

Field Report on investigation into Periglacial Ramparted Depressions (PRDs) in Norfolk (Walton Common)

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Project summary:

Ice-cored hills were characteristic of permafrost zones across northern Europe during the Pleistocene epoch (>10 ka BP). Although their surface geometry is well-documented, their genetic origin is less well-understood. Accurate identification of relict ice-cored hills is further complicated as they decay and collapse to form Periglacial Ramparted Depressions (PRDs). This inverted topography means PRDs can look superficially similar to features created by different processes e.g. kettle lakes, solution hollows *etc.*, particularly when found in areas now without permafrost.

Project aim:

This is a multidisciplinary project combining geology, micromorphology and periglacial geomorphology to study PRDs, their genetic origin, form and landscape context. It is part of a broader study, the aim of which is to develop a set of diagnostic criteria at the macroscopic (geomorphological mapping, coring and test pits) and microscopic (thin section) scales to characterise the internal structures of PRDs drawn from a range of sites in different environmental and palaeo-periglacial settings. Fieldwork in Norfolk provides samples from a lacustrine environment in an area glaciated during the Anglian advance but not since.

Methods:

1. 3 test pits, a maximum of 1m³ in dimension were dug into a rampart. Data collection included:
 - photos.
 - sedimentary logs and sketches.
 - extraction of sediment samples using Kubiena sample tins (8x6x4 cm).
 - loose sediment samples taken from each pit.
 - shear vane testing in the base of each test pit.All pits were back-filled and turf replaced.
2. A core from the pingo basin up to ~3 m depth and ~30 mm diameter using a narrow hand gouge.
3. dGPS measurements taken.

Significance of BSG funding

BSG funding contributed to the production of thin sections following excavation and sampling of the PRD site in Norfolk (Walton Common). The grant increased the amount of data available for analysis at the micro-scale. Analysis of the thin sections and sediments is still underway as they contribute to a wider investigation into the internal structures of PRDs. On completion of analysis of samples from all sites investigation into ramparted depressions will:

- i. contribute to a better understanding of the formation of ice cored hills and allow consideration of the potential links between the different landform types *e.g.* pingos, palsas, lithalsas.
- ii. aid identification and characterisation of ramparted depressions, particularly where surface features (*e.g.* ramparts) are missing due to burial or decay.
- iii. enable palaeoenvironmental reconstruction and climate change since ice-cored hills only form under specific climatic parameters.
- iv. inform civil engineering projects in sediments disturbed by PRD development (*e.g.* heave and subsidence).