

Detecting buried Archaeology using Airborne Remote Sensing

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Introduction

The uncovering of archaeological sites as a result of coastal erosion is very common (e.g. Skara Brae). Once revealed however, these important sites are then under serious threat from damage by further coastal erosion. A method is required which can be used to target unstable coastlines and determine the nature of the archaeological remains underneath. This pilot project tests the use of airborne multi-spectral remote sensing for detecting buried archaeological sites. The study was carried out on the islands of Coll and Tiree in Scotland (Figure 1).



Figure 1: Location of study area. The islands are typically low-lying and flat with thick layers of biogenic dune sand overlying bedrock.

The islands were visited by the antiquarian Erskine Beveridge who published a report on the island in 1903. His report detailed the archaeological remains that could be found on the island. In particular, Beveridge identified a number of chapel sites and associated burial grounds. These sites were subsequently revisited by the Ordnance Survey in 1972 and by the Royal Commission on the Ancient and Historic

Monuments of Scotland on numerous occasions in the 1970's. The visits revealed that many sites, particularly those in the dune fields, were no longer visible (Figure 2).

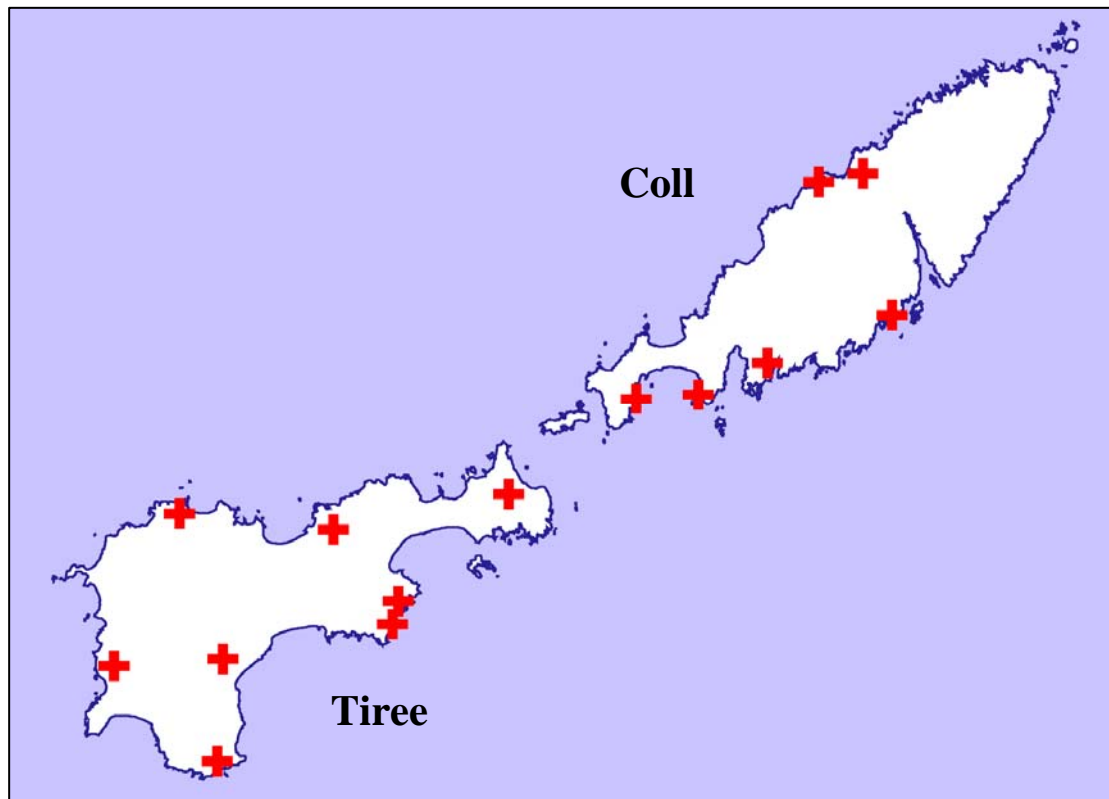


Figure 2: The Lost Chapels of Coll and Tiree.

Techniques

Visible, infra-red and thermal infra-red images were acquired by the NERC aircraft using the onboard Airborne Thematic Mapper (ATM) sensor (Figure 3). The images were processed and enhanced for visual interpretation. Processing methods included creating false colour composites, NDVI images and Principal Component Analysis. Resulting images were interpreted visually and any possible archaeological features identified were entered into an MS Access database. Potential sites were visited in the field.

