



What can we learn from national-scale geodata describing soil erosion?

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The United Kingdom has a rich dataset of soil erosion observations, which have been collected using a wide range of methodologies, across various spatial and temporal scales. Yet, while observations of soil erosion have been carried out along-side agricultural development and intensification, understanding whether or not the UK has a soil erosion problem remains a question to be answered. Furthermore, although good reviews of existing soil erosion rates exist, there is no single resource that brings all of this work together. Therefore, the primary aim of this research was to build a picture of why attempts to quantify erosion rates across the UK empirically have fallen short, through: (1) Collating all available, UK-based and empirically-derived soil erosion datasets into a spatially explicit and open-access database, (2) Developing an understanding of observed magnitudes of erosion, in the UK, (3) Evaluating impact of non-environmental controls on erosion observations i.e. study methodologies, and (4) Exploring trends between environmental controls and erosion rates.

To-date, the database holds over 1500 records, which include results from both experimental and natural conditions, across arable, grassland and upland environments. Of the studies contained in the database, erosion has been observed ca. 40% of instances, ranging from $<0.01 \text{ t}\cdot\text{ha}^{-1}\cdot\text{yr}^{-1}$ to $143 \text{ t}\cdot\text{ha}^{-1}\cdot\text{yr}^{-1}$. However, preliminary analysis has highlighted that over 90% of the studies included in the database only quantify soil loss via visible erosion features, such as rills or gullies, through volumetric assessments. Furthermore, there has been an inherent bias in the UK towards quantifying soil erosion in locations with either a known history or high probability of erosion occurrence. As a consequence, we conclude that such databases, may not be used to make a statistically unbiased assessment of national-scale erosion rates, however, they can highlight maximum likely rates under a wide range of soil, topography and land use conditions. Finally, this work suggests there is a strong argument for a replicable and statistically robust national soil erosion monitoring program to be carried out along-side the proposed sustainable intensification of agriculture.