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Ground-making research: the first UK arable soil formation rates

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The increasing pressure humans place on the land has led to the acceleration of soil erosion, to an extent where human-induced erosion of the soil is expected to outpace the production of new soil by more than an order of magnitude. Given that the thickness of the pedosphere is a first order control on soil functions, with thicker soils having a greater capacity for water, carbon and nutrient storage, the continued thinning of non-renewable soil profiles and the associated consequences on their productivity and health is arguably one of the most significant threats to soil sustainability. Despite the fact that the future long-term security of soils depends on mitigating soil erosion rates down to (and below) the rates of soil formation, our knowledge of the latter is surprisingly meagre. Recent developments in cosmogenic radionuclide analysis have catalysed greater investment in the derivation of soil formation data, and yet there still exists no isotopically-constrained study of soil formation in arable contexts. Arable soils are often the loci for accelerated erosion but in the absence of comparative soil formation data, the magnitude of the threat this accelerated erosion places on arable soils is unknown. Future policy to ensure their long-term security, and the delivery of multiple ecosystem services, demands greater work in quantifying soil formation in these contexts. Our research is the first in the world to respond to this call and here we present the first soil formation rates under arable soils. Saprolite was extracted at the soil-bedrock interface down a catena sequence at Rufford Forest Farm (Nottinghamshire, UK) and processed through cosmogenic radionuclide analysis. Further samples from a catena sequence in a woodland near Quatt (Shropshire, UK) were also processed. We will present our isotopically constrained rates with reference to the relationship between soil formation and soil depth and in the context of the worldwide soil formation rate inventory.