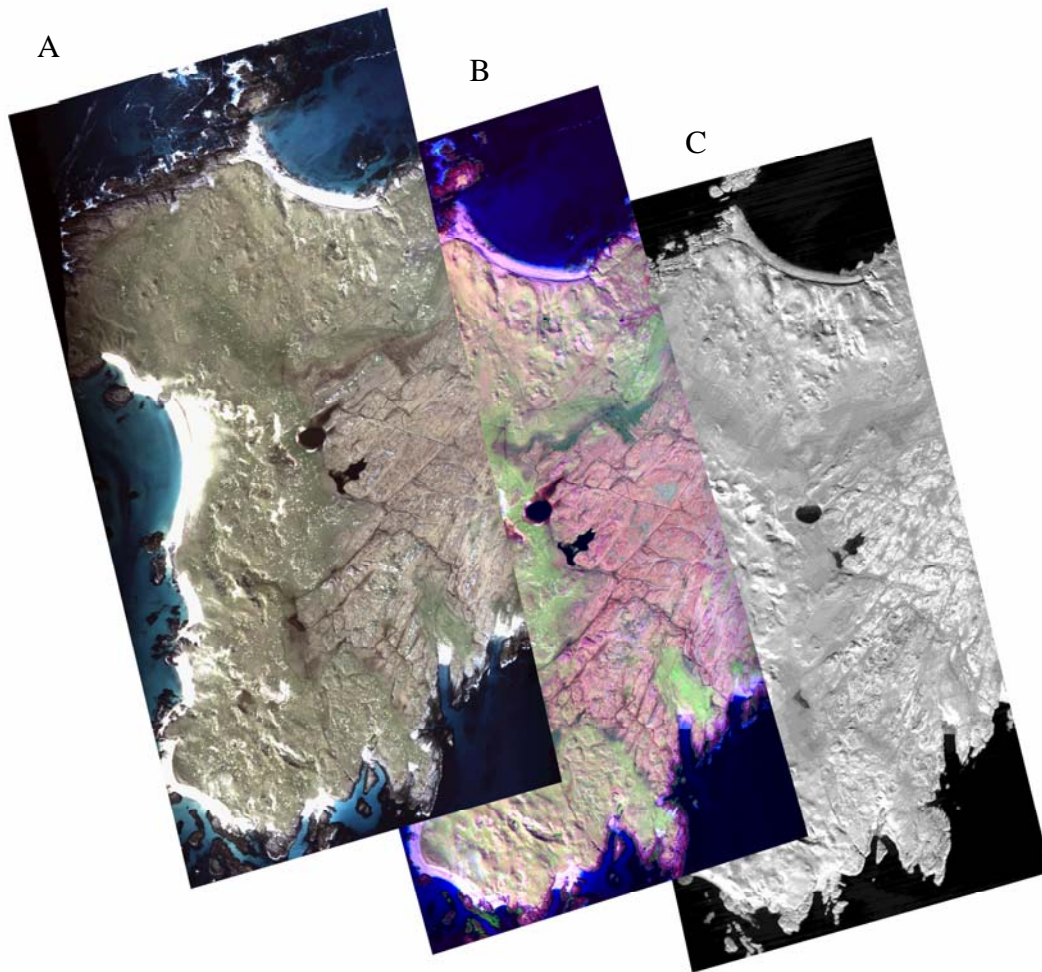
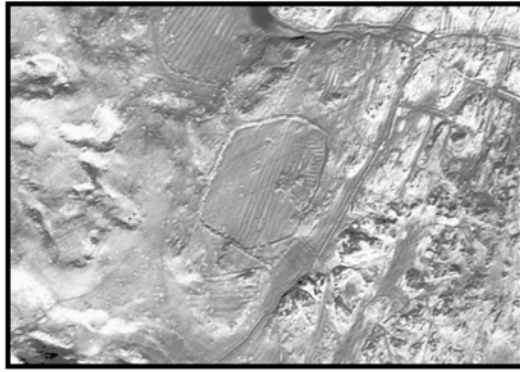


Figure 3: Images acquired by an Airborne Thematic Mapper (ATM) sensor:
A: True Colour Composite.
B: False Colour Composite.
C: Thermal Image.

Results

Daytime thermal images revealed small-scale topographic variations, which were useful for picking out abandoned enclosures and ruined buildings (Figure 4). Subtle differences in agricultural soils were revealed from multi-spectral imagery, and in particular infra-red images. These differences in the images resulted from older cultivation patterns (Figure 5). Daytime thermal images have revealed a possible chapel site believed to be Kilmoluag - the church of Moluag of Lismore, who died in 592 (Figure 6). Geophysics has confirmed the presence of buried structures.



0 100 200 300 Meters

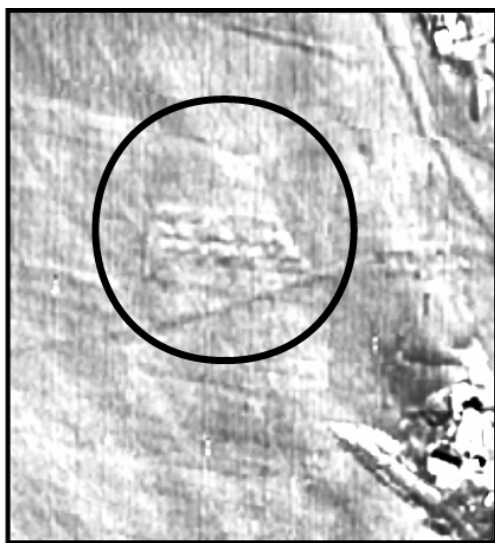
Figure 4: Thermal image revealing abandoned enclosures and ruined buildings.



A

0 50 100 150 200 Meters

Figure 5: Infra-red image revealing older cultivation patterns.



0 40 80 Meters



Figure 6: Thermal image revealing a possible chapel site.

Conclusions

- Features detected included buried walls, enclosures, abandoned farmsteads, buried structures (possibly chapels) and cairns.
- The dune dominated areas were problematic as it was difficult to interpret archaeological features amongst the irregular topography. However, within the machair areas, features were more clearly visible.
- Infrared and NDVI images were good for detecting a wide range of features.
- Thermal images were good for picking up small scale topographic variations.
- This pilot study proved the usefulness of this approach to synoptic archaeological prospecting within mobile sand-dominated environments which typify much of the northern and western coasts of the UK.

Acknowledgements

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