



Using a novel combination of geophysical and proxy techniques to reconstruct variations in long-term carbon accumulation in selected bogs of the Brecon Beacons National Park, South Wales.

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Terrestrial carbon stores are considerable. Peat bogs in particular, despite only covering 3% of the earth's surface, account for approximately one third of all soil carbon storage. Within the UK, peatlands represent the single most important terrestrial carbon store. In particular, blanket and raised bogs account for around 23,000 km² or 9.5 percent of the UK land area, with current estimates indicating that they store approximately 3.2Pg C. Recent studies suggest that carbon-sequestration rates have been highly variable during the Holocene. Reconstructing these past fluctuations is essential to assess how peatlands will respond to future climate change, particularly the possibility that large amounts of respired below-ground carbon will be released as a result of enhanced rates of decomposition, causing positive climate feedback.

Historically regional peatland volume estimates have been obtained using aerial imagery and manual probing techniques, to establish area and depth, respectively. However, these conventional survey methods are time consuming and laborious, or lack aerial data coverage and are therefore impractical for detailed, large scale investigations. Furthermore, uncertainty exists when average depth estimates are used, as these are not necessarily determined from systematic field measurements, and can disregard the heterogeneous subsurface conditions. The high water content and low mineralisation of peat soils make them well suited for Ground-Penetrating Radar (GPR) investigations; peat is highly resistive, with low signal attenuation and high permittivity, resulting in low propagation velocity (typically 0.03-0.04 m/ns). The result is high-density spatial data allowing accurate estimation of depth to be achieved.

This project brings together a novel combination of geophysical and proxy techniques to reconstruct variations in long-term carbon accumulation in selected bogs of the Brecon Beacons National Park. Extensive GPR common offset surveys were completed. Due to the difficult surface conditions, a 100 MHz articulated rough terrain antenna was used. A strong reflector was observed across all transects, except for some central regions where depth penetration was lost due to the signal being attenuated by a thick clay layer. GPR derived depths and surface-elevation data from LiDAR imagery are used to estimate total peat volume. In combination with radiocarbon dating and palaeoenvironmental data (bulk density, loss on ignition, total organic carbon, humification and macrofossil analysis) the carbon stored is quantified and the factors influencing variation in long-term carbon storage (climate variation) are discussed.