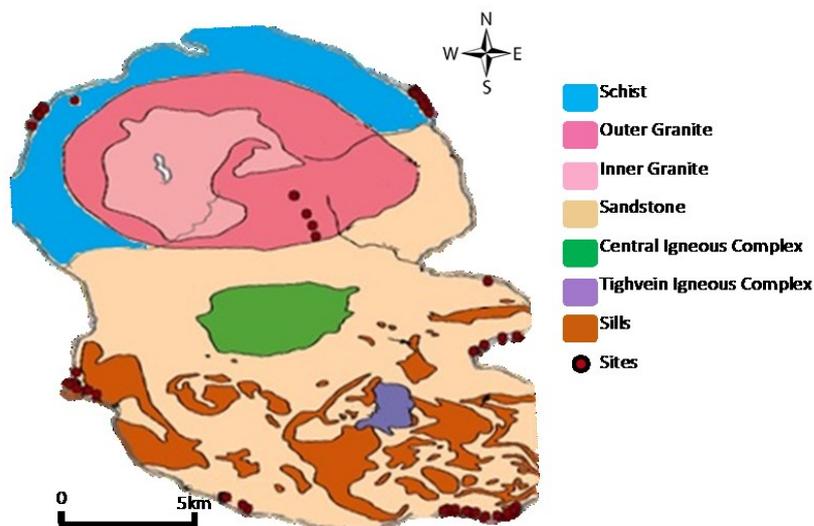


Figure 2 – Map showing where the sites that measurements were taken at and the different country rocks that they were emplaced in

The dykes were emplaced during the British Tertiary Volcanic Province (BTVP), which was a period of intense igneous activity in the British Isles that was associated with continental separation and lithospheric attenuation during the early stages of the opening of the North Atlantic.

I have always had an interest in earth science and in particular volcanism and their deposits, hence why I chose to do my dissertation on dykes and I had never been to Scotland before, which is another reason why I chose to do it in Scotland.

I undertook 10 days of fieldwork with a partner, where I organised transport, accommodation and data collection methods. Data was collected at six different locations across the island (figure 2). These sites were chosen in order to get a range of country rock types and dyke lithologies and also due to the high dyke frequencies in some areas. At each site the width, orientation, dip and dip direction were measured and a sample of the dyke and country rock was taken. I used a systematic sampling technique where each fifth dyke was measured, however this was only realistic to do in areas where there were ample dykes. Around the coast there were plenty of dykes to sample because the country rock was exposed to erosion from the sea and was sedimentary and therefore was a lot softer and easily eroded, as a result the dykes protruded out from the country rock a lot and it was a lot easier to find and measure them.

There were several challenges and limitations that I came across in the field. The tide was a limitation due to the tide affecting the amount of the dyke that was exposed. As a result when the tide was out, more dyke was exposed and more of the dyke could be evaluated, therefore getting a more accurate representation of the dyke than when the tide was in. Also it was sometimes difficult to distinguish between 2 different dykes, for example between a split dyke or 2 different dykes, so a decision had to be made there about which one it was and this might not have necessarily been correct. Also the boundary between the country rock and the dyke was sometimes difficult to establish, which would lead to inaccuracies in the width measurements of the dyke. These made the fieldwork challenging, but we overcame each problem.



Figure 3 – Scenery from walking up Goat Fell

After collecting all of the data I used X-Ray Fluorescence analysis to gain compositional data from all of my samples in order to categorize the dykes quantitatively using a Total Alkali-Silica (TAS) diagram. This was a very time-consuming process due to all of the preparation that was needed. I then used statistical analysis to analyse my data. I did this through fitting statistical distributions to the width data. To then analyse this data I also created a rose diagram and a width vs silica plot and compared all this analysis to my field observations and the statistical distributions. From this in depth analysis I was able to conclude that country rock strength is the dominating factor controlling dyke thickness, however there are other independent random factors that also affect dyke thickness. As a result all the work from my fieldwork and analysis paid off because I was able to come to a solid conclusion.

During the fieldwork I saw a lot of amazing scenery, wildlife and fantastic geology. There were lots of seals and jellyfish around and one day we climbed up the highest peak on the island, which was called Goat Fell, that day we walked 25km and it took us 5 hours to find out first dyke and I fell down a bog. We had some very eventful and entertaining days!

With the help of this scholarship I was able to afford flights to Glasgow, accommodation as well as travel around the island in order to complete my fieldwork. I am very grateful for this scholarship and it enabling me to do fieldwork for my dissertation and I loved every second out in the field. Doing independent fieldwork has embedded my love for earth science and working in the field. I believe that undertaking independent fieldwork is an invaluable experience and it enables you to develop many skills instead of just gathering secondary data. Before my dissertation I had only undertaken fieldwork as part of field courses with lecturers, so it was a big step to do field-work in a pair without direct instructions from lecturers. As a result I developed many skills such as organisation, through organising the accommodation, transport, data collection method as well as the sites. Team work skills were also developed through collecting data in a pair. Also time-management skills had to be developed due to having to balance the time out in the field and watch the tide and catch the bus back in time. Additionally these 10 days fieldwork, will go towards the fieldwork needed in order to get an accredited degree when I graduate. Once again I am incredibly grateful for receiving this scholarship, it has helped me fulfil my fieldwork for my dissertation to the best of my ability and has given me so much great experience in the field.



Figure 4 – An example of a well exposed dyke dipping heavily to the right



Columnar Jointing



An example of Cross-cutting dykes



An example of a very eroded dyke



Taking a sample of the Country Rock



A seal bathing on the rocks



A Jelly fish that had been washed up onto the shore

Figure 5 – A selection of photos showing the geology, wildlife, dykes and country rocks across Arran