Big Peat and the Kiwis: How northern hemisphere peatlands may have obscured the upwelling of deep Southern Ocean carbon in the Holocene

Northern peatlands are an integral part of the global carbon cycle—a strong sink of atmospheric carbon dioxide and source of methane since the last glacial maximum. Using a new algorithm for calculating peat carbon accumulation, we show that there is nearly twice as much peat in the Northern Hemisphere as was previously calculated. This new inventory has a profound impact on our understanding of the carbon cycle during the Holocene and Late Glacial and begs the question, where does this carbon come from? Why do we not see ice-core evidence for a more significant drawdown of atmospheric pCO2? For the answer, we look to the ocean. The Southern Ocean is an important pre-anthropogenic source of carbon to the atmosphere. When Southern Hemisphere Westerly Winds are shifted poleward, wind-driven upwelling brings carbon-rich deep water to the surface. While this mechanism has been shown to be particularly important during the last deglaciation, new paleo-reconstructions from lakes and peatlands on New Zealand’s South Island and Subantarctic Islands show strong evidence that the middle Holocene was also an important time for increased upwelling. This upwelled carbon, instead of remaining in the atmosphere, was quickly sequestered by fast-growing northern peat.