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**ANALYSIS OF SPATIAL VARIATION IN CHEMICAL CHARACTERISTICS OF A SWAMP PEATLAND, ANGLESEA, AUSTRALIA.** R. Ferguson, V. Wong, School of Earth, Atmosphere and Environment, Monash University, Clayton, Australia (rfer0017@student.monash.edu).

**Introduction:** Peatlands are increasingly becoming recognised as crucial stores of carbon in natural systems. Much of the peatland cover worldwide occurs in high-latitude and high-altitude areas, where the combination of cold, waterlogged conditions reduces the decomposition rate of plant material. Boreal peatlands in the northern hemisphere are known to have a particularly high carbon store; it is predicted that approximately 455 to 621 petagrams of soil carbon is stored in these regions1. In a global context, this estimate is equal to around one-third of the global pool of soil carbon1,2. Peatlands also largely occur in areas of high rainfall and/or poor drainage, such as rainforests and estuaries.

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Studies examining peatlands in Australia tend to focus on higher elevation sites such as the Australian Alps, primarily due to their unique and somewhat rare characteristics in Australia [3]. However, comparatively few studies examine other types of peats, for example peat swamps in estuarine regions; this knowledge gap is addressed in the current study.

**Methods:** This study was located in the estuarine peat swamps of Anglesea, a coastal town in south-eastern Australia. Mean annual rainfall is 780mm, but tidal factors allow a regular supply of water in which peatlands can form. A total of 28 sites were sampled along a transect in 1 km iterations, representing distance from the estuary mouth. Between 3–6 soil cores were taken at each site; the depth range from which cores were taken were recorded. Cores were analysed for a variety of soil chemical properties including Soil Organic Carbon (SOC, %), sodium concentration (mg/kg) and sulphur concentration (mg/kg). Due to the large number of data points (**Figure 1a**) data were grouped by average depth value, creating mean values of SOC, sodium and sulphur concentrations (**Figure 1b, Figure 2**).Chart, scatter chart

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sulphur concentrations (**Figure 1b, Figure 2**).

**Figure 1.** Four iterations of the same data; Organic Carbon (%) over depth. a: ungrouped data; b: data grouped by average depth; c,d: figure b separated into 0–0.4m (c) and 0.4–1.1m (d). Note that the y-axis has been inverted to more clearly visualise depth; therefore equations remain correct.

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**Figure 2:** Comparison of log-transformed average sodium (top) and average sulphur (bottom) concentrations over depth at each of the 28 sites sampled in the study. Note that the y-axis has been inverted to more clearly visualise depth; therefore equations remain correct.

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**Figure 3:** Log-transformed sodium (top) and sulphur (bottom) concentrations of samples over distance from the estuary mouth.

**Results:** Although the ungrouped data showed little to no trend, grouped data showed that SOC generally increased over increasing depth, with a significant result observed (p = 0.0039, **Figure 1b**). The rate of SOC change appeared to be greatest at the lower depths (0.4–1.1m) compared to the shallower depths (**Figure 1c, d**). However, no trend was observed when examining this trend over distance from estuary mouth (i.e. colour-bars).

Once sodium and sulphur concentrations were log-transformed, a relatively strong correlation (r2 = 0.60, 0.57 respectively) was observed for both variables, with significant results obtained for sodium (p = 0.0008) and sulphur (p = 0.0014) (**Figure 2**). Like SOC, both sodium and sulphur concentrations increased over increasing depth. Despite this, no trends were observed again when examining the colour bars (distance from estuary mouth).

Sodium and sulphate concentrations appeared to increase as sampling sites became further from the estuary mouth (**Figure 3**). Despite the weaker correlation (r2 = 0.44, 0.47 respectively), the linear regression fitted to the scatter plot was significant for both variables (p = 0.01846, 0.01169).

**Conclusions:** The results of this study highlight characteristic attributes of peat formation, particularly in terms of carbon storage. SOC increased in concentration over depth, which is a rare result when considering most Australian soil types [4]. However, due to the slow decomposition rates of peat ecosystems, SOC is allowed to accumulate over time resulting in carbon stores somewhat similar to ‘blue carbon’ reservoirs.

The observed accumulation of sodium and sulphur concentrations over increasing depth could likely explained by downward leaching of nutrients. Although elevated sodium and sulphur concentrations can be detrimental to the growth of some plants, in this situation we can assume that peatland species can tolerate estuarine conditions. Nevertheless, future studies should determine the critical threshold of nutrients such as sodium and sulphur for peatland species in these areas.

Perplexingly, sodium concentration was found to increase as distance from the estuary mouth increased, contradicting the expected result. This could signify retention processed of sodium, but future studies should examine this anomaly in more detail.

**References:** [1] Gorham (1991) Ecol. Appl. **1**, 182-195. doi:10.2307/1941811 [2] Turunen et al. (2002) The Holocene **12**, 69-80. doi: 10.1191/0959683602hl522rp [3] Wilson et al. (2021) Aust. Ecol. doi:10.1111/aec.13115 [4] Isbell (2021) CSIRO [8016 (csiro.au)](https://www.publish.csiro.au/ebook/download/pdf/8016)