

Analysis of Sterol Diagenesis Stages in a Peat Core from Kamchatka, Russia

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Peatlands are a critical part of the global carbon cycle. While many studies of peat carbon focus on accumulation, less is known about peat decay. We use the diagenesis of sterols to track the decomposition of peat in a Holocene-length core of a sedge fen on the Kamchatka Peninsula, Russia. Diagenesis can transform sterols as soon as the peat is initially deposited, but they can also remain unchanged for millennia. We have quantified the transformation of sterols into their diagenetic products to measure the maturity of peat and estimate carbon loss. Further, there are two pathways in sterol diagenesis, oxidative and reductive, and the products of these two pathways can indicate the conditions under which the peat degraded. This project focuses on the transformations of cholesterol, campasterol, and β -sitosterol, to cholestanol, campastanol, and stigmasta-3,5-diene-7-one, respectively. During the late Glacial period (before 10 ka) the oxidative pathway dominated sedimentary sterol transformation, indicating strongly reducing conditions. These sediments were deposited before the site transitioned to a peatland, and are dominated by sapropel, supporting the steroid evidence for reducing conditions. During the Early Holocene, (about 8 - 6 ka) sterols, and, presumably, peat, were well preserved, and coincided with high carbon accumulation rates. In the middle Holocene (5 - 2 ka) the reductive diagenetic pathway dominated, indicating oxidizing conditions, and coincided with low rates of C accumulation. At 2.5 ka, conditions favoring the preservation of sterols returned, along with higher C accumulation.