Geology, soils and landscape on the Dartmoor Granite around Moretonhampstead and Chagford

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The newly published soil map of northeastern Dartmoor (National Grid 10 km squares SX 68 & 78) covers the granite outcrop from the peat covered high moorland to its eastern limits against the metamorphic aureole, straddling the Sticklepath Fault Zone. The northwest to southeast alignment of that Zone is paralleled by fractures across much of the surveyed area. These, with secondary northeast to southwest lineations, give much of terrain a distinctive trellis-like grain, particularly apparent in the patterns of the groundwater affected soils. However, there are areas where this configuration breaks down, in places replaced by closer, dendritic patterns. In these areas decomposed, *in situ* granite appears commonplace, albeit cheek by jowle with sound rock. Over some of this ground partially underlain by kaolinised granite, there are subsoils with softened, but undisturbed, feldspar megacrysts, usually accompanied by gleying's clear indications of restricted permeability. In these areas physiographic contrasts with the fracture controlled land mirror those of the soil patterns. Here valleys and ridges are smaller and more sinuous, as are steep slopes. Many spur ends have reversed gradients, while dome-like low hills make up some of the area. Critically timed aerial photography, along with LiDAR, reveal further aspects of the distinctive landscape around this section of the Sticklepath Fault Zone.

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Introduction

Over recent years a soil survey was carried out of Ordnance Survey National Grid squares SX 68 and 78, around Moretonhampstead and Chagford. This was chosen to represent the Dartmoor granite along a 20 km long and 10 km wide traverse, from the highest moorland at about 600 m O.D., to the lowest part of the outcrop at below 100 m O.D. It completes the former Soil Survey of England and Wales' programme of sample surveys of Ordnance Survey 1:25,000 Second Series maps in each main natural region.

The main variation in the granite reported (Hawkes, 1982) across the two 10 km squares is a broad westerly decline in the proportion of feldspar megacrysts. A few very small outcrops of finer grained granite are shown on BGS maps. The area is crossed by the Sticklepath Fault running northwest to southeast along the Bovey Valley on the Dartmoor Forest geological map (BGS 1995) and north northwest to south southeast just west of Chagford on sheet 324 (Okehampton)(BGS 1969). Hawkes (1982) indicates that it comprises a zone of complex en-echelon faulting rather than a single fault. Displacement of the granite's contact with the Carboniferous between Hunt's Tor (SX722897) near Castle Drogo and Uppacott (SX734885) suggests the fault zone's easterly expression ends along the scarp running southeast from there passing to the east of Moreton and down the east side of the Wray valley towards Bovey Tracey. Overall lateral displacement is around 1.5 and 2 km. Away from the Sticklepath Fault Zone it is often paralleled by a physiographic grain affecting ridges and valleys, which Waters (1957) interpreted as marking joint and fracture lineations. He identified a secondary alignment from east northeast to west southwest. Waters inferred ridges as occurring at the intersection of wider separations of the joints and fractures on the two lineations, his positive elements, while closer joint spacings were taken to coincide with basins, negative elements.

The nature of any parent material, either as *in situ* rock or as its modification into superficial deposits, such as solifluction head, has a strong influence on soil properties. At the onset of this soil survey it was anticipated that the effects of climate's changes with altitude, culminating in the formation of peat on the higher land, would be the principal influences on pedological development passing from east to west across the survey area. Although that was indeed so, decomposed granite proved to be extensive (particularly in the Sticklepath Fault Zone) in several places having demonstrable effects on the soils and terrain. This paper will explore how the soils' form and distribution, along with the terrain, are influenced by altered granite and how their mapping helps demonstrate its occurrence.

Decomposition and kaolinisation of the Dartmoor Granite is known elsewhere, most obviously being the china clay of Lee Moor. Horsham (2015) quotes Sandemane (1901) as describing over 50 m of altered granite in places in the excavations for Burrator Reservoir. There are occasional references to it on unpublished local field slips in the BGS archives. Linton (1955) recognised it while postulating on tor evolution from the Two Bridges exposure, while Clayden (1971, p.111) described *"in situ weathered granite with distinct soft feldspar crystals up to 5 cm long"* extending down from 58 cm depth in a soil profile between Bovey Tracey and Lustleigh. Over parts of the district