Analysis of Glacial Sediments in North Norfolk, UK

During the summer of 2013, I conducted a week of fieldwork in north Norfolk in order to examine, in considerable detail, the glacial sediment exposures situated at various locations along the coastline, and to collect sediment samples for further laboratory analysis. An award from the Expeditions Fund provided financial assistance which enabled the successful completion of this fieldwork. This report provides an overview of: the fieldwork conducted; the laboratory analysis of samples collected; the relevance and implications of the fieldwork on my studies, and how the Expeditions Fund award assisted this.

1. Fieldwork Conducted During the Summer

North Norfolk, in eastern England, is a prime location for studying in situ glacial till sediments; sediments documenting Britain’s past glaciations are well preserved here, and rapid coastal erosion means that they are readily accessible.

My fieldwork consisted of the analysis of coastal sediment exposures at various locations along the north Norfolk coastline. Originally, I had planned to visit the coastal areas of only Sheringham and Weybourne; however, with the assistance of the Expedition Fund, I was able to extend this so as to visit West Runton and Morston as well [Fig.1]. At each exposure, all of the sediment layers were logged in considerable detail in order to provide context, and multiple sediment samples were taken for further laboratory analysis. At Morston, a single sediment exposure (approximately 2m high) was examined, and 3 samples of glacial till were taken. In contrast, numerous sediment exposures (approximately 12m high) were examined along the Weybourne-Sheringham-West Runton coastline and a total of 17 glacial till samples were taken.

The fieldwork was quite successful; time allowed for the careful recording of each sediment exposure, and multiple samples were taken across 3 different glacial tills and numerous localities along the coast. However, the work was quite strenuous, as most days involved long walks between exposures along the coast and hard climbs up the more stable cliffs in order to collect sediment samples. Yet, overall the fieldwork yielded successful results as more sites were examined and more sediment samples were collected for analysis than were originally expected.

Fig.1: Map of north Norfolk. Fieldwork focused on the sediment exposures at Morston, and along the Weybourne-Sheringham-West Runton coast.
2. Laboratory Analysis

The sediment samples collected during fieldwork were then processed and analysed in the laboratory in order to examine the micro-scale features of individual quartz grains. Scanning Electron Microscopy (SEM) has long been used to discriminate between different depositional environments: however, it has recently been suggested that SEM quartz microtextures can be used to reconstruct the dynamics of former ice-sheets; the identification and analysis of certain surface features are thought to indicate specific glacial and erosional processes, and as such sediment and glacial histories can be inferred. This laboratory analysis focused on testing this method: quartz grains were extracted from a particular grain size (250µm) for each of the 20 sediment samples collected, which were then analysed under the SEM microscope. Surface features, such as in [Fig.2], were then identified and quantified using statistical analysis methods, the results of which are still ongoing.

3. Implications for Study

Both the field and laboratory work conducted on the glacial sediment exposures in north Norfolk have formed the basis of my third year dissertation project. As part of this, I tested the validity of the application of SEM quartz microtextures as an indicator of former glacial dynamics using the sediment samples collected from the fieldwork in north Norfolk. Further to the laboratory analysis outline in this report, I have also applied numerous mathematical and statistical tests in order quantify the significance of my findings so as to fully explore the validity of the method in question. The fieldwork and collection of samples were a vital part of this project, and the project itself forms a vital part of my degree programme, and may have implications for further research and development of the method.

4. Expeditions Fund Assistance

The financial assistance provided by the Expeditions Fund enabled me to conduct the week of fieldwork in north Norfolk outlined in this report. The fund contributed to the costs of accommodation for the week, and for travel both to north Norfolk, and between the sites of interest in several towns along the coastline. Without the fund, I would have been limited to a few days in the field, which would have restricted the number of sites I would have been able to visit and collect samples from; however, the Expeditions Fund award actually enabled me to visit and sample more sites than was originally anticipated, which provided a greater dataset for study in my dissertation. I am exceedingly grateful to the Expeditions Fund Committee for their assistance which enabled me to conduct my first individual research project in north Norfolk